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Ian Douglas
Zhengjie Liu *Editors*

Global Usability

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Chapter 1
Introduction

Ian Douglas and Zhengjie Liu

1.1 Background

The idea for this book arose from a student project started 3 years ago at Florida State University. A student had expressed an interest in working with Google maps and it was suggested he build a system that tracked the location of usability laboratories and test centers around the world. We were aware that there were several html-based lists of such places on various web sites. These tended to be limited and often out of date. Three years later and with the subsequent involvement of four other students, we have over 500 entries into this database (see Fig. 1.1).

Initially labs were entered through searches on the Internet for existing labs and lists of labs. This was assisted by the various language skills of the students (Chinese, Korean, Spanish). We also included a mechanism for labs to add themselves to the database and this now accounts for most of the new entries. The map shows large concentrations of labs and centers in North America and Europe, but also significant clusters of labs appearing in other parts of the world. In a sample survey of the labs it is apparent that this spread is relatively recent for many countries (Douglas 2008).

Dr Douglas who led this project decided to take the opportunity to visit some of these labs while attending conferences overseas. The first lab he visited was Prof. Liu's lab in Dalian China while in transit to the 2007 HCI International conference in Beijing. On subsequent visits to other labs, notably Pontifícia Universidade Católica do Rio de Janeiro, it seemed there was an interesting story emerging about the development of usability around the world. Different factors have shaped the study and different disciplines have taken the lead in developing the concept and promoting its importance. For example, linguistics, specifically semiotics has had a strong influence in the development of a Human-Computer Interaction (HCI) community in Brazil. In several Asian countries departments of Industrial

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Fig. 1.1 Global Usability Knowledge Management Project showing the spread of usability labs and test centers around the world

Engineering has had the most prominent role, with relatively little development of HCI within the Computer Science community. In addition to developments in education and industry, professional societies and government have played various roles in promoting usability. This book is an attempt to tell the story of the development of usability, as it becomes a design issue of global concern.

In telling the story we must first begin with tackling the issue of how we define usability. The concept has been used in different contexts by different disciplines, which have slightly different perspectives on its meaning. All the disciplines have an overlapping interest in improving design. One of the earliest communities to consider usability as a general design issue was ergonomics (Meister 1999). Although ergonomists were initially concerned with the more physical interaction issues of design, they later developed the concept of cognitive ergonomics (Falzon et al. 1990). This field has developed from the very diverse parent field of engineering; it is primarily associated with industrial engineering departments, but is also located in more specialist human factors engineering departments. Interest in usability has also long been found in Psychology and Cognitive Science departments.

This book series primarily caters for those in the field of Human-Computer Interaction (HCI), which has a strong, but not exclusive relationship with computer science. Although the interest of this field was initially in developing new methods of interaction with desktop computers, it has branched out into other areas of design and to other technological products (e.g. mobile phones, ubiquitous computing).

It has also developed links with more human-centered techniques of study that are more focused on understanding user behavior than developing a specific instance of a technology.

In addition to these groups of academics, there are people in information science, management information systems and new groups emerging in web science (Hendler et al. 2008) and research in the science of design (Purao et al. 2008). Usability is a common thread that runs through all their work, but their understanding may be different based on their experience and the fact that the different groups are insulated from one another with their own journals, conferences and academic departments. Some in the HCI community may see usability as synonymous with HCI. Others have a sense that usability is a general design attribute of just about anything humans design (Norman 1988). A more general sense of usability is seen in the definition of usability contained in the international standards organization (ISO) standard titled "Ergonomics of Human System Interaction[1] Part 11: Guidance on Usability" (ISO 9241-11 1998):

> Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Given this any discipline that involves any type of design will essentially have an interest in usability. In addition to specific products, it is also possible to argue that organizational systems and services are designed with more or less usability. For example, the design of signage to facilitate navigation around a public library contributes to the usability of the library as a service (see Fig. 1.2).

The classic definition of usability is relative rather than absolute. You cannot say some design is usable, user friendly or has good usability. You can say that design

Fig. 1.2 A sign designed by and for a library expert not end user

[1] Formerly called: Ergonomic Requirements for Office Work with Visual Display Terminals.

A is relatively more usable than design B based on some measure of effectiveness (task completion, number of errors and number of times seeking assistance), efficiency (time taken to complete the task), satisfaction (users' rating of experience), and learn ability (amount of instruction/study required). These must be evaluated for a range of tasks in realistic use environments. Numerous usability evaluation techniques have emerged to measure these factors. In this book there will be reference to these techniques and how they are adapted for different cultures.

Some researchers have gone beyond these more mechanical measures to focus on the emotional impacts of design. The experience of practitioners has had an influence here and many would now prefer to focus on what is termed 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 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.

Given this book is a collaborative effort between a number of writers with different backgrounds, it did not seem appropriate to proscribe a definition to the authors. The authors were only asked to consider different discipline's involvement in usability activities in their countries, but inevitably some authors will have a broader perspective and some countries will have certain disciplines dominant in the development of usability. Some of the authors specifically address the definition of usability from their own perspectives.

1.2 Book Overview

This book is divided into two main parts. In the first part we invited authors who are prominent in working on cross-cultural usability. The intention is to provide an overview on the issues and interests in research and development related to usability.

In Chap. 2, Michael Best and Thomas Smyth note that the spreading of technology throughout the globe does not automatically mean the spreading of usability knowledge acquired in the most developed countries. Efforts must be made to make this a universal element of the technology design process. In addition there is a need to adapt this knowledge and expand it to meet the needs of different groups.

They identify the "dimensions of difference" of different communities and cultures, which are used to consider two perspectives on usability. One perspective sees it as a verb, which requires consideration of how you do usability and adapt the doing to different contexts. Here they cite a number of studies that demonstrate that the traditional methods often require adaptation when used in different countries. The other perspective considers usability as a noun, a community and body of knowledge that is expanding throughout the globe. Here they refer to several map based information systems that illustrate the spread.

In Chap. 3, Andy Smith expands on usability as a verb, continuing the discussion on adapting usability methods and tools developed in the west for use in other parts of the world. Smith further argues that adapting the methods is not enough; what is also needed is “Institutionalization” in academia and industry throughout the world. Local institutions (e.g. governments, industry, professional bodies) need to recognize the importance of usability expertise and take ownership of its development. Smith also introduces the work of Hofstede (1991) one of the main reference points for many researchers interested in the cultural influences on design.

In Chap. 4, Dianne Cyr deals with web design, which has been a particular motivator of interest in global usability. Anyone with a web site is essentially establishing a global presence since anyone with Internet access can access the site. Many organizations wish to have sites that are particularly targeted at specific countries and cultures, and this is more than a task in language translation. The issue of trust is one that is particularly linked to usability (Bevan 1999). Cyr presents an overview of research dealing with the issue of trust and how design and culture interacts. It is the kind of work that can be undertaken by different researchers in different cultures producing results and guidelines applicable to web developers everywhere.

In Chap. 5, Susan Dray and David Siegel provide a detailed review and discussion of field research in an international context. In addition to providing a wealth of practical advice from their extensive experience, they argue that practitioners should have a proactive and holistic understanding of the people and locations that make up their markets. In doing this partnerships with local experts are important and this leads into the one of the main purposes of the second part of the book.

The initial interest relating to global usability was from western researchers interested in the cultural aspects of design and western product developers interested in selling their products in a global market. We now have a situation where many countries outside Western Europe and North America are starting to develop their own communities of researchers and invest in their own design industries.

In the second part we have chapters that provide profiles of individual countries that are outside North America and Western Europe. They provide an insight into what is happening in particular countries and a guide to potential collaborators for both researchers and practitioners.

For part II, we invited people who were prominent and knowledgeable in their countries’ usability community to provide an overview of usability related activity in their country. We have tried to get representation of as many countries as we can with either newly emerging or distinct traditions in relation to usability research and practice. Authors for the country chapters were provided with the following basic outline for their chapters:

- Brief overview of the country: demographics, economy and culture
- Overview of usability in the country: including the history of its development and any unique perspectives and problems
- Extent of activities: universities with educational programs, industrial activity, research, conferences/meetings and organizations

- A few samples of industrial projects and academic research carried out in the country

Different authors have chosen to emphasize different parts of this outline and some have added additional elements, such as a view to the future. We trust that the information provided will not only provide an insight into the countries, but will facilitate those readers interested in participating in a global network of researchers and developers working in different countries.

While we believe we have been largely successful in creating a picture of the development of usability throughout the world, there are a few gaps. There are some countries where we had authors who were not able to deliver a chapter. As a result, certain areas of the globe are either underrepresented (South America, Middle East) or not represented (Africa). We anticipate the opportunity for future editions to correct this problem and fill in the gaps. We also believe that future editions will cover more and more countries and witness a healthier development of usability research and practice along with the growth of the field worldwide.

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Part I
Issues Relating to Global Usability

Chapter 2
Global/Local Usability: Locally Contextualized Usability in the Global South

Michael L. Best and Thomas N. Smyth

2.1 Introduction

Digital technology has permeated nearly every inhabited corner of the globe, from the metropolitan global information hubs in the USA or Europe, where everything from the parking ticket to the vacuum cleaner seems increasingly digital and networked, to the most remote African or Indian village, where the mobile phone and network are proliferating at much talked-about speeds. Meanwhile, the swelling middle classes of developing urban areas in low-income countries race to catch or surpass their high-income country counterparts in their technological capacity and enthusiasm. Digital technology is now a truly global phenomenon.

With this spread of technology comes the growing importance and necessity that it be easy to use, especially where its users are neophytes. This basic fact was thankfully recognized several decades ago, resulting in the field of usability and human-computer interaction, and today a vast canon of academic literature, field guides, best practices, and case studies of success and failure has been assembled and refined around the topic of usability. The ubiquity of digital technology would seem to foretell of the coming ubiquity of those same maxims and mores of usability. But this would be a mistake. This chapter argues that for true usability to prevail, usability methods, techniques, and institutions must be localized and contextualized. While true for any region, we feel that this principle is most important in the world's poorest countries, which we will refer to here collectively as 'The Global South'.

This term, 'Global South', like any other which entails dividing the world into discrete categories, comes with its own baggage. But in any case this chapter does not hinge upon any concrete geographic delineation. Broadly, we suggest that our analysis is most salient for countries listed as low- or lower-middle income in the World Bank's country classification, though we acknowledge that there will be exceptions.

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Table 2.1 Dimensions of difference

Dimension-of-difference	Examples of differences
Linguistic Diversity	Differences in the roots, scripts, and number of languages
Literacy	Levels of print and computer literacy, degree of orality
Technical Infrastructure	Presence and extent of electrical and communications networks
Physical Environment	Climate, built environment
Cultural Norms	Norms on privacy, gender norms, age-specific norms
Distance	Physical geographic distance between North and South

Rather than focus on crude income-based or geography-based delineations, we center our discussion on a set of *dimensions of difference*, listed in Table 2.1. We see these dimensions as among the principal axes along which countries in the 'North' and 'South' can be distinguished. We also believe that these dimensions are most demonstrative of the importance of careful contextualization of usability theory and practice. No country can be fully described by singular points along these dimensions; indeed no individual person can be so simply characterized. Instead we believe that these dimensions offer ways to position the technologies, methods, and institutions operating within the usability program, and this categorization assists us in discerning elements of potential success and failure when developing usable solutions for people in the Global South.

As a further caveat, we acknowledge that many of the arguments presented here could apply perfectly well to communities and regions *within* the Global North itself. The indigenous communities of the USA, Canada, Australia, and New Zealand are poignant examples, as are many inner city groups in major US cities.

We structure our discussion around three fundamental meanings of the word 'usability' itself. At its most basic, usability is simply the noun form of the adjective 'usable', and refers to a property or feature of a technological artifact—a system *is* or *isn't* usable. Thus the first part of our discussion reviews how this property of usability may have different meanings in the Global South. Taking a step back, one sees that the term 'usability' has also come to encompass an always-expanding set of methods and techniques developed to assist in the production or evaluation of usable systems. Here, usability becomes an action, or verb, and in the second part of this chapter those methods and techniques are examined. A final step back reveals the epistemic communities which are responsible for developing, maintaining, and applying the usability canon. These include professional associations, academic interest groups, private companies, and others. One might look for a job in the *field of usability*. Here 'usability' becomes a noun unto itself. The third part of this chapter considers the global distribution of this community, and the importance of its continued expansion into the Global South.

2.2 Usability as Adjective: A Feature of Technology

Of our three units of analysis, *technology* is at once the most obvious and the most controversial. It is obvious insofar as conceptualizing issues of global/local usability often have the *thing* of use as a starting point. After all, technology as the *Ding an* *sich* in a use experience surely is easy to grasp and describe and so naturally forms the point of departure. It is the most controversial because we know this reified positioning falls quickly into overly simplistic techno-deterministic models. Here technology is detached and unto itself, unmediated by culture or community. If a study of global/local problems in usability tell us anything it is that we must reject technology as the singular artifact, even while (often happily) these shibboleths of techno-determinism remain common in our headlines and popular narratives.

These limitations notwithstanding, what can we learn from a focus on the technologies themselves that can help inform a project in global/local usability?

Some scholars of interaction studies have successfully made use of Heidegger's (1962) concept of ready-to-hand usability and breakdown to help us focus on when the technology as a *thing* can most fruitfully reveal elements of its use and users. Heidegger perhaps first surfaced in computer design context in the work of Winograd and Flores (2005) and has been well explored in how it relates to embodied or tangible systems by Dourish (2004). As explained by Guignon (1993), "When everything is running smoothly in the workplace… the ready-to-hand and the surrounding work-world remain unobtrusive and unnoticed…. When something goes wrong in the workshop, however, there is a 'changeover' in the way things show up for us. If the handle breaks off the pot or the spatula is missing, the whole project grinds to a standstill…. It is when things are temporarily unready-to-hand in this way that we can catch a glimpse of the web of functional relations in which they played a part" (p. 12).

We suspect that Heidegger's concept of "breakdown" or failure will be particularly helpful when examining local/global technology usability if for no other reason than failure seems so common. Indeed the ICT4D literature is replete with stories of technical breakdown and multiple researchers have identified "technological sustainability failures" (Kumar and Best 2006) or "technical critical failure factors" (Heeks and Bhatnagar 1999) as significant components to our overall understanding of breakdown and success among these interventions.

In this chapter we have selected a set of dimensions-of-difference, categories of lived experience that commonly differ between the Global North and South (see Table 2.1). We are arguing that at a moment of changeover misapprehensions of the designer as to user's lived experience along these dimensions-of-difference may help reveal sources of breakdown. Since our goal with global/local usability is to avoid these moments of breakdown in the first place, this process should provide a useful diagnostic.

Let's first consider a particular and well documented example of breakdowns with the hope that it will help us illuminate technology and global/local usability.

2.3 Warana Wired Village Project

Technical breakdown of PC hardware is a common refrain when examining the ICT4D literature and thus a clear example of the global/local usability failure that should move a system from being ready- to unready-to-hand.

One well-known example of technological breakdown comes from the Warana Wired Village Project was setup in a wealthy rural district of Maharashtra, India among a very successful cane sugar cooperative. It was designed to provide 70 PC based village information centers. These centers would allow local farmers to increase their efficiency, have access to information, communicate more efficiently across the cooperative, and more (Vijayaditya 2000). While the project was launched with great fanfare, and indeed even as it declined was routinely trumpeted as a triumph, it was broadly known that the project was not sustaining itself and that, for instance, much of the technology was not functioning and the users where not happy. Amazingly, even to this day the project is read as a success in some places (see Thadaboina 2009) demonstrating perhaps a true lack of "honesty about what works" (Donner et al. 2008).

A recent study found that while most of the computers were in working condition, they were "covered with dust.... covers were missing or loose from frequent replacements of components. Cables had apparently been chewed by rats…." (Veeraraghavan et al. 2009, p. 84). We argue that this project experienced pervasive technological breakdowns.

As assessment evidence continued to reveal the technological failures of the PCs in this intervention (among other points of failure) a set of scholars proposed to replace the PCs with a mobile phone SMS based system that would preserve the functionality of the initial system but implement it on what was viewed as a more natural technology (Veeraraghavan et al. 2009). The Warana Unwired was thus born. According to the researchers, "[t]he distinct advantages of such a system are: Mobile phones are much less expensive to purchase and maintain than PCs; they have their own battery system; they provide a means of remote communication; and, for the kinds of information that were actually exchanged by farmers at these kiosks, SMS is more than sufficient," (p. 87).

We shall return to this example after we further explore our dimensions-of-difference.

2.4 Breakdown on Dimensions-of-Difference

Above we introduced dimensions along which differences routinely obtain between the Global North and Global South. Detailing these dimensions should, we submit, enhance our ability to diagnose and fix points of technology failure. A foundational question is how do these technologies encode assumptions, made by their designers, about the lived experiences of the users as they are positioned on these dimensions. Here are examples of technology breakdowns, and some fixes, along these dimensions:

Literacy. Many, indeed most computer systems assume print literacy in the application language. This assumption of print literacy is not true for many places and particularly in low-income countries but, nonetheless, few technologies have been actually crafted to leverage the higher levels of orality and low literacy in these contexts (Sherwani et al. 2009b). For instance, scholars (Sherwani et al. 2009a) have shown that low literacy users find speech interfaces preferable to touch-tone interfaces in mobile phone medical applications.

Language. So much of modern information technologies privilege the Latin alphabet and indeed the specifics of English. The QWERTY keyboard is a quintessential and historically contingent example of such a technological encoding of specific language expectations. Several research efforts have examined alternative designs (e.g. Joshi et al. 2004), but the QWERTY design still reigns supreme. Contemporaneous to this writing, ICANN has (finally) announced support of non-Latin characters in top-level domain names (http://icann.org/en/announcements/announcement-16nov09-en.htm), a rather modest technological affordance in support of the world's languages.

Technical Infrastructure. Assumptions of robust infrastructure, such as power and telecommunication grids, is another potential dimension-of-difference that can lead to design flaws, technological breakdown, and ultimately poor usability. Examinations of desktop computer systems have demonstrated extraordinary increases in power consumption over the years, clearly without any regard to low-power consumption in the absence of a robust energy grid (Winrock International 2004)[1]. Similarly technological designs frequently code for assumptions about the ICT networking infrastructure. In South Africa, for instance, many vast numbers of Internet users are accessing the Web either exclusively or primarily through their mobile phones (Gitau and Donner 2009). Many users know no Internet other than the mobile Internet. What ramifications should this have for technology design?

Physical Environment. Technologies are generally designed for stable indoor settings with well filtered air and temperature controlled by HVAC facilities. This assumption is not always true for many places in the Global South and represents one point along the environmental dimension-of-difference. Some researchers have, however, tried to design ICT systems that are well suited to hot, dusty, or rainy environments. For instance Sugata Mitra and his colleagues developed a positive pressure enclosure, using reversed exhaust fans, to ensure a dust-free environment for PCs deployed in rural India (Mitra and Rana 2000).

Cultural Norms. Normative elements are always encoded in technological designs and these norms generally represent those of North American or European cultures. Clearly culture is a dimension-of-difference between the Global South and North. We have been critiquing the core cultural norms of the *personal computer* especially when deployed *in* cultures where technologies are routinely shared among a community (Best 2008). How would you design a *community computer* if you wanted to ensure that the appliance functioned well beyond a personal setting?

[1]Of course the laptop and mobile phone markets have provided a counter-force to the power guzzling desktops.

2.5 Usability as Verb: Methodology and Approach

Though usability is a young field, the number of methods it has produced is great, and today they enjoy considerable currency. As a striking example, the U.S. federal government maintains the Web site usability.gov as a central source for usability information. The site lists a standard, well-known set of methods including card sorting, interviews, focus groups, heuristic evaluation, personas, prototyping, surveys, task analysis, usability testing, and use cases. But arguably all of these methods were developed with standard office use scenarios of the North in mind. As such, they undoubtedly carry implicit assumptions in each of the areas covered by our dimensions of difference. When those methods are *imported* to a Southern setting, either through indigenous growth of the technology sector or through international development activities, those assumptions can cause problems.

In this section, we review some of these established usability methods, and consider their suitability for a Southern context, with reference to our dimensions of difference. Where applicable, we note modifications or refinements of methods reported by authors who have attempted to transplant them. The unique circumstances of the South have also inspired the development of some novel usability methods, which we also survey here.

2.5.1 Physical Environment

A typical site for usability testing and prototype evaluations in the North is a dedicated usability laboratory, often outfitted with soundproofing materials, one-way glass, recording equipment, and so on. Other methods like interviews and focus groups can also benefit from quiet, controlled spaces, especially when the proceedings are being recorded. Finding or constructing such spaces in the South can be difficult, in both urban and rural areas.

A lack of appropriate facilities has been seen to cause problems for certain methods. As Ankowa et al. (2009) write: “background noise, interrupting bystanders, and technical problems due to power and other failures are practically guaranteed” in conducting user studies.

Medhi et al. (2008) further argue that a usability lab setting and formal procedures could be distasteful to certain classes of participants. They write “[our participants] were drawn from communities that often fear testing of any kind and find air-conditioned office environments alien and possibly intimidating.” The authors’ solution was to conduct tests in more familiar settings, which inevitably leads to the same kinds of conditions described by Anokwa et al.

In survey work we have carried out in rural areas in Africa large crowds have confronted the research group, undoubtedly due to the novelty of a foreigner’s presence in a remote locality. Members of the crowd sometimes appeared to be influencing survey-takers by suggesting answers. Moreover, outspoken members of communities sometimes interrupted the proceedings entirely, demanding to know what was going on (despite our having obtained appropriate permissions). As experimenters, we eventually learned to better handle such disruptions by politely requesting silence, and speaking to inquisitors off to the side.

2.5.2 Cultural Norms

Many usability methods, such as surveys, think-aloud protocols, focus groups, and interviews, rely for their validity on the willingness of participants to express negative feedback. But this can pose a problem in some parts of the South. As Smith et al. (2008) write , “it is impolite to tell someone they have a bad design” in some Asian cultures. Similarly, Chavan (2005) argues that the Indian cultural millieu “largely advocates acceptance of the state of a given situation and then if possible, to work around it. To give an obviously negative opinion about people or things is uncomfortable for most people.” A North-South power dynamic may exacerbate this tendency in some situations. Ankowa et al. (2009) find that as a foreign researcher, “there seems to be a mystique to being labeled a ‘technologist,’” and that as a result, “there was a limit to the value of the feedback participants shared.” They share modifications to methods such as ‘getting groups talking’, wherein groups of participants are encouraged to talk about their opinions with each other, while the experimenter listens in the background. Substituting peer-group discussion for direct experimenter-participant discussion was seen to overcome the reluctance to criticize in some cases. They also argue that a triangulation strategy, though advisable for any research effort, is especially warranted.

Chavan (2005) describes three methods developed to mitigate the ‘discomfort’ felt by Indian users in giving honest criticism. The first, labeled ‘Use the Collective’, mirrors the ‘getting groups talking’ strategy of Anokwa et al. The second titled ‘Evaluation Bollywood Style’ leverages the ubiquitousness of the Indian film critique to get users to speak frankly. The technologies being tested are woven into dramatic, Bollywood-film-style narratives, and users are asked to review them, thus encouraging the users to “transfer the critiquing mindset from films” to technologies. Chavan’s third method is a cultural probe called ‘Emotion Ticket’, in which users are given a set of nine ‘tickets’, one for each of the nine *rasas* or emotions traditionally used in Indian performing arts. Over several days of use, users are asked to record their feelings about a technology on corresponding tickets. Chavan claims that the informality of this approach made users “less defensive” and produced “more frank answers”.

Meanwhile, Smith et al. (2008) report some evidence that Indian users “do not adapt readily to sequential task-based testing,” supposedly in accordance with India’s “polycronic” culture in which multiple tasks are often handled at the same time. While the authors stop short of suggesting alternative methods or recommending generalizable guidelines based on these observations, they nonetheless call out an interesting consequence for usability methodology of widely acknowledged differences in the perception of time between the North and South.

Cultural considerations can also affect sampling procedures for methods like surveys and interviews. An ideal randomized sample often calls for participants to be contacted at random, rather than via a trusted intermediary. However some Southern cultures may be less amenable to cold calls from strangers. Medhi et al. (2007) write that as a result, they "reached out through contacts whom [participants] trusted, and who were in almost all cases, present through the duration of the study."

2.5.3 Literacy

Widespread illiteracy is one of the most distinct and troublesome features of the world's poorest regions. While many Southern cities are home to increasing numbers of well-educated college graduates, some usability work in the South is bound to encounter illiterate participants. Brewer et al. (2006) describe difficulties experienced by illiterate participants in a usability study, claiming that they had trouble understanding the nature of a 'task', and in differentiating between formal and colloquial language. Their story involves a participant testing a voice-recognition phone system, in which the participant is asked to say either 'yes' or 'no' in her local language, in response to a series of prompts. The experimenters instructed that the formal version of the word 'yes' should be used, but the participant repeatedly used the colloquial form instead. The authors speculate that the participant's illiteracy was to blame for the confusion.

Other methods conflict with poor literacy skills for more obvious reasons. For example, prototypes and usability tests must be designed and conducted carefully to exclude the use of text and advanced literate concepts. But just which such concepts are most problematic for illiterate participants and users is a matter of ongoing research. In perhaps the most extensive treatment of this issue, Sherwani et al. (2009b) have applied the cognitive theories of Walter Ong (1982) to the question of usability for illiterate users. Ong's original work mapped what he called the "psychodynamics of oral thought", where 'oral' is a more accurate signifier for 'illiterate'. For instance, Ong argues that oral thought is "close to the human lifeworld" and favors the specific over the abstract. Sherwani et al. accordingly advocate that "abstract categories should be avoided" in interfaces for oral users. As for usability methodology, the authors call for a substantial overhaul, claiming that "it is arguable whether results from [typical user] studies are of much analytical value in oral contexts" because a procedure involving abstract tasks, lists of instructions, examination-style questions is a "clinical abstraction that is alien to the lifeworld of a typical oral person." Their methodological recommendations mostly related to the abstract/specific dichotomy: avoid neutral tasks and Likert scales, motivate and contextualize the system using concrete examples, allow for ample practice time.

Other works have called out other interface features as problematic for illiterate users. Walton et al. (2002) argue that hierarchies are culturally specific constructs unnatural to some groups of users. Deo et al. (2004) make a similar argument specifically for illiterate users. These sentiments echo Ong who treats hierarchies as a fundamentally literate idea.

2.5.4 Distance

International development work often produces situations in which researchers or practitioners are separated by considerable geographical distance from users. This poses problems for methods where face-to-face contact is desirable, such as interviews, focus groups, surveys, and usability tests. Physical distance also often breeds cultural and experiential distance—researchers or practitioners far away from a work site who start off with limited knowledge of a culture or domain will have difficulty building that knowledge. Unfortunately, resource constraints make these distances an unavoidable reality.

Best et al. have described a novel hybrid methodology for partially managing distance. Dubbed 'heuristic, diaspora, field' (HDF), it advocates a three-stage iterative design and testing process (Best et al. 2009). In-house experts are consulted first, according to the well known 'heuristic evaluation' process (Nielsen and Molich 1990). The heuristics used may be derived from standardized sources, but may evolve as the iterative process proceeds. As a next step, the method suggests reaching out to members of a diaspora community originating from the locale of interest. For Best et al., the community was Liberian expatriates living in Atlanta. The authors acknowledge that expatriates may not be ideal stand-ins for target users in-country, but their experience indicates that there is still much to learn from them. The third step in the iterative process is the transporting of the technology to the field site, where it can be tested and refined with users in country. Taken together, these steps could be seen as a 'discount' usability evaluation process for cross-cultural situations, in the spirit of Nielsen's original discount set of techniques (Nielsen 1994) that also included heuristic evaluation.

2.5.5 Linguistic Diversity

Any usability method that involves interaction with users is subject to the challenges of linguistic diversity. Often a qualified interpreter fluent in several languages is enough to enable verbal methods such as interviews and focus groups. When text is embedded in a system's interface, the task becomes more difficult. For instance, the very choice of which language to use may not be straightforward. Ankowa et al. (2009) discuss the difficulty of choosing a primary language for one such system, reporting that hidden expectations, aspirations, and power relations contributed to a confusion over whether to use a national language or a regional tongue.

2.6 Usability as Noun: Community and Institutions

As we move further outward from the technological artifact to the broader social context surrounding usability, we now turn our attention to the *community* of individuals and organizations which gathers to develop and employ usability methods and produce usable systems.

Fig. 2.1 UPA chapters

The usability community in the North has grown to be quite large, led by large academic conferences such as CHI and UIST, and substantial organizations such as SIGCHI and UPA. Predictably, the Global South is home to a much smaller community, although many of the same institutions, which were founded in the North, are expanding into Southern areas. Figure 2.1 shows the global distributions of chapters of the Usability Professionals Association (UPA), Fig. 2.2 shows chapters of the ACM Special Interest Group for Computer-Human Interaction (SIGCHI), and Fig. 2.3 shows usability labs and testing centres as surveyed by Douglas (2009).

Within this Southern expansion, China and India lead the way. Both are home to several SIGCHI and UPA chapters, as well as international usability firms such as Human Factors International. The Global Usability Knowledge Management (GUKM) website (Douglas 2009) lists 28 usability labs or testing centers in India and China, a considerable number. However, there is still much ground to cover—28 is far less than the 150+ labs in the U.S., especially on a per-capita basis.

Smith et al. (2008) suggests that several factors contribute to this discrepancy. First, some Chinese socio-political perspectives have traditionally placed minimal value on disciplines such as psychology and sociology, which underpin the usability field. Moreover, in both India and China, a "highly skilled, yet technically oriented approach to computing" is predominant, favoring coding and implementation over design and user research. Early information services booms were perhaps partly to blame for this penchant, since most work initially being offshored to Asia was of a menial or narrowly technical nature, with more creative design work remaining in the North.

Fig. 2.2 SIGCHI chapters

Fig. 2.3 Labs/testing centers

But there are signs that all of this is changing. Smith's group has led EU-funded projects to develop knowledge about usability in China and India (Smith 2008). The maturity of Indian and Chinese IT companies is also progressing, with more offering "full-lifecycle" solutions and hiring larger usability teams. Other efforts to help spread usability knowledge are also in evidence. The uiGarden Web site (http://uigarden.net) facilitates communication between English and Chinese-speaking usability professionals by offering translated articles and moderated discussion fora.

The picture in Africa is much sparser, however. UPA reports no chapters on the continent, and GUKM lists only 4 labs, all of them in South Africa. Post-secondary education seems to reflect this trend. A survey of 24 African university computer science departments revealed that only 11 featured any courses on human-computer interaction or usability, and seven of those were in South Africa (Chetty et al. 2007). The relative lack of IT industry must also be partly responsible, as Africa has experienced nothing like the IT booms of India and China.

Nonetheless, the presence of South Africa as a guiding light in usability is encouraging. Partnerships similar to Smith's in India and China should be undertaken in an effort to spread that momentum to other parts of the African continent.

2.7 Conclusion

We argue that many technologies fail due to usability errors that occur when designers create solutions that embed erroneous assumptions along our dimensions-of-difference. These design errors are even present in the processes and methods of usability analysis and evaluation, so it is not enough to just adapt the technologies—we must modify the approaches towards usability as well. But these methodological adaptations will probably never be enough until we have built robust institutional support and organizational foundations for usability work in the Global South itself. Currently there is a paucity of scholars and practitioners working in low-income settings on usability issues.

Robust usability in the South will require confronting the word across all of its syntactic roles: verb, adjective, and noun. This is required if we are to truly find usable solutions in the Global South that respond to their local contexts.

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Chapter 3
Issues in Adapting Usability Testing for Global Usability

Andy Smith

3.1 Introduction

Across the globe, local people have their own concepts of knowledge and their own forms of information communication. It is important that they should be able to shape their use of interactive systems without the risk of losing their culture and identity. Cultural differences have the potential to affect both the product (e.g. website, mobile phone, software application) and the process (e.g. requirements capture, usability evaluation) of interactive systems development. In relation to the product, cultural differences in signs, meanings, actions, conventions, norms or values raise challenging issues in the design of usable localized artifacts.

In relation to the process of development, cultural differences potentially affect the manner in which users are able to participate in design and act as subjects in user based evaluation and testing methods. The number of usability professionals who are implementing such methods is growing significantly across the globe. Through a wide range of engagements with usability practitioners it is clear to the author that there is a considerable appetite to learn about Western usability methods in the expectation that these can be implemented locally. However there are two problems to overcome:

- Firstly a holistic understanding of HCI is necessary in order for the most effective tools or techniques to be successfully selected and implemented – this implies a much broader 'education in HCI' rather than just 'training in tools'.
- Secondly the cultural and organisational differences between countries and cultures mean that HCI tools and techniques that have been developed in Western countries may not be the most effective ones in developing countries. What is required is the localisation of methods to meet local requirements.

In collaboration with others (Smith et al. 2007), the author supports the international 'institutionalisation of HCI and usability' as they key way to ensure that HCI

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is properly developed and implemented across the world. Institutionalisation needs to exist both in academia (so that effective teaching and research can be supported) and industry (so that interactive developers and usability engineers can understand and implement the ideally localised principles and practices). This institutionalisation has three elements (Fig 3.1):

- Firstly we require the redefinition of HCI and usability practice in the local country/culture. This involves the potential adaptation of Western methods to suit local needs – essentially the localisation of methods as mentioned above. Of course this redefinition does not need to start from scratch, but neither is it appropriate to replicate untested methods that may be successful elsewhere. In order to achieve this redefinition both indigenous and global approaches are requires, involving critically a collaboration between them.
- Secondly it will be necessary to the embed HCI and usability expertise in local national organizations. This involves taking ownership of the redefined HCI within local countries/cultures such as through national computer societies, usability professional associations and in academia.
- Finally we require the roll out of usability practice in industry – so that fully effective interactive products can be deployed with a global IT industry.

In practice these elements will occur in parallel (and indeed all have started) but the critical issue is to ensure sufficient feedback between the elements. Taking this model as a basis, this chapter will focus on the localisation of usability testing methods. In particular it will focus on the extent to which cultural differences between users and developers impinge on the effectiveness of such methods. As long ago as 1996, Herman (1996) noted that the results of user-based testing indicated that cultural effects exist, and that they exert a strong influence on the outcome of user interface evaluation. In addition he recognized the need to modify ‘Western’ usability evaluation methods for application in the Far East. Since then a number of other researchers have reached the same conclusions (Evers 2001; Yeo 2001; Oyugi et al. 2008)

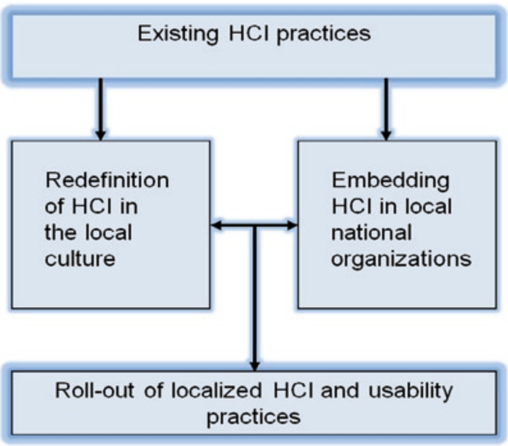

Fig. 3.1 Elements in the global institutionalization of HCI/usability

particularly in relation to evaluation methods that seek to elicit users' attitudes through the use of contextual inquiry think-aloud methods and structured interviews.

In order to explore the relationship between culture and user based evaluation this chapter will be structured as follows. It will begin with a review of different methods for user based testing/evaluation. This will be followed by two sections summarizing key aspects of the literature on how cultural issues may influence evaluation effectiveness and on studies to date that document the effects of culture and usability evaluation. The fifth section of this chapter will attempt to summarise potential guidance on the selection and implementation of usability evaluation methods in a global context.

3.2 A Review of Methods for User Based Testing/Evaluation

Over the two or more decades of HCI and usability research a wide range of usability evaluation method have been proposed. Indeed the issue is a controversial area as evidenced by Gray and Saltzman (1998) who have challenged the effectiveness of many reported usability methods. Indeed, a number of researchers have attempted to classify and compare methods for usability evaluation. Maiden and Rugg (1996) for example in a review of requirements engineering methods identify a wide range from the 'ethnographic' to the 'constructivist'. Goguen (1996) distinguishes between 'social' approaches and 'cognitive' approaches and discusses the limitations of 'traditional sociological' approaches (including 'objective' methods such as questionnaires) as they are not 'situated'. As a starting point, a simple basic classification is to break down usability evaluation methods into user or expert based.

Expert based methods require an HCI expert (or a number of them) to undertake a personal evaluation based upon some formal, or semi-formal, approach. A cognitive walkthrough is an expert based technique for evaluating the design of a user interface with special attention to how well the interface supports exploratory learning – i.e. first time use of the interface without formal training. A comprehensive account of cognitive walkthrough is presented in Wharton et al. (1994), but essentially one or more system designers perform evaluation at an early stage in the design. There are several versions of the technique but they all involve a detailed series of questions which the designer attempts to answer from the user's viewpoint while inspecting the interface.

Heuristic evaluation requires the expert to interpret the interface against a set of guidelines that have been derived from earlier analysis of similar artefacts. For the 'global usability' professional it would be good to have a set of localised culturally specific guidelines for each country or culture. However we are a long way from producing such detailed support. Marcus and Gould (2000) have produced some guidelines based on Hofstede's (1991) dimensions but, as we will see later, there is only very limited evidence that these dimensions are actually relevant to HCI and as a result such guidelines may be misleading.

For these reasons user based methods are critical to the understanding of usability evaluation in the global context and form the focus of this chapter. The important premise here is that events can only be understood in relation to the concrete situation in which they occur; they acquire meaning through interpretation in that situation (Suchman 1987). Only real end users interacting with interactive products can provide such a concrete situation. The interface design process should be user-centred and needs to be founded on the principles of participation and co-operation between users and developers. However participation and co-operation needs to be carefully planned. Effective participative tools and techniques are therefore required to maximise the contribution that each can make to the user-based evaluation process. A range of differing approaches have been proposed for user-based evaluation. A brief review of these methods will now follow as a key issue in relation to global usability is evaluating their suitability with users from differing cultures and counties.

A key input to the development of user-based testing methods is the concept presented by contextual inquiry. Holtzblatt and colleagues (Beyer and Holtzblatt 1998) have developed a methodology which provides a number of techniques for studying work context. The heart of the contextual inquiry method involves members of the development team intensively interviewing users in their work environment. The aim is to build a partnership in which the developer and user collaborate to create a shared understanding. By basing questions on the user's activity the interviewer gives up some control over the questions which are asked. However the method has drawbacks of interrupting the user with questions and disrupting normal work. Therefore the experience may not be as normal as would be the case in pure ethnography. Also it can be difficult for users to verbalise the details of their operational experiences (Lin et al. 1997).

When applied to user-based interface evaluation, capturing the user's immediate experience via contextual inquiry is attempted by a number of related methods that are variously known by the terms think-aloud, verbal protocol and co-operative evaluation. All are linked by the concept that the best way to understand users' experiences of an interface is to observe people as they operate and concurrently talk about their experience. There is evidence that the actual process of thinking aloud can cause the subject of the study to proceed differently and can lead users to encounter different usability problems. Other variations of the technique have been identified including record and thinking aloud, in which user actions are recorded and then later replayed with users being asked to explain their actions.

The study of usability methods by Lin et al. (1997) makes the point that thinking-aloud seems very unnatural to most people and some users have great difficulty in keeping up a steady stream of utterances as they use the system. Inexperienced users find difficulty in verbalising their operations so that both the users and the evaluators need training for the technique to be effective. Another problem is highlighted by Goguen (1996) who criticises such think aloud methods as 'unnatural' for the reason that language is intrinsically social; it is created for a conversational partner. As a result a person imagines a partner with certain desires and tries to address these desires, at the expense of accuracy and reliability.

Smith and Dunckley (2002) have extended the contextual inquiry method for usability evaluation in their Developer-User Contextual Evaluation (DUCE) method which has been used successfully with many UK commercial developments.

One of the features of the DUCE method is the questioning style. It is suggested that each DUCE session should be treated flexibly, however questions which have been inspired by those prepared by Carroll and Rosson (1991) for generating claims in scenario-based design are provided and structured under Norman's Seven Stages of Action (Norman 1986). These can be asked at appropriate points within each discrete user action. DUCE has been shown to be effective in the UK situation but, as detailed in latter sections, may not be suitable in other cultures.

Co-operative evaluation is a variation of thinking aloud in which the user is encouraged to see himself as a collaborator in the evaluation rather than just a subject. This is claimed to be less constrained as the user is encouraged by an evaluator, who is not necessarily the developer, to actively criticise the system. Co-operative evaluation has probably existed is some form since the 1980s (Carroll and Mack 1984) and an experimental study was reported by Wright and Monk (1991) in which the conversational approach was contrasted with the pure think aloud procedure in terms of the number of usability problems identified. One problem with this approach is that a significant factor in the maintenance of human–human dialogue appears to be the expertise of the evaluator.

3.3 Cultural Issues Affecting Evaluation Effectiveness

A number of researchers have attempted to define the various dimensions that underpin culture through empirical research. Hall (1976) distinguished cultures on the basis of a way of communicating along a dimension from 'high-context' to 'low-context'. A high-context communication is one in which little has to be said or written because most of the information is either in the physical environment or within the person, while very little is in the coded, explicit part of the message.

In spite of a wide range of research, it is Hofstede's (1991) dimensions of culture that are the most often quoted theories in relation to cross-cultural usability. He conceptualised culture as 'programming of the mind', in the sense that certain reactions were more likely in certain cultures than in other ones, based on differences between basic values of the members of different cultures. He proposed that all cultures could be defined through three dimensions:

- Power distance (PD), the degree of emotional dependence between boss and subordinate
- Collectivism/individualism (IC), integration into cohesive groups versus being expected to look after him/her self
- Femininity/masculinity (MF), which could be interpreted as toughness versus tenderness

In later research he recognised that, for Western cultures there was another important dimension:

- Uncertainty avoidance (UA), the extent to which members feel threatened by uncertain or unknown situations; and for Eastern cultures

- Long-term Confucian orientation, which represented a philosophy of life that was prepared to sacrifice short-term results for long-term gain. This dimension does not discriminate across all cultures in the same way as the dimensions given above. It has been suggested that it discriminates between environment-centric cultures and human-centric cultures (i.e. the 'West').

As stated in the introduction cultural differences such as these are potentially relevant to both the product and the process of design. In relation to the product (interface) itself the cultural dimensions could potentially lead to design guidelines. Marcus and Gould (2000), for example, address Hofstede and present guidance for each of Hofstede's dimensions based on a theoretical analysis of websites.

Of specific relevance to user-based evaluation, Hall distinguishes ways in which culture defines time, with the concept of monochronic and polychronic time. In monochronic cultures, time is divided into linear segments, and can be measured and controlled. Individuals in such cultures also tend to focus on doing one thing at a time (Hall and Hall 1987). In comparison, in polychronic cultures, human interactions are more valued over time and material things. Individuals in these cultures are comfortable juggling a variety of tasks at the same time and consequently time schedules are flexible and only serve as a rough orientation. This concept is supported by (Trompenaars and Hampden-Turner 1997) who distinguish between cultures with sequentialism, where time moves forward in a straight line and people in these cultures tend to do one thing at a time and synchronism, where time moves around in cycles and the people in these cultures tend to do several things at the same time. As we will see these issues potentially effect the way in which users are able to engage in task based user testing which in Western approaches tend to be essentially monochronic and sequential.

Although cultural models are a useful tool in aiding the understanding the concept of culture, they have not been without criticism. Most criticism however, has been directed to Hofstede's cultural model particularly the relationship between culture and country. Quite possibly, for example, a software developer working for Microsoft in Bangalore, India may have more in common in relation to his or her interaction with an interactive product with software developers in Redmond, Washington, USA rather than his or her close neighbours living in the slums of outer Bangalore. Criticism levied against the Hall's cultural model is that it is based on qualitative insights rather than quantitative data and does not rank different countries. Despite these criticisms, cultural models provide a means for understanding and categorising culture.

Despite an abundance of theoretical underpinning for cross-cultural usability, there is a lack in explicit demonstration that such theories are actually transferable to the discipline. However, Smith et al. (2003) undertook studies in China to actually measure the extent to which Hofstede's dimensions affected perceived usability of websites. A number of studies in China (Beijing, Dalian and Kunming) were completed in which Chinese users were asked to undertake a series of tasks on Chinese websites. The sites chosen possessed different levels of the factors of power distance, individualism/collectivism, masculinity/femininity and uncertainly avoidance as rated by experts using Marcus and Gould's conjectures. After accessing the sites users were asked to complete a relatively simple quantitative survey instrument designed to elicit their overall ‘acceptance’ of the website. The acceptance scores from the survey instrument formed the basis of the statistical analysis.

A number of findings emerged from the study. Firstly by far the most significant/important dimension was that of power distance with the preferred level for Chinese users being high as predicted by generic cultural models. In relation to individualism/collectivism, Chinese users were found to marginally prefer individualistic sites, in contrast to possible expectations. Hofstede later suggested uncertainty avoidance to be only relevant to Western cultures and this is vindicated in the fact that this factor was not found to be significant at all for Chinese users.

In a later paper Smith et al. (2004) propose a process model for developing usable cross-cultural websites including the notion of the cultural fingerprint that diagrammatically represents both the numerical value and the importance/significance of Hofstede’s dimensions to website usability. Although this work is of relevance to the product, as opposed to the process of development (on which this chapter focuses), it is relevant as the question we are beginning to answer here is the extent to which generic cultural issues really affect our overall discipline. It shows that much more work is needed to understand the relationship.

3.4 Studies Documenting the Effects of Culture and Usability Evaluation

Landauer (1995) has described user testing as the ‘gold standard’ because only by studying real workers doing real jobs in real environments can we be sure that we will find out what is truly relevant. These ‘traditional’ methods of testing are difficult and costly to operate across cultures and remote geographical locations (Dray 2001). Cultural differences potentially effect usability evaluations in multi-dimensional ways. Differences can occur as a result of cultural differences inherent within different cultural user groups, with differing groups potentially reacting differently to individual evaluation methods. Differences can also be evidenced as a result of cultural differences between users and evaluators.

3.4.1 Cultural Differences Between Users and Evaluators

Vatrapu and Pérez-Quiñones (2006) present a controlled study investigating the effects of culture on the effectiveness of structured interviews in cross-cultural contexts. In this experiment a website was evaluated by two independent groups of Indian participants. There were two interviewers, one of an Indian background and the other of an Anglo-Indian background who both had minimal familiarity with the participants. Results of this experiment showed that participants found more usability problems and made more suggestions with the Indian interviewer than with the Anglo-American Interviewer. More positive comments and fewer negative comments were made by the participants to the Anglo-American interviewer.

Another important difference in the feedback is that the participants were reluctant to make culturally related comments to the Anglo-American interviewer, while with the Indian interviewer the participants were more forthright. A possible explanation to these results is that the participants in the evaluation were from a high power-distance culture. Nonetheless, Vatrapu and Pérez-Quiñones (2006) concedes that 'it is not clear if the results are more influenced by the difference in the culture between the participants and the interviewer or that the participants were from a large power-distance culture'.

Similar results are echoed by Clemmensen and Plocher (2007), who carried out a pilot study and chose users and evaluators from Denmark and India. They specifically focused on conducting all possible pairings of users and evaluators. Having a local evaluator testing local users seemed to be fastest and the best way to find culturally specific problems with localised test applications. The pilot further indicated that the distant evaluators identified more of the cosmetic usability problems, while the local evaluators focused on the usability problems related to culturally specific symbols and texts.

It is clear therefore that usability tests should be undertaken by moderators who are from the same cultural background as the users themselves. However using local moderators in combination with foreign developers affects the ability of the local moderator to comprehend the rationale, selection of usability method, context and overall purpose of the test. To overcome these problems it is not unusual for the foreign designer to travel to the location and observe the conduct of the local usability tests, to provide advice and to observe and take notes. This procedure, however, significantly increases the cost of testing but results in improved quality of usability evaluation.

3.4.2 Cultural Differences Inherent Within Different Cultural User Groups

Research into cultural differences relating to user-based studies has been ongoing for many years. Nakakoji (1994) highlights important cultural issues that would need to be put into consideration when migrating software to Japan finding that Japanese were not happy with brainstorming sessions and that it was culturally unacceptable to challenge managers' ideas in public. These findings were supported by Herman (1996) who reported behaviour in the Eastern culture whereby it was considered culturally unacceptable to criticise the designer directly openly as this may cause the designer to lose face.

Many cultures, particularly in Asia and Africa, demonstrate difficulty with Western developed contextual inquiry methods, particularly those with probing. Lim and Usma (1998) carried out a summative usability evaluation of public information kiosks in Singapore finding a mismatch between the objective assessment feedback and the subjective assessment feedback. Sacher (1998) reports of a study surrounding the design of advanced interfaces to integrate speech and handwriting for Chinese text input. He similarly detected differences between users' vocalised views and their actual ease of use stating:

> ..working with Asians in the design process turned out to have distinct aspects…politeness, formal attitudes and different conventions towards expressing personal views can have significant impact on usability studies……users close to desperation while testing a prototype, sometimes concluded with ….am sure I can get used to it!

Yeo (2001) describes a study that examined the efficiency of the global-software development lifecycle technique. An American English spreadsheet was adapted for Behasa Melayu literate speakers (a cultural group in Malaysia) using think aloud user-based evaluation questionnaires and interviews. Again, he found that users were reluctant to provide critical negative comments. This reluctance was because they wanted to 'preserve face' of the designer and also because they showed respect for hierarchy.

Chetty (2005) describes a research project that was undertaken in rural South Africa where a telemedicine software prototype was being implemented. The project involved a mixed group of participants from the university and the local community. It is noted that during the evaluation phase which was carried out by a Cuban doctor and a Xhosa nurse, cultural factors may have played an important part. Both participants 'did not criticise' the prototype but 'leaned towards the positive in all their suggestions'. Chetty attributes this reluctance to criticise to the fact that both Cuban and Xhosa cultures view criticism as a sign of disrespect.

Oyugi et al. (2008) report two separate empirical studies of a number of well-known techniques with UK, African and Indian users. In the Indian study three different methods (think aloud, think aloud with probing and post-usage interview) were selected for investigation with two user groups (UK and Indian). In fact all users were resident in the UK but the Indian users has only recently arrived in the UK and their levels of acculturalization was low as determined through the Suinn-Lew Asian Self Identity Acculturalization (SL-ASIA) scale (Suinn et al. 1992). As determined by the number of useful pieces of usability information obtained, post usage interview performed worst for both Indian and UK users. Similarly think aloud with probing performed best for both user groups. However for Indian users the improvement of thinkaloud with probing over think aloud alone was much less marked when statistically analysed.

The author and colleagues have found evidence that Indian users in particular have some difficulty in adapting readily to highly structured task-based testing. This is supported by Chavan's (2005) work on the Bollywood method where a far richer scenario is presented to the user compared to Western methods. Both the interview and think aloud only methods, being ones without evaluator interruption, seem to allow much more flexibility in user's interpretation of the required tasks. With the contextual inquiry/probing method user interaction is far more interrupted and this may inhibit flexible interaction. This is potentially in accordance with India's supposed polychronic culture as defined in cultural models in which multiple tasks are handled at the same time, and time is subordinate to interpersonal relations. It is possible that think aloud with probing methods reinforce monochronic interaction.

In further work in Kenya, Camara et al. (2010) compared the co-discovery usability method and the retrospective protocol method with both Kenyan and UK users, finding that the data collected from the Kenyan users using the co-discovery method to be much richer as compared to that collected using the retrospective protocol method and the DUCE method. The suggestion being that co-discovery was more suitable to the Kenyan collectivist culture.

Some attempts have been made to localise methods to meet local needs. As mentioned above, in India Chavan (2005) has proposed the Bollywood method. The need for a tailor-made usability evaluation method that suits the Indian culture is necessitated by the fact that generally Indian participants are not comfortable criticising people (i.e. usability moderators) or things (interactive products) as their culture ‘largely advocates for a general acceptance of the state of a given situation and if possible work around it’. On the other hand, Bollywood films reviews are a popular and accepted format of critiquing and comparing products (in this case, films). Therefore, in the improvised usability evaluation method, Bollywood, scenarios were generated (some of them dramatic) and woven into an entire story line based on the web sites being evaluated. Several analogies to popular films and their reviews were alluded to in the description of the scenarios. It is noted that all subjects were unexpectedly forthcoming with their criticism of the website evaluated using the Bollywood method and that many actually offered design solutions. These unexpected results could only be attributed to the usability evaluation method adjustments made to accommodate the target culture.

In common with work in China, additional significant outcomes in Indian based research relate to the specific nature of localised interaction either in local language script, with particular devices or user groups (e.g. Yammiyavar and Kate 2009; Katre 2008).

In Namibia in Africa, Winschiers (2001) describes exploratory research based upon a computerised tutorial system for students. Similarly to Indians, Namibians have a culture of non-criticism and it is considered impolite to criticise someone’s work in front of them. The culture also demands that the culturally established authoritarian hierarchy is respected at all times. In order to overcome the authoritarian gap Winschiers used peer-to-peer evaluation in comparison and integration with other methods. The outcome of the peer-to-peer evaluation differed dramatically from other methods, as the students were approached by their peers, there was a willingness and freedom to speak freely.

In later research, Winschiers and Fendler (2007) have attempted to culturally validate usability evaluation in Namibia, by ensuring that when using interviews, the users are of the same ethnic group. They have also introduced a collective usability evaluation method in the form of workshops rather than individual user evaluations to reflect local community habits. They suggest that African traditional story telling can be mirrored to design task-analysis evaluations as it creates a necessary contextuality for users to relate to a task.

For the practicing usability engineer and for interactive systems developers the implications of all these culturally determined issues are considerable. International interactive product developers may need to use different methods to evaluate the product in different regions and/or with different users. This in itself may be problematic as results from separate studies will not be directly comparable.

3.5 Guidance on Global Usability Evaluation Methods

When providing guidance to usability engineers and international interactive product developers there are a few key issues on which there is little doubt:

- Test locally. It is clear that user evaluation/testing should take place in the local context. Using immigrant users initially from a local culture but who happen to be based in the country where the product is being developed is not appropriate. When placed in a new cultural situation, users may undergo a process of acculturalization which is defined as the social and psychological integration of individuals with the target language group (Spolsky 1989). This occurs as the dominant host culture absorbs to a certain extent minority immigrant culture (Suinn et al. 1992). Even though the alternative of engaging in international travel is highly expensive, undertaking usability tests in the culture of the software developers with immigrant users from other culture is not to be trusted.
- Test with local moderator. Furthermore, usability tests should be undertaken by moderators who are from the same cultural background as the end users themselves. This may not be easy as the development of the usability profession is variable globally. In Asia (India, China etc.) there is now a fast growing usability community, but in other areas (such as Africa) this may not be so and it will be difficult to select appropriately skilled local people as usability moderators. In such circumstances it will be necessary to select, train and manage local moderators very carefully.

Although the above two factors are generally agreed within the international usability community, going further we need to consider the type of evaluation/testing method to be employed and its suitability to the target culture. Here there is less general agreement but a growing body of knowledge is emerging as evidenced in the previous section.

Whilst acknowledging the dangers inherent in over simplification, but also recognising the need to provide practical guidance to interactive product developers Table 3.1 presents an overview of some of the key factors that are relevant in major geographical regions. The table presents guidance by relating key cultural dimensions with possible preferred usability testing methods.

3.5.1 Key Cultural Dimensions

In an attempt to structure and classify how cultural differences affect usability evaluation two key interrelated issues emerge:

- Ability to criticize/loss of face. This is a recurring feature in may reported studies and with reference to models of culture it would seem that the problems evidenced in the above studies relate to the effects of Hofstede's dimensions of power distance and collectivism. The difficulty in this situation may be compounded in areas of high uncertainty avoidance. In such situations methods such as co-discovery between a local moderator and a single user may work.

Table 3.1 Key factors and usability approaches in key geographical regions

	Key cultural dimensions			
	Ability to criticize/loss of face		Appropriateness of sequential tasks	
	Power distance	Collectivist/individualist	Polychronic/monochronic	Possible preferred Usability evaluation/testing methods
US UK Germany	Low	Individualist	Monochronic	Task based think aloud Task based think aloud with probing User/moderator co-discovery
Brazil East Africa Arab countries China	High	Collectivist	Polychronic	Scenario based think aloud Record and think aloud User/moderator co-discovery Peer to peer co-discovery
India	High	Collectivist/Individualist	Polychronic	Task based think aloud Scenario based think aloud Record and think aloud User/moderator co-discovery

Alternatively it may be necessary to involve peer-to peer interaction in a collective workshop setting.

- Appropriateness of sequential tasks/effects of polychronic cultures. Although there is less documented evidence relating to these issues, an emerging hypothesis is that users in polychromic countries find greater difficulty with strictly task based testing, particularly if integrated with the probing style of contextual inquiry. In such situations much richer, more generic problem based scenarios may be required allowing the users far greater flexibility in the way in which users are required to interact with the product.

3.5.2 Preferred Usability Testing Methods

In order to simplify analysis Table 3.1 identifies six broad methods:

- Task based think aloud. As commonly practiced in US/Europe, this method adopts the contextual inquiry approach with local users engaging in a series of clear problem based tasks with a local moderator.
- Task based think aloud with probing. This is a variant of the above method where the local moderator is more active in the evaluation process asking questions of the user as appropriate. Examples of the method include DUCE.
- Scenario based think aloud. Here the user is provided with a richer and higher level problem scenario scenario (e.g. Bollywood) that will enable local users to provide feedback to the local moderator.
- Record and think aloud. Using this 'retrospective protocol' method user interaction in uninhibited by both the need to think aloud at the time of interaction, or the probing of the local moderator. Instead the sessions are recorded and the local user engages in the think-aloud/reflection process based on the recording after the evaluation session.
- User/moderator co-discovery. In this approach the local user and local moderator collaboratively explore the interactive product in an attempt to reduce barriers (power distance) between user and moderator.
- Peer to peer co-discovery. In order to reduce loss of face and the effects of power distance in this method co-discovery is undertaken by pairs or groups of users with very little moderator involvement. In this workshop approach usability information can be obtained in real-time, or on completion of the interaction sessions.

3.5.3 Usability Approaches in Key Geographical Regions

Table 3.1 takes the two dimensions of power distance and collectivism, that would seem to underpin the ability to criticize, together with the dimension of polychronicity, which relates to the appropriateness of sequential task based testing.

Before adopting the guidance it is of course necessary to remember the need to understand the typical user group in each region. As stated above a software developer working for Microsoft in Bangalore, India may have more in common in relation to his or her interaction with an interactive product with software developers in the USA rather than his or her close neighbours living in the slums of outer Bangalore.

With all these caveats Table 3.1 indicates some tentative suggestions as to methods that might be considered suitable in three key example cases:

- a collection of countries such as UK, US and Germany which can be described as low power distance, individualistic and monochromic,
- a collection of countries such as Brazil, East Africa, Arab countries and China which can be described as high power distance, collectivist and polychromic,
- India which can be described as high power distance, individualistic/collectivist and polychromic.

3.6 Conclusion

For HCI and usability to be socially responsive and economically effective in a global software development community they needs to adapt to the needs of the local societies, both to individuals who interact with the artefacts that are produced and with the development communities who produce them.

At the start of this chapter elements in the proposed global institutionalization of HCI and usability were identified (Fig. 3.1). A key element in this is the redefinition (localization) of methods and this chapter has focused on the localization of usability testing.

There still remains much to be done to achieve the aim of global institutionalization of HCI and usability. For the usability evaluation/testing process this involves further empirical evidence collection from across countries and cultures leading to the further validation and possible extension of the model proposed in Table 3.1.

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Chapter 4
Website Design and Trust Across Cultures

Dianne Cyr

4.1 Introduction

As shoppers converge in online stores, vendors are increasingly concerned with how to best attract and retain satisfied, trusting and loyal customers. It is important that websites are private and secure if they are to be revisited. According to Reichheld and Schefter (2000) an increase in customer retention rates by only 5% can increase profits by 25–95%. Therefore, the development of loyal customer behavior is a valued goal for managers, marketers, and strategists.

In June 2009 Internet users are over 1.6 billion strong, and hail from virtually every corner of the globe. Of those Internet users the majority reside in Asia (42.2%), followed by Europe (24.2%), North America (15.1%), Latin America/Caribbean (10.5%), Africa (3.9%), the Middle East (2.9%), and Oceania/Australia (1.2%) (Internet Usage Statistics 2009). These users are also potentially Internet shoppers seeking positive and secure consumer experiences. Culture affects Internet usage, e-commerce trust, information and communication technology adoption, Internet marketing, and website development – therefore it is important to gauge user reactions to the Internet based on country and cultural diversity. Yet despite the importance of culture in an Internet context, relatively few studies have examined topics such as trust and risk across cultures.

To better understand user perceptions of online trust and risk, an investigation was conducted in Canada, the United States, Germany and Japan. Canada and the U.S. were chosen due to cultural similarity, while these two countries are considered culturally distinct from Germany and Japan. Participants in the study completed an online task of searching the local Samsung website for a cellular phone they would like to hypothetically purchase. Each participant was asked questions about trust and willingness to risk online, legitimacy of the vendor, information privacy and quality concerns, and payment security. Results of this investigation are supplemented by other research by the author (Cyr et al. 2005, 2009; Cyr 2008a, b).

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Contributions of this chapter are: (1) to provide background on topics related to culture, trust, and website design; and (2) to report the results of studies primarily conducted by the author on the topic of website design and how this translates into cultural difference and similarity in user perceptions related to online trust and security. These findings have implications for managers, strategists, marketers, Web designers and researchers who seek to provide a more trustworthy and secure online shopping experience in diverse cultural settings using information technologies. The chapter begins with an overview of culture and website design, and then outlines previous research on website trust and culture. This is followed by the documentation of previously unpublished results from cross-cultural comparisons of user reactions to websites related to risk and vendor legitimacy, information privacy and quality, and transaction security. In addition, results are reported for how various design elements statistically impact online trust in Canada, Germany, and China.

4.2 Culture and Website Design

Culture has implications for Internet use and affects marketing (Tian and Emery 2002), consumer trust (Jarvenpaa et al. 1999), Internet diffusion (Ferle et al. 2002), and website development (Kang and Corbitt 2001; Sun 2001). Differences in online communication strategies for target markets exist between Japan, Spain and the U.S. (Okayazaki and Rivas 2002). In other work, Evers and Day (1997) suggest there are differences between cultures concerning Web interface acceptance and preferences for design features.

Effective website design engages and attracts online consumers (Agarwal and Venkatesh 2002; Cyr 2008a; Fogg and Tseng 1999, 2002; Hoffman and Novak 1996; Nielsen 2001). According to Gommans et al. (2001, p. 51), "A website has to be designed for a targeted customer segment…Local adaptation should be based on a complete understanding of a customer group's culture". Barber and Badre (2001) refer to the merging of culture and usability as "culturability", when cultural elements are considered in website design and are expected to directly affect the way a user interacts with the site. If websites are culturally appropriate or "localized" then users are more likely to visit and remain at the website (Barber and Badre 2001; Evers and Day 1997).[1]

In research in which design characteristics were considered across cultures different user preferences were found (Cyr et al. 2008; del Galdo and Neilson 1996; Marcus and Gould 2000). Singh et al. (2003) employed content analysis of 40 American-based companies to compare their domestic and Chinese websites.

[1] Localization is the process of adapting a product or service to a particular language, culture, and desired local "look and feel." In localizing a product, in addition to language translation, details such as currency, color sensitivities, product or service names, images, gender roles, and geographic examples are considered.

Significant differences in cultural characteristics were found for all major categories tested. The authors concluded that, "[T]he web is not a culturally neutral medium" (p. 63). Cyr and Trevor-Smith (2004) examined design elements using 30 municipal websites in each of Germany, Japan, and the U.S. Use of symbols and graphics, color preferences, site features (links, maps, search functions, page layout), language and content were examined, and significant modal differences were uncovered in each design category. In other research in which color (Cyr et al. 2010) or human images (Cyr et al. 2009) were specifically investigated, cultural differences were likewise noted across culturally diverse groups.

To understand how national culture is related to social psychological phenomena such as trust, researchers (Cyr et al. 2005; Cyr 2008a; Dawar et al. 1996; Jarvenpaa et al. 1999; Simon 2001; Yamagishi and Yamagishi 1994) refer to Hofstede (1984) cultural dimensions of individualism-collectivism, uncertainty avoidance, power distance, and femininity-masculinity.[2] In the documented research in this article, Hofstede's dimensions are used as a proxy to determine cultural differences or similarities among countries. However, it is recognized and expected that individual value differences also occur within countries.[3]

4.3 Background: Website Trust and Culture

"Disposition to trust is a general, i.e. not situation specific, inclination to display faith in humanity or to adopt a trusting stance toward others" (McKnight et al. 1998, pp. 473–490). "Trust is determined by a general trusting disposition that is the product of a lifelong socialization process. This disposition is especially influential when the trusting party has not had extensive personal interaction with the specific organization or person in question. Therefore, a trusting disposition should influence people's trust in a vendor" (Gefen 2000, p. 729). Lack of trust is one of the most frequently cited reasons for consumers not purchasing from Internet vendors (Grabner-Krauter and Kaluscha 2003).

Considerable research has been dedicated to unraveling the complexities of online trust (Bhattacherjee 2002; Chen and Dhillon 2003; Gefen 2000; Gefen et al. 2003). Corritore et al. (2001) provide a definition of online trust that includes cognitive and emotional elements, with trust encompassing "an attitude of confident expectation in an online situation or risk that one's vulnerabilities will not be exploited" (p. 740). Unlike vendor–shopper relationship established in traditional retail settings, the primary communication interface with the vendor is an information

[2] It is expected most readers are familiar with Hofstede's cultural categorizations and therefore details of this work will not be elaborated here. However, for more information on this topic refer to Hofstede (1984), Dawar et al. (1996), or to Simon (2001) who provide an excellent overview of Hofstede's dimensions in a compressed format.

[3] Refer to Srite and Karahanna (2006) for a discussion of the role of individual and espoused cultural values in technology acceptance.

technology artifact—the website. In line with Jarvenpaa et al. (1999), trust is referred to here as consumer confidence in the website and "willingness to rely on the seller and take actions in circumstances where such action makes the consumer vulnerable to the seller" (p. 4). In addition, and related to Web site design elements, the design of the website is trusted.[4]

Consumer trust in the website is fundamental to the establishment of online loyalty, including intentions to revisit an online vendor or to buy there in the future (Cyr 2008a; Flavián et al. 2006; Gefen 2000; Yoon 2002). Antecedents to website trust vary and include Web design characteristics (Cyr 2008a; Cyr et al. 2009, 2010), social presence (Cyr et al. 2007; Gefen et al. 2003), perceived vendor reputation (Jarvenpaa et al. 1999; Koufaris 2002), clear and trustworthy privacy policies (Reichheld and Schefter 2000), online transaction security (Palmer et al. 2000), or information privacy (Hoffman and Novak 1996) among other things. Overall the results from these studies indicate that website properties and trust are related and that they influence online purchase intentions.

There are cultural differences related to propensity to trust. For instance, within one's own culture, generally there is greater willingness to trust in collectivist than individualist cultures (Doney et al. 1998; Parks and Vu 1994; Triandis 1990). Collectivists rarely move in and out of groups and levels of trust and cooperation are high among collectivist group members. Weber and Hsee (1998) found that Chinese collectivists are less risk averse when selecting financial options than participants from the U.S., Germany or Poland. The authors suggest that in collectivist countries like China, collectivism acts like "a cushion" when other members in the family or society assist in bearing possible negative consequences of a decision. Alternately, individualistic societies tend to be less trusting and cooperation in relationships is transitory.

However in relationships that extend beyond one's own culture, the tendency to trust is reversed. Individualists are more optimistic than collectivists concerning benevolence from strangers (Inglehart et al. 1998; Yamagishi and Yamagishi 1994). Kim and Son (1998) measured levels of distrust between highly individualist Americans and highly collectivist Koreans and found that 59% of Americans trust members of a different ethnic group in their society, and 57% trust people from a different country. For Koreans, the average responses were 23% and 18% respectively. According to Yamagishi and Yamagishi (1994) exchange relationships outside a cultural group only occur when there are strong institutional safeguards such as

[4] A thorough review of trust in offline and online settings is not feasible within the scope of the present paper. However, the reader may wish to refer to Rousseau et al. (1998) for a critique of offline trust and Gefen et al. (2003) for a summary of online trust. In research in which online trust is the primary focus, it is recognized a multidimensional construct for trust is most appropriate. Trust may result from a consumer's belief that an online vendor demonstrates ability, benevolence, or integrity (McKnight et al. 2002). Alternately, in studies such as this one, when trust is one element included to better understand a more comprehensive user reaction to a Web site, then trust as a single construct has been used (Gefen et al. 2003; Koufaris 2002).

strong cultural norms or legal sanctions. In an Internet environment when institutional safeguards may be perceived as illusionary, collectivists may consider online buying as more risky than do individualists (Jarvenpaa et al. 1999).

4.4 Empirical Findings: Website Trust and Culture

With a spotlight on prior research on website trust and culture Jarvenpaa et al. (1999) used Hofstede's dimensions to compare Internet trust in collectivist and individualist cultures. The researchers expected consumers from individualist cultures would exhibit higher trust in an Internet store than consumers from collectivist cultures (similar to Yamagishi and Yamagishi 1994 as noted above). Contrary to this hypothesis no strong cultural effects were found for trust. Similarly, Badre (2000) conducted research on consumer trust in an Internet environment in individualist versus collectivist cultures with mixed outcomes. Simon (2001) found differences in trusting stance toward websites. Asians were most trusting of information provided across American and European websites (83% positive), counter to the earlier findings of Yamagishi and Yamagishi (1994) and Inglehart et al. (1998). In Simon's study, Europeans (46% positive) and North Americans (42% positive) exhibited substantially lower levels of trust toward the websites.

Considering the mixed results found in the above work, Cyr et al. (2005) conducted a study to investigate whether or not local websites engender higher levels of trust for Web users than a foreign website of the same vendor (Samsung in this case).[5] Related to earlier work by Yamagishi and Yamagishi (1994) and others, it was expected that Web users from individualistic cultures such as Canada or the U.S. would be least likely to trust the local website, and most likely to trust the foreign website than moderately individualistic German users, and collectivist Japanese users. When comparing the level of trust between countries for the local website almost no differences are reported between the Canadians, Americans and Germans. However, there were large differences between the Japanese and Americans, Canadians or Germans. Contrary to expectations, Japanese respondents trusted their local website least, while Germans trusted their local site most. Similar results were found for users viewing the foreign version of the website. Based on interview data all four cultural groups identify vendor familiarity and visibility of security signs as important factors influencing trust in online purchasing. For German participants personal experience with online purchasing or friend's opinions of a website affect online trust:

[5] Thirty participants were selected in each of Canada, the United States, Germany, and Japan. Participants had an average age of 35 years; 42% were female and 58% male. After navigating the Samsung website (local and foreign versions) in search of a cellular phone, each person completed a survey (translated and back translated for each required language), followed by a digitally recorded interview. Interpreters were used when necessary.

> I really trust if I had good experience. Even if I hear from friends…good things [about the company], normally I trust more than, let's say, if it's the first time I'm on the site.

4.4.1 Vendor Legitimacy and Willingness to Risk

Building on the preceding, it is expected that vendor reputation is important and willingness to trust a vendor will differ across cultures (Jarvenpaa et al. 1999). According to Chen and Dhillon (2003) "Since transactions [on the Internet] occur without personal contact, consumers are generally concerned with legitimacy of the vendor and authenticity of products or services" (p. 1). Similarly, propensity to take risks is known to vary across cultures. Generally speaking, Canada and the U.S. are not high in uncertainty avoidance, and hence are more willing to take risks than countries such as Japan which is generally risk averse. Germany is in the middle (based on Hofstede 1984). Additional data beyond that reported in Cyr et al. (2005)[6] document user responses concerning vendor legitimacy and willingness to risk (for U.S., Canada, Germany, and Japan respondents) as outlined in Table 4.1.

There are significant differences across cultures regarding preference to buy recognized brands, with Canadians most concerned about this factor and rather surprising – Japanese least concerned. All groups feel it is important that the Internet store is known and has a positive reputation. Japanese participants comment, "What is important is…if the supplier is very famous, very popular. Well, I can trust them." or "I don't buy anything from a company that I never heard of." Germans indicate a company's name and reputation are associated with trustworthiness,

Table 4.1 Risk and vendor legitimacy

	U.S.	CAN	GER	JPN	Sig
It is important to avoid risks	3.24	3.33	4.03	4.21	**
Concerned about security when buying on the Internet	3.66	3.59	3.43	4.11	*
Prefer recognized brands or companies when online shopping	3.93	4.07	3.67	2.93	*
Trust Internet store with well known reputation	3.86	4.19	4.03	3.82	ns
Concerned about the legitimacy of the online sales contact	3.17	3.26	3.27	3.54	ns

Notes: Scales are 1 = low to 5 = high
ns = No significant differences; *Significant differences; **Very significant differences

[6] Data reported in these tables was collected from the sample population and using the same methodology as in Cyr et al. (2005) however it has not been previously published.

especially if someone they consider to be reliable recommended that company. Canadians and Americans are more prone to independently seek information to determine a company's credibility, and mention acquiring information through the Web or by contacting the company directly.

Germans are least concerned with security when buying online, while Japanese are most concerned. Canadians note they are aware of security problems when using the Internet, but feel the benefits outweigh the risks. As one Canadian describes,

> You realize that some of the concerns the market has, or some of the perception that people have with security are unfounded…The likelihood that someone is going to intercept the transmission between your computer and a website, and decipher it, is very low.

In contrast, a Japanese participant mentions, "I will stay away from risk, as much as possible." The interpreter further added, "He's worried about the risks all the time…Using a credit card is a secret matter."

4.4.2 Information Privacy and Quality

Information privacy is important and a "lack of trust arises from cyber consumer's perceived lack of control over the access others have to their personal information during the online navigation process" (Hoffman et al. 1999, p. 82). Defined, information privacy in an online environment is the right of an individual to control the release of his or her personal information.

Accordingly, online business environments can result in "problems associated with insecurity and privacy among transaction counterparts, which put pressure on Internet marketers to create a trust that is much stronger and more persistent than what is normally demanded offline" (Yoon 2002, p. 51). In support of this statement, in a study on information privacy 95% of those surveyed declined to provide personal information over the Internet (Hoffman et al. 1999). In a second investigation 5 years later this number had shrunk to 82% of online users refusing to provide personal information. Further, 34% of respondents admitted to being untruthful when asked about their personal habits and preferences (Teltzrow and Kobsa 2004). While various studies have addressed the role of privacy and trust in e-commerce, there is little attention to information privacy concerns across cultures. The first two items in Table 4.2 address this topic.

Providing personal information online is more a concern for Germans and Japanese than for North Americans, although the difference is not statistically significant. This outcome is reflected in the following quotations. One German remarks, "For example, if you download something, and you have to give your e-mail address, I don't like it, because you can be sure you'll get spam." A Japanese participant mentions, "Actually I don't show them my personal things…if I have to I will, but I hate it", while his interpreter adds, "The sites where I shop online usually don't require personal data. I'm choosing those kinds of sites." Regarding the misuse of personal information, significant differences exist for the four countries in this investigation. Japan is least confident about the proper use of information

Table 4.2 Information privacy and quality

	U.S.	CAN	GER	JPN	Sig
Concerned about sharing personal information with online merchants	3.45	3.26	3.77	3.61	ns
Confident personal information will not be misused when shopping online	3.00	3.44	2.73	2.04	*
Product information on the website should be trustworthy	4.62	4.67	4.47	4.71	ns
Important that online product information is complete and detailed	4.10	4.56	4.47	4.46	ns
Trust information presented on website	4.11	3.93	4.40	3.43	**
Important that product ratings from customers or consumer publications are provided on the website	3.45	3.67	3.67	4.21	ns

Notes: Scales are 1 = low to 5 = high
ns = No significant differences; *Significant differences; **Very significant differences

provided, followed by Germany, with Americans and Canadians moderately confident how personal information is used.

Whether shopping in a physical store or online, customers generally desire high quality information about a product or service in order to make a purchase decision. Quality information at a website further contributes to customer loyalty. This may include perceptions of how information is presented, or how much information is appropriate for a particular cultural group. For example, in North America substantial amounts of product information are considered desirable, while in other cultures the same level of information would be considered inappropriate as outlined below (Cyr 2002, p. 172).

> [O]n the [customer] support side, there's a lot of pride in some European countries. In France they have a long history of what they're doing, and status comes from the knowledge and expertise acquired. So it's very important to only tell customers information about products which they assume it's reasonable not to have…otherwise, it's like trying to tell them how to do their job.

In the current study, there are no significant differences among participants regarding whether product information is trustworthy, complete, and detailed. However, it should be noted that the scores for participants in all countries are very high on these dimensions. Generally, participants across all country groups note they prefer few product details upon first entering a website, and like more details if they choose to investigate a product further. According to a Canadian respondent,

> For a first glance I like the first ten bullet points, the ten most important things. But if I'm looking for detail information I want it to be there. For example, the sizes and dimensions or something like that.

The amount of information preferred is often associated with the type of product or service being purchased, and in some instances, participants mention seeking information on their own if necessary. An American elaborates,

> Many times I'll go online with Travelocity or Orbitz or Expedia to look for travel connections, and I end up calling the location directly and placing the order with them even though it costs me a little bit more because I can find out more information. I can ask, if I want a room with two double beds, can I get that, can you promise me it's a non smoking room, can you tell me what I see when I look out the window, or, how far is the nearest McDonalds? I want to talk to somebody that has the information that answers my questions, not just general questions that aren't complete.

Concerning ability to trust the website, Germans are most trusting, followed by Canadians and Americans, with Japanese least trusting. Consumer reports, consumer opinions/ratings, product brand, and familiarity with the product are identified by all participants as ways to judge quality online. It is especially important to Japanese that product ratings from customers or consumer publications are provided on the website. Canadians emphasize consumer reports, consumer opinions/ratings, and familiarity with the product. For instance, a Canadian remarks,

> When I was looking for the digital camera, I didn't buy the camera online, but I did the research online, and the things that counted the most for me were the reviews from other users, and the professional reviews.

4.4.3 Transaction Security

As a result of "separateness" of buyer and seller, security of the transaction process is important to the buyer. Online credit card fraud is a major concern for online shoppers, often ameliorated by privacy policies or security signs on the vendor website.

In this study, all groups are concerned with misuse of credit card information, and are very concerned with Internet security. Regarding security of the payment method, Japanese participants indicate the importance of this is 4.93 out of a possible score of 5 on the survey. Refer to Table 4.3. Japanese often refer to the dangers of using credit cards, and in some cases are apprehensive about vendor credibility. According to one Japanese respondent,

> When I think of all the Internet online shopping stores, I think maybe 50% cannot be credible." One interpreter added, "I just don't want to give my credit card number, so if the method of payment is something else, then I feel okay shopping online.

The presence of security signs do much to console online visitors, although some Germans feel these signs could be faked. Company contact information seems to imply a degree of legitimacy. While Canadians and Americans seem relatively comfortable

Table 4.3 Transaction security

	U.S.	CAN	GER	JPN	Sig
Concerned about who will access credit card when shopping online	3.72	3.41	3.87	4.18	ns
Concerned about misuse of credit card when shopping online	3.55	3.19	3.57	4.04	ns
Concerned about unauthorized use of credit card when shopping online	3.79	3.26	3.87	4.11	ns
Important that payment method is secure	4.69	4.81	4.50	4.93	ns

Notes: Scales are 1 = low to 5 = high; ns = No significant differences

with credit card purchases, Japanese users express concern about online payments and instead opt for payment through the mail. Germans likewise mention alternate ways of making payments, including using invoicing or direct bank transfers.

4.4.4 Modeling Website Design to Trust

The results presented in the previous sections illustrate cross-cultural comparisons concerning website design, trust and security although no causal relationships are implied. However, in research by Cyr (2008a) three elements of website design (Information Design, Navigation Design, and Visual Design) were modeled to determine if a statistical relationship exists between these various design elements and trust. The design categories are based on earlier work by Garrett (2003) and have been used in previous studies (Cyr and Bonanni 2005; Singh et al. 2003).

A total of 571 participants located in Canada, Germany, or China completed an experimental task and online survey (N = 230 in Canada; 118 in Germany; and 223 in China). To ensure participants are "of the culture" it was determined that each had lived in the country the majority of their lives and spoke the native language as their primary language. Participants were recruited from a wide range of sources, including universities, institutes, and companies. Average age across countries is very close with an overall average of 25.6 years. Participants are experienced online shoppers and well educated. Most had completed either a university degree or post-graduate education.

For the research treatment, participants responded to the local version of the SonyStyle Web site represented in their native language. Users were requested to initially view the home page of the local Web site, followed by navigation of the Web site to choose a cell phone they would hypothetically purchase. Once participants concluded this task, each completed an online survey. Background information to the study and all other written content, including the survey, were translated and back-translated into each required language. Instrument reliability and validity were confirmed (for details refer to Cyr 2008a). Data were modeled using a Partial

Least Squares analysis.[7] It is proposed that Information Design, Navigation Design, and Visual Design are central features of websites that potentially result in trust. As such, each feature is elaborated briefly below.

Information Design refers to website elements that convey accurate or inaccurate information about products or services to a user. The location of an icon on the screen would be the domain of information architecture, while whether or not that icon or text conveys the right information to a user is Information Design (Garrett 2003). Information is considered an important prerequisite to trust (Flavián et al. 2006; Yoon 2002). As McKinney et al. (2002, p. 308) described, “Customers dissatisfied with web site information contents will leave the site without making a purchase”. As noted in an earlier section, research comparing user preferences in Canada, the U.S., Germany and Japan for perceived access and presentation of product information uncovered few significant differences between the U.S., Canada, and Germany but significant differences ($p < .01$) between these countries and highly collectivist Japan. Based on qualitative comments from the study, there appeared a desire on the part of Canadians, Americans, and Germans for utility – at least as far as obtaining site information is concerned. In Cyr (2008a) a further comparison is made between Germans and Chinese who both score moderately on Hofstede’s scale for uncertainty avoidance – suggesting German and Chinese users prefer to avoid risk when shopping online. Canadians score in the low category for uncertainty avoidance. Hence, it was expected that Information Design would result in website trust for Canadian users but not for Germans and Chinese (Cyr 2008a).

Elements of Visual Design deal with balance, emotional appeal, aesthetics, and uniformity of the website overall graphical look. This includes colors, photographs, shapes, or font type (Garrett 2003). In some research a relationship between the “aesthetic beauty” of a website and trust was established (Karvonen 2000), while in other studies visual design of the website did not significantly impact trust (Yoon 2002). Color is a common differentiator by culture and connotes different meaning (Barber and Badre 2001; Singh et al. 2003). Red means happiness in China but danger in the United States. Users from collectivist cultures such as China have a strong preference for visuals, whereas users from more individualistic cultures like Germany prefer a logical and structured page layout (Szymanski and Hise 2000). Therefore it was expected that Visual Design would be more important to Chinese users and result in trust compared to Canadians or Germans (Cyr 2008a).

Navigation Design refers to the navigational scheme used to help or hinder users as they access different sections of a website (DeWulf et al. 2006; Garrett 2003). “No matter how thorough the information content of a site is, a customer who has difficulty in searching and getting the needed information is likely to leave the site” (McKinney et al. 2002, p. 308). Preferences for the form of navigational scheme are expected to vary by culture (Marcus and Gould 2000). Simon (2001) found that Europeans and individualist North Americans prefer navigation that enhances

[7] A variance-based Partial Least Squares (PLS) method was chosen over covariance-based methods such as LISREL because it supports both exploratory and confirmatory research (Gefen et al. 2000).

movement and makes the site simpler to use. Alternately, Asian/Latin and South Americans (generally collectivists) desire navigation aids to change the appearance of the site without particular concern for movement. Germans who are moderately high on uncertainty avoidance "feel anxiety about uncertain or unknown matters" (Marcus and Gould 2000, p. 39), and therefore prefer "navigation schemes intended to prevent users from becoming lost" (Ibid p. 41). Similar to Germans, Chinese are moderate on Hofstede (1984) scale for uncertainty avoidance while Canadians are least risk averse. The preceding suggests differences in Navigation Design may exist between Canadians with German or Chinese users. More specifically, it was expected that Navigation Design would result in website trust for Canadian users but not for German or Chinese users (Cyr 2008a). Results of the investigation (Cyr 2008a) in which Information Design, Navigation Design, and Visual Design are tested for their relationship to trust appear in Fig. 4.1.

As depicted in the figure, Navigation Design results in trust for Canada and China, Visual Design results in trust for China only, and Information Design results in trust for Canada only. It is clear that there are distinct design preferences between the

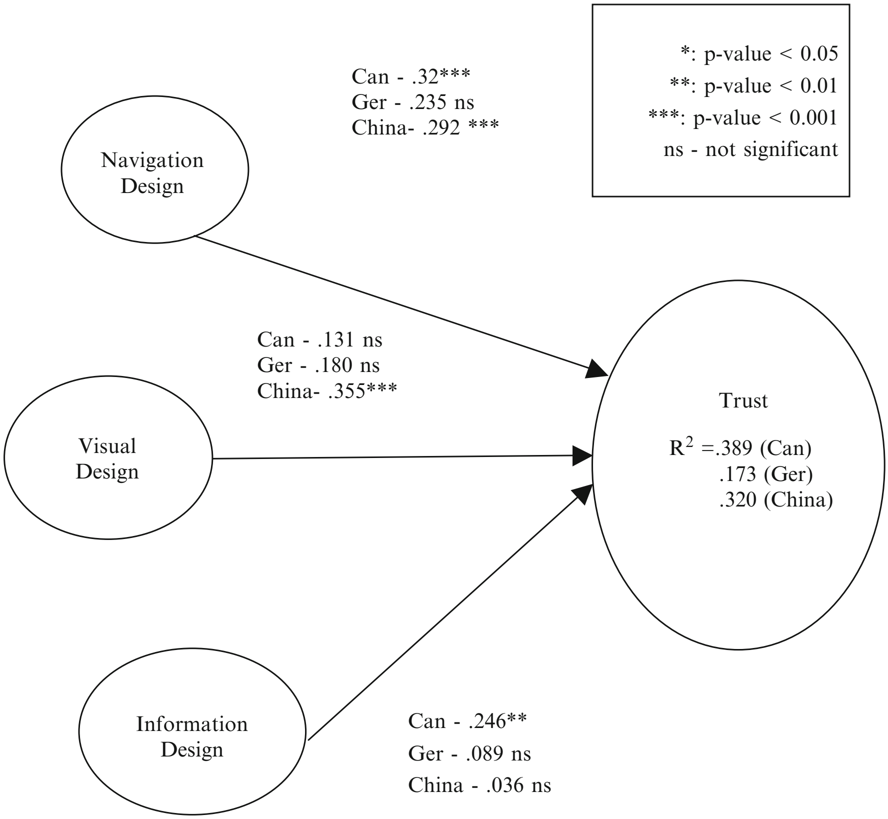

Fig. 4.1 PLS structural model (Canada, Germany, Japan)

countries in this study. Also of interest is that the three design characteristics serve to explain an outcome of trust better in Canada and China, while the variance explained is lower in Germany ($R^2 = .173$). In the case of Germany, it would appear that other characteristics not captured in this study also contribute to online trust. This may include the company name and reputation, or perceived security of information as already reported. Predictions for how the various design features would result in trust were mostly supported as outlined earlier. That is, Information Design results in trust for Canadians but not for Germans and Chinese, and Visual Design results in trust for Chinese but not Canadian and German users. It was predicted that Navigation Design would result in trust for Canadians but not for Germans and Chinese. These relationships received partial support as Navigation Design resulted in trust for Canadians but also for Chinese users (Cyr 2008a).

4.5 Concluding Remarks

Perhaps more online than anywhere, consumer perceptions of trust and security are a necessary universal ingredient if online browsers are to turn into purchasers. Willingness to take risks on the Internet varies across cultures, with Americans and Canadians least risk averse and concerned about security when buying online, Japanese most concerned with risk, and Germans somewhere in the middle. It is rather surprising that Japanese are least focused on buying recognized brands online, while Canadians are most likely to pay attention to this matter. It would seem that for Canadians, establishing product credibility is especially important.

For all groups it is paramount that online transactions are secure. No significant differences occur across the four country groups for any of the items regarding credit card access, misuse of credit card information, or the security of the payment method. However, in each category for each country these issues are of prime concern. To assure all users, and especially highly risk-averse Japanese users, managers and Web designers will want to place security symbols and other assurances strategically and prominently on websites. Credit cards are the most trusted payment method for North Americans, while Germans and Japanese prefer other forms of payment. Hence savvy online vendors will aim to match payment methods with country preferences.

A company's reputation is important and is often assessed based on other people's opinions – usually friends. Germans feel security symbols may be "faked" therefore a presence of security symbols that are easily identifiable would be especially important for this group. North Americans feel more secure about an online vendor if contact information is available on the website, and are also likely to seek information about a company's reputation through the Web.

Japanese are least trusting of information presented on websites and least confident that personal information will not be misused. Some of this concern can be moderated when online vendors provide product ratings from customers or consumer publications on their websites. Overall information quality should be high, with online product information complete, detailed and trustworthy. Information Design is especially important to Canadians and is statistically related to trust. This is a beacon to online vendors to pay special attention to effective presentation of information on the website. As already noted the type and amount of information varies by country and should therefore be tailored to particular users. For example, all users noted they prefer few product details when first entering a website and these details should be easily accessible. Detailed information can be embedded at the next level of the website.

Navigation Design is highly related to trust for Canadians and Chinese, which suggests that users from these countries expect websites that are clear and transparent. Navigation itself has cultural nuances. Based on earlier studies Canadians expect utilitarian websites that enhance movement and are easy to use. On the other hand, Visual Design is very important to Chinese users related to trust, and less so for Canadians and Germans. As such, website designers should pay particular attention to the colors, images, shapes and overall graphical look of websites. Asian users tend to trust websites more if they have "emotional appeal" and are otherwise engaging (Cyr et al. 2005).

While elements of website trust formation are generally known, cross-cultural comparisons are not well documented. The results reported in this chapter provide online vendors with added insight as to how to most effectively build trust in consumers from international locations. As suggested in the introduction, even minor increases in customer retention rates serve to augment profits. As such, designing websites that are perceived as trustworthy and secure in alignment with cultural expectations of the user has potential for huge commercial advantage.

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Chapter 5
International Contextual Field Research

David A. Siegel and Susan M. Dray

5.1 Introduction: Contextual Field Research and Usability

Field research approaches have evolved to address factors that influence the user experience and that are not well captured in a usability laboratory setting or in the form of simulated tasks. They are a collection of techniques and methods to study real users or realistic potential users in the real context of usage or intended usage. Different projects may place different amounts of emphasis on identifying user characteristics, goals, behaviors, current practices, usage patterns, and usability issues, but, at its core, field research attempts to understand the situational (contextual) factors that influence the likelihood and ease of incorporating the product into the usage environment, and that will affect its perceived and experienced usefulness, usability, and desirability, or to evaluate existing products on those same dimensions as realistically and holistically as possible.

5.1.1 Contextual Field Research in Relation to Usability

In its early days, "usability" was synonymous with a focus on cognitive issues, looking at how easy it was for people to figure out how to accomplish representative tasks with a particular user interface (UI). These tasks were often selected based on the team's concerns, such as the desire to represent common types of tasks, tasks the evaluator thought might be difficult, or to probe parts of the design about which there was particular concern. The task scenarios asked the participants to assume that they had a particular goal in mind. Even discount usability methods tended to focus on the narrow question of whether the UI enabled users to do tasks easily. The research itself did not assess whether the assumed goals of these tasks were indeed relevant to the user.

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In usability evaluation, the users themselves are part of the simulation. They are typically selected to be representative of or similar in key ways to intended or real users. This is consistent with the underlying cognitive science paradigm. However, simulated usage experience does not capture the motivational aspect of usability. Motivation and commitment will affect user perceptions in many ways, including influencing willingness to persist long enough to learn one's way through the system, or to exploit more challenging though potentially rewarding capabilities of the system. In situations where real users experience urgency about achieving their goals, real motivation may decrease tolerance for problems. Conversely, when real users expect that a new task or product is intrinsically complex, they may be more forgiving of what they perceive as a complex UI or process, especially if they believe that the end result will be worth the investment in terms of time and/or cognitive complexity.

When usability testing uses participants who are not already dedicated users of the system or even of closely related systems, it tends to focus on tasks that novice users will encounter, and thus to be more sensitive to problems of discovery and less sensitive to problems of efficiency in extended use. Also, while usability is assumed to include ease of learning, usability testing with novice users does not directly study the learning curve that will occur with repeated usage and experimentation. In addition, usability tests often require a system to be populated with simulated data. This can introduce a confound, because it can be challenging to separate inherent usability problems with the design from problems that result from the user working with unfamiliar data. Such tests necessarily evaluate the product out of the context of the diverse real life situations where it will be used, and therefore do not do a good job of identifying the ways experienced usability will be influenced by these factors.

Early on, there was a tendency to do usability studies when a system was developed enough for test users to have a realistic experience with it. Unfortunately, this often meant it was too late to change fundamental problems. Designers and managers tended to look for problems that could be solved with surface changes in screen design, but all too often the problems turned out to be at deeper levels. As efficient formative usability techniques such as rapid paper prototyping (Snyder 2003) and the RITE method (Medlock et al. 2005) evolved, iterative usability evaluations that were incorporated throughout the design became more common and usability evaluations came to be increasingly accepted as a necessary part of the design process. Doing usability evaluations earlier tended to mean looking at deeper, more fundamental aspects of the design, because it was easier to modify these early on. These included things like the basic architecture of the interface and the basic functionality and features of the product, things that affect not only whether users are able to do certain tasks (if they choose to), but also whether users would experience the product as useful and desirable.

However, for things to be useful and desirable, many contextual factors must be also taken into account. These include user factors like lifestyle, education, expectations, desires and motivations; and contextual factors like incentives, surrounding practices, environmental and social factors, to name but a few. Understanding these things as proactively as possible and working to introduce this type of holistic understanding into every stage of the process of conceptualizing and designing the product requires stepping out of the simulated environment of the usability lab. Because of the traditional association of usability with lab usability evaluation, this broadened focus of usability is sometimes referred to as Usability with a capital U, or "Big Usability," or is treated almost as if it were synonymous with the whole field of user experience (UX) or user-centered design (UCD).

Field research plays a major role in this expanded definition of usability research. It is a key way of gathering information to support proactive and holistic understanding. Examples of some of the main categories of information that field research addresses include:

- Understanding what makes a product desirable, beyond what people can tell you when you ask them directly, such as in a focus group:
  - Understanding how the product could improve what people actually are motivated to do
  - Identifying the value propositions that will resonate and be meaningful in the local context
  - Understanding how the product will need to fit into the spectrum of other experiences people have in interacting with technology
  - Understanding what will make it subjectively inviting to people
  - Understanding and designing for the adoption process
- Understanding existing practices and behaviors and the challenges of migrating from those to new tools or approaches
  - Understanding how value will be experienced at different stages in the individual and large scale adoption lifecycle
  - Understanding how people learn about, consider, and decide on new products of this type
  - Understanding how the ecosystem surrounding the product supports or does not support its adoption
- Targeting the appropriate market segment
  - Developing an appropriate segmentation model based on a meaningful set of distinctions among subgroups
  - Understanding how distinctions among needs, motivations, challenges, and requirements map onto these distinctions among users
- Evaluating potential designs in realistic ways that are appropriate and relevant to the users and the usage context
  - Assessing how the product serves users doing real tasks aimed at real goals in their own way
  - Understanding how the product fits with the real ecosystem and infrastructure
  - Identifying obstacles to deepening engagement with the product at different stages of the usage experience and what would it take to solve these

5.1.2 The Behavioral Emphasis of Contextual Field Research

A key factor for user experience research in the field that allows it to add unique value to product development is its emphasis on behavioral research (Siegel and Dray 2005a). Reviewing the above list makes it clear that field research tends to emphasize strategic factors that influence product planning and design at deep levels. We have previously written about this in detail (Siegel and Dray 2005b). The fact that UCD field research tries to understand what will determine value as it is actually experienced by users brings it into contact with the turf of market research. Even though UCD and market research are typically distinguished based on their different missions (predicting what will produce a positive usage experience versus predicting what will make a product sell), it is nevertheless hard to draw a clean boundary between market research and UCD field research. First of all, the goals of market research and UCD should ideally be in alignment. The explicit or implied promise made about a product should be fulfilled by the experience the product actually delivers. Second, there is overlap between the two fields in practice. Market research has its own set of methods to predict what will make a product desirable and attractive for people. There are people in market research organizations doing qualitative research in the field with small samples, who may look superficially like they are doing user experience research.

In our experience, one thing that tends to most strongly differentiate the two fields from each other is the dominant research paradigm. Market research tends to rely much more heavily on self-report data, while UCD field research tends to give higher status to behavioral data and puts less credence in self report. Market research tends to emphasize quantitative analysis of data from large samples, and self-report data in the form of survey responses is the most easily amenable to this type of analysis.

The behavioral emphasis of UCD field research also distinguishes it from conventional approaches to identifying user requirements to guide software design. It is more than simply gathering of requirements that users can tell you about explicitly. In addition, the insights it strives for are different from what can be captured in an exhaustive set of use cases. User experience research has to go beyond cataloguing and describing to include an evaluative and prescriptive component. This is essential for selecting among alternative ways of designing products and interactions.

5.1.3 Why Field Research Is Particularly Important in International Research

Contextual understanding is important for all product development, but it is especially important for global product development. We find that product teams often underestimate the heterogeneity within user groups even when they are developing domestically, but this is even truer – and more dangerous – when they are developing for a global market. Not only is it easy to underestimate differences among human beings and their practices in different contexts, but it is also easy to underestimate the number of dimensions of potential difference. Field research helps correct this tendency.

Unspoken cultural assumptions affect product planning. Even when product teams are in the very early stages of development, or when companies are seeking new opportunities and claim they are not wedded to any particular product concept, we find that culturally based assumptions almost inevitably influence their thinking. Even when being open-minded about what they might develop, companies naturally imagine that their technical strengths have applications that will matter to people. This image of what their technology might do for people and why it might matter for them often is based on subtle, unspoken assumptions about how life is lived, typically based on the "givens" of the development team members' own lives, or sometimes based on beliefs about the other country. These need to be made explicit, subjected to verification, and often must be modified for a product to succeed.

There are special issues with UCD for economically developing parts of the world. Here, where the need for in-depth understanding of local conditions and where their effect on requirements for success of the product is the greatest, a certain kind of arrogance can lead to the assumption that "they need what we have." There is a saying in English, "In the land of the blind, the one-eyed man is king." It expresses the belief that competence is relative to the average competence, or, "If you know just a little more than others in the room, you are the expert." The saying was used ironically in a short story by HG Wells, originally published in 1904, in which the hero discovers a lost society in the Andes where everyone is blind. He assumes he will easily be able to take charge, but as a matter of fact, the inhabitants have not only developed a society that is perfectly adapted to blindness, but actually perceive his sighted behavior as pathological. Far from ending up the king of the society, he……. Well, read the story (see Wells 2010). This saying perfectly expresses the arrogance of judging an unfamiliar set of practices as lacking in sophistication or as being "primitive" or thinking that your solution will be eagerly adopted because it is more sophisticated. Human beings in every society have developed successful and sophisticated adaptations to their real local circumstances. And there are ways in which the so-called "developing" world turns out to be more "sophisticated" than the "developed" world. For instance, according to Rotich (2010), in terms of the adoption of "mobile money", the "third world" leads the "first world."

We have to be clear that not all global product development is the same in regard to the UCD challenges it presents. Developing products for globalized businesses that to some degree are homogenous, or where national variations may not be greater than variations among companies within a country or region, may involve less need for building new fundamental knowledge than designing products for an unfamiliar consumer market, where practices may differ very widely. Developing a product incrementally when you already have a base of experience with the user population does not present the same type of challenge as introducing a product to a brand new and unfamiliar market.

5.2 The Temptation of Discount Approaches

In this time of cost cutting, it is completely understandable that companies will try to find the most inexpensive ways to get international user information to minimize the costs of going overseas to collect insights in person. As remote usability evaluation is becoming more and more acceptable, there is pressure to try to extend these methods to field research. We would argue that this may seem like it is inexpensive, but in reality, these alternatives to travel are not always effective and can even be dangerous. Furthermore, you very likely will not know what you have not learned. Some of the most common ways that companies try to cut costs for international field research include talking solely with expatriates, using cultural design guidelines, thinking that translation and localization are enough, and using cultural probes. Below we discuss the limitations of these approaches to support the claim that there are no good substitutes for actually doing field research internationally.

5.2.1 Expatriates

Some companies will look to do research with local people who are natives of the target culture, whether they use people within their own companies or other expatriates, such as students. This is a risky strategy for a number of reasons.

The people who have immigrated to your country from their country of origin are very often not "typical" of the potential users in that country. Not only are they usually a select sample, but their familiarity with behavior and relevant contexts in their home countries may not even be very current, unless they emigrated very recently. They often have migrated disproportionately from certain regions and may represent particular ethnic groups or share a particular economic or educational status. In addition, most people do not have cross-cultural interpretation expertise, or the skill to look dispassionately at their own society more broadly than simply remembering their own experience. It is also a mistake to assume that expatriates have detailed knowledge about the way the specific domain your product addresses functions in their home country. In short, it does not make sense to rely on expatriate engineers as experts on users in their home country any more than you would rely on engineers from your own country as experts on domestic users. A final limitation is that using expatriates is likely to limit you to retrospective interviews and eliminate the opportunity for behavioral observation in context.

5.2.2 Cultural Design Guidelines

Our common experience of cultures suggests that there are ways that, at some level and to some degree, they look and feel internally consistent and different from each other. It is intriguing to consider what the implications of these differences might be for design. Not surprisingly, a literature has grown that is focused on identifying cultural design guidelines. The classic research most frequently cited is by Gert Hofstede (1991) who characterized countries' cultures on 5 dimensions: Power Distance, Collectivism vs. Individualism, Femininity vs. Masculinity, Uncertainty Avoidance, and Time Orientation. Hofstede's dimensions were not focused on design, but subsequent researchers and authors have tried to apply them to design in the form of guidelines (e.g., Marcus 2005; Gould and Marcus 2000; Smith et al. 2004 to name a few). Other researchers (e.g., Barber and Badre 1998; Smith et al. 2004 as examples) have tried to derive cultural characteristics in visual design by auditing existing web sites from various countries.

While it is certainly understandable that teams might look to these types of guidelines in creating new designs, this is risky for a number of reasons. (We discuss limitations of cultural models at length in Siegel and Dray 2005b.) For one thing, there are problems with the underlying research and data. Hofstede's study was based on a survey of IBM personnel in the late 1960s, hardly a representative sample. While there have been several follow-up studies that claim to have partially replicated his findings, they have all been based on self-report surveys like Hofstede's was originally. Even if there are statistically significant differences in response patterns across countries, we should question how well they predict behavior in specific circumstances. In addition, it is a tremendous inferential leap to move from broad generalizations about culture to design of technology. Cultural design guidelines are almost always at a high level of generality, so as to be broadly applicable. However, cultural distinctions do not necessarily map cleanly onto national borders, and nations do not have monolithic cultures (of which we are frequently reminded, when one of us, a "transplant" from New York to Minnesota, is accused of driving like a New Yorker, or when we hear ethnic jokes applied by people from one region of a country to people from another region). They also do not take into account the specific cultural norms of behavior that apply to very specific sectors in a country. For example, cultural guidelines will do little to help you understand how to design a banking application so it fits the context specifically in regard to norms, attitudes, and practices regarding finance, investment, credit, etc. Thus far, much of the literature in this area seems to involve attempting to translate the description of the variables into visual design characteristics based on literal semantic association. For example, Marcus (2005) recommends using images of groups for collectivist cultures. At this point in time, therefore, cultural models are not yet sophisticated or specific enough to help a team in design, although they may help sensitize researchers to fundamental cultural differences when doing international contextual field research.

5.2.3 Translation and Localization

High quality translation of a product's interface is, of course, a minimal requirement for a product to even launch in international markets. Localization takes a product to the next level – making sure that all aspects of the product, including things like time, date, and address formats, currency defaults, and spelling, fit the standard conventions of a particular target culture. These activities are critical to the usability of a site, but they are not sufficient to assure experienced value and usability. We continue to hear examples of people in business thinking they are well-prepared for global release of a product, because they are confident in their localization. Localization does not ensure usability of deeper characteristics, like whether the fundamental value propositions of the product are compelling in the local context, whether the package of functionality is applicable, whether the information architecture makes sense given local ways of thinking, whether the prioritization of features fits what is really important to people, etc. Another problem with thinking that localization takes away the need for contextual field research is that localization often happens at the end, or close to the end, of the product development lifecycle, when deeper levels of the product concept, functionality, and architecture have all become well established. By the time a product gets to translation and localization, it is simply too late to make sure it will be usable and useful in different cultures.

5.2.4 Cultural Probes

Cultural probes are a method developed in the late 1990s by Bill Gaver (Gaver et al. 1999) at the Royal College of Art and Design in London. It has been widely adopted to gather data "remotely." Researchers give or send users a packet of materials typically including maps, postcards or other media with unstructured questions for users to answer, a disposable camera for users to take photos, both specified and free-form, and/or other materials as deemed relevant by the design team. The participant sends all of these materials back to the researcher. In practice, there may or may not be an interview to explicate the materials. There is not necessarily any attempt to "analyze" the resulting materials that are returned to the design team. Instead, the materials are intended to serve solely as inspiration for designers. Asking participants to create expressive collages of materials in preparation for a field research visit is a close relative of this method. They are both closely related to projective methods used in market research, the rationale for which is the claim that participants will express their underlying attitudes, beliefs, and associations by expressing themselves in response to unstructured stimuli. Even diary studies can fall into this category, depending on how much structure the participant is given.

The idea that using these materials as "inspiration" eliminates the concern about correctly interpreting them or analyzing them is potentially misleading. Whether you call it an "inspiration" or a "research finding," some decision is being made on the basis of some evidence, and all the issues of validity that arise with any form of data still seem relevant. Cultural probes are inherently ambiguous – that is part of the point of any projective method – and therefore, interpretation of the returned information is also ambiguous. In addition, anything that the participants write or tell you is self-report, with all of the attendant issues that come with it. There is always a risk that the words or images alone will lead team members to assume that they understand the meanings when, in fact, the interpretation should always be considered simply a hypothesis. The underlying idea that the stimuli are ambiguous and that therefore the communication is determined by what is “inside” the participant is itself questionable. It is very hard to determine how the participant’s self expression is influenced by the available materials, or by irrelevant factors that make it easier to accomplish the expressive task one way versus another.

For these reasons, many practitioners use methods like cultural probes as a supplement to field research with participants. They use the materials created by the participant as ways to open new topics for probing. The probing is what is “inspired” by the materials, and the “real data” is what is turned up in this further investigation. One appeal of this kind of data gathering is that it can be done remotely. This can be especially appealing in the context of international research. Certainly, it can be used to start the process of exploration and to engage the user before the researcher arrives on the scene. However, we are aware of situations in which cultural probes have been used in connection with telephone interviews with geographically remote participants as a substitute for research that is truly done in context. The main concern about this approach is that the researchers who do this have no way of knowing what they might have unearthed had they been able to follow threads of investigation in context.

5.3 Main Methods for Contextual Field Research

There is a wide range of approaches and techniques for learning about users, usage, and the context of use internationally. While this chapter is about special issues in doing field research internationally, rather than a primer on the basics of doing field research, it makes sense to give a brief overview of approaches. One of the most important dimensions on which approaches differ is in regard to their fundamental focuses, ranging from an emphasis on understanding basic human processes and dynamics in a domain of behavior relevant to the technology, to an emphasis on understanding usage of and issues with technology in support of particular human functions, to evaluative study of usability in real usage situations. Approaches can vary in the amount and style of interaction with users, from almost none to intensive. They differ in the amount of pre-determined structure that the researcher brings to the data collection process. They differ in the balance between self-report and observation, and in how these are integrated. Rarely are the approaches we describe briefly below practiced in pure form. In most real studies, especially complex international ones, combinations of approaches are used, reflecting combinations of their emphases.

There is a tendency for people to think of different approaches to field research as being associated with different phases of product development, so that people talk about fundamental user research as a way to look for product opportunities or as relevant during the earliest stages of development. Similarly, people talk about studies of earlier technology in use as a way to develop requirements. However, we strongly believe that distinctions like these are somewhat artificial, and that any of these types of research can generate insights to influence any aspect of product development. This is especially true when we think about the broad range of product planning issues that contextual field research can inform beyond just interface design (see the list of the main categories of understanding that field research addresses included earlier in this chapter).

5.3.1 Naturalistic Observation

Naturalistic observation involves watching people's behavior essentially without interference. It can be useful to collect a small amount of data anonymously from each member of a very large sample. For example, you might observe a series of people interacting with a kiosk. It can also be useful for noticing large scale patterns in public environments, such as to understand norms of behavior in a market place, while riding in public transportation, in the waiting room of a clinic, etc. Paco Underhill's book, *Why We Buy* (Underhill 2008), is a popular account of large scale observational research on things like how product placement and display in stores affects mass behavior of shoppers.

In contrast to doing observation anonymously, you may use it when shadowing a participant you have come to know well, to get a realistic sense of a typical day in their lives or of their natural workflow and variations in it. It is an essential method in situations where interaction between the researcher and participants would be overly disruptive to the natural process, distracting or even dangerous. For example, we have used it for purposes as diverse as understanding interactions between customers and sales people, and interactions among professionals during medical procedures.

Although it may sound like an easy technique, it is not easy to do it in a way that is useful for product development. The researcher has to make choices about where to focus attention, and it can be difficult to distinguish what is most relevant and important from what is incidental. Ingenuity is required to choose the vantage point from which you will observe, both in terms of physical placement and in terms of how you relate to the participants. For example, to understand the shopping experience, should you lurk in a store or should you present yourself as someone who is interested in learning from a salesperson by shadowing him through his day? It can also be difficult to determine why people are acting the way they are or to tell what their intentions were, what cues they responded to, and why those cues had the meaning that they did for the participants. Sometimes it is even difficult to tell exactly what people are doing. As a result, the researcher often needs to plan for ways to obtain some explication of the observations, even if that cannot be done in real time.

5.3.2 Ethnography

Ethnography developed in anthropology as an intensive way to study human societies and cultures, through in-depth study of particular cases. (See Blomberg and Burrell 2007, for an in-depth overview of design ethnography.) For a number of reasons, it can be somewhat difficult to define. The term has a particular meaning in the context of academic anthropology, but in industry it is often treated as though it is synonymous with any field research focusing on understanding people. Also, it is not defined based on the method of data collection, since ethnographers use a wide range of techniques. Sometimes it seems as though ethnography is anything that people with the title "ethnographer" do, but this is not very helpful, especially when one considers that not all ethnographers practice the same way. As a result, we propose a definition that focuses on what we think of as the core characteristics of ethnography that distinguish it meaningfully from anything else you might do in the field.

Ethnography can be characterized by its focus. It attempts to provide foundational knowledge of users or potential users to inform product planning and design. "Foundational" means that it tends to pay attention to the context of basic human and social functions within which the product will hopefully play a useful role and within which it will have to fit. This is different from focusing on use of or evaluation of tools. Of course, this distinction is blurry, because people's goal-directed behavior inevitably involves use of tools. What distinguishes ethnography is the tendency to see use of the tools as only one way of fulfilling a basic function, and ethnographic approaches seek to understand use of that tool in relation to everything else one does to fulfill that function. If, for example, you are developing a new email system, you might do an ethnography to understand communication, including the role of a spectrum of existing ways of communicating (including current email systems the participants are using – if any). This is very different from focusing on what people like or dislike about their email tool.

Another generalization one can make about ethnographic method is that deep case study of individuals or families serves as the raw data from which understanding of larger patterns is abstracted. Someone who traveled to a foreign country and gathered tremendous amounts of local knowledge but who did not spend significant time with particular actors within that context to deeply understand them and how their behavior, beliefs, values, etc. related to that context would not be doing ethnography.

Finally, in our experience, ethnography tends to be less concerned about issues surrounding the validity of self report than other field research approaches. This may have to do with its roots in anthropology, where the end goal is to understand the case in order to derive more abstract concepts about culture. If it is assumed that culture is embodied not in the concrete things that people do, but in what these things mean to the members of the culture, then the way that people account for their behavior and the norms of their society is inherently valid.

This may be partly traceable to the fact that ethnography comes out of a particular tradition in anthropology, the "emic" as opposed to the "etic." An etic approach looks for generalizable rules governing behavior, while emic approaches look at coherent collections of meaning at the case level, using constructs that are themselves meaningful to the participants and in culture. Here is an etic discussion of what we may call "corruption:" Corruption is more likely to arise in a system in which civil servants are paid very little, because this creates incentives for the civil servants to work for "gratuities." The fact that the hierarchy of civil servants will be supported by lower status workers paying a percentage to their superiors removes any incentives for transparency or to have power reside in the formal institutions of society rather than in the individual occupying the role. However, since as long as everyone understands and plays by the role of the game, this can be an effective model for maintaining social order. An emic discussion of the same phenomenon might tell a coherent story about the dynamics within a particular society, focusing on things like why an officially low-paid civil service job would be considered so prestigious that the civil servant is thought to be a better marriage prospect than a successful entrepreneur or high tech worker; how drivers' concept of and feelings about formal legal institutions are affected by their fear of being stopped by a police officer and having to pay a large "gratuity" to avoid being arrested for minor safety violations.

There are some potential risks and challenges with design ethnography. A focus on "meanings" may be very important for managing subjective aspects of user experience, like what value propositions people will resonate to, or what psychological associations should be conveyed by visual design and messaging of a product, but it may be less useful for predicting and guiding behavior through interaction design. Since the goal of ethnography is to understand underlying dynamics, perhaps the biggest risk for this type of study in industry is that the focus may become too diffuse, resulting in findings that are not perceived as providing useful and specific guidance for the product. Synthesizing and analyzing the very rich qualitative data from ethnography in a rigorous way so that findings are not just impressionistic is a challenge. All of these challenges are ongoing topics of study and debate in the professional community.

5.3.3 Contextual Inquiry

Contextual Inquiry (CI) focuses on studying how people interact with current, customary tools to achieve their goals. It is founded on the belief that only by grounding interviews in observation of actual work can you compensate for the weaknesses of self-report such as biased recall, tendency to give summary information, and difficulty recognizing how one's own behavior depends on context (Beyer and Holtzblatt 1997). CI is a set of interview techniques for probing people's explanation of their behavior – and exploring variations in their behavior – while they are actively engaged in carrying out their tasks. It includes techniques both for deepening and for broadening the conversation, while staying focused on samples of actual work.

CI is not primarily an evaluation method per se, because its main focus is on trying to understand user tasks and goals, and deeper levels of how their work is organized. However, it includes an evaluation component because these goals are expressed through the way people work with their current tools, and the way the tools structure their work process. Thus, inevitably the data suggests limitations with the tools. Of course, people also spontaneously express frustrations with their tools and wishes about how they might be different. In contrast to conventional interviews, CI allows the researcher to do more than just catalogue reported problems and user requests. In CI, the researcher probes for and observes concrete examples to understand in detail things like how the reported problem arises from specific combinations of task characteristics, circumstances, and design characteristics of the tools, as well as how it affects the user.

Working with experienced users can be both a strength and a weakness in using CI as a source of evaluation information regarding existing tools. As a strength, it may be better than laboratory usability studies with inexperienced users at showing how a tool makes a task efficient or inefficient. However, the adaptations that experienced users have made to their existing tools is a confound. They may also not recognize ways in which their process could be more efficient or less error prone. Therefore, opportunities for improvement may have to be inferred based on observation (such as by studying work-arounds) and based on the researcher's synthesis. Sometimes a product team already has some ideas about design alternatives going into the field. If the researcher can imagine alternatives, interviewing a person in the context of his or her work at least allows the researcher to probe for variations in the work where the change would be an advantage and where it would be a disadvantage.

We have been using the term "work" to describe the behavior that is the focus of CI. Indeed CI is sometimes thought of as a process that applies in the workplace. In reality, it is applicable to consumers as well. However, it depends on participants engaging actively in their own tasks during the session, and this level of engagement can sometimes be more challenging to achieve with consumers than with people doing work tasks, because the task for the user is more often "optional."

5.3.3.1 Artifact Walkthroughs

It is usually not possible to be present to see in real time everything that might be important. It can be difficult to observe a representative sample of intermittent tasks, or of common tasks done under unusual circumstances. Even for routine tasks, observing a representative sample may require a great deal of time if the tasks are highly varied. Artifact walkthrough is a technique that helps address this by grounding interviews in concrete evidence of past behavior. It is easily incorporated in both Ethnography and Contextual Inquiry.

Artifacts are any traces left by human activity. In that sense, they provide concrete evidence of the intention and behavior that led to their creation. Some artifacts may be created automatically as by-products of work activity. Others may be created intentionally. They may be the end result of a work process, or they may be evidence of a process used in producing something else. Examples can be work products, evidence of customization of tools, ways in which a person has organized materials or data, evidence of usage history, schedules, and so on. They can be as diverse as annotations made on a document, an organizational scheme created for files, the set of applications downloaded onto a mobile phone, events that have been logged or recorded, the physical arrangement of the workspace, emails exchanged with coworkers, etc.

In an artifact walkthrough, the interviewer probes about the history of the artifact, the process of its creation, the intentions that led to its having its specific characteristics, the role it played in other processes, what was helpful or unhelpful about it, etc. The process of exploring an artifact often leads the participant to think of other examples to share, or about important factors specific to the situation the artifact played a role in. It can serve to identify directions for probing on current activities that may reflect variations of the processes of which the artifacts give evidence, or on aspects of the context that lead to variation in the processes the artifact opens a window into.

Cultural probes, which we described earlier, can lead to participants gathering artifacts for examination. As we said in that earlier discussion, we feel that this can be useful, as long as these are used to stimulate the type of in-person probing we are describing here. In addition to the benefits of allowing the researcher to branch out from the artifact walkthrough into other aspects of the contextual investigation, being in context gives the researcher more opportunity to identify and select potentially interesting additional or different artifacts for exploration, as opposed to leaving this entirely up to the participant as in cultural probes.

5.3.3.2 Naturalistic Field Usability

Naturalistic usability evaluation in the field is the process of evaluating ease of use under conditions of usage that are as realistic as possible. It is applicable to evaluating existing tools as well as new tools. One key way it differs from traditional usability evaluation is that it is less scripted and structured. In fact, since "conventional" usability evaluation does not have to happen in a usability lab, it is probably more accurate to contrast naturalistic usability evaluation with scripted usability evaluation. In the naturalistic approach, the researcher looks for opportunities that arise during natural use to evaluate where and how the design supports or interferes with the things the user chooses to do, rather than using a set of predetermined task scenarios. Thus, it measures usability in terms of what matters to each particular user. Scripted scenarios typically start by asking the user to assume a certain goal. In contrast, in naturalistic usability, the user's motivation is real, which is likely to affect aspects of the user's approach to the task (e.g., persistence) as well as the subjective experience of trying to accomplish that goal. It also more realistically takes into account the usability challenges presented by the user's actual data, while avoiding introducing extraneous confusing that can come from using simulated data with which software may be populated for evaluation purposes. By doing the evaluation in the user's environment it also takes contextual factors into account, such as the fit with technical infrastructure, workflow, etc. In short, it measures usability in a way that is much closer to how it is actually experienced by real users.

The fact that this method does not use scripted scenarios does not mean that the researcher has no agenda of his or her own. The evaluation may be guided by a set of design issues or features that are high priorities for evaluation. In addition, the researcher needs to have a general concept of the real-life situations that might arise naturally to provide relevant test data. Thus, rather than task scenarios, naturalistic evaluation is based on general descriptions of categories of tasks. While the emphasis is on using spontaneous user behavior as the source of usability data, sometimes it is necessary to propose general types of tasks to participants, and allow them to fill in the details with relevant examples from their own actual work. This same technique can be used in the lab, asking the user to choose a goal that is like something they would do naturally. However, this by itself does not adequately simulate real motivation, and has the other limitations that come with being done out of context.

Naturalistic field usability can be done with the participant's existing tools or with new tools. When done with existing tools, it can look similar to CI, with the difference that the researcher is somewhat more directive in the case of naturalistic usability evaluation. With existing tools, the challenge is in identifying usability issues in the face of the fact that the user has probably already adapted to some of them. The focus is more likely to be on on-going efficiency and errors than on initial ease of learning. Naturalistic usability evaluation with new tools presents a different challenge: how to get the users to realistically engage with new tools to do tasks that are truly meaning to them. Many strategies are available for achieving this, and they vary in their degree of naturalism.

5.4 Special Issues in Applying Field Research Approaches Internationally

Of course, the challenges inherent in doing any field research are important to address, but in this section, we emphasize aspects that are particularly relevant to international field research. Some of these are specific to international contextual field research, and some are magnified versions of issues that are present for domestic field research. Here we consider some of the most important. We group them under the headings of Defining Scope and Focus; Sampling; Research Roles and Perspectives; Language; Arranging In-Country Assistance; and Managing Multi-Country Studies.

5.4.1 Defining Scope and Focus

Even though international field research has become much more common, it is still not routine. When people do such projects, it is understandable that there is pressure to accomplish as much as possible to make best use of the limited opportunity and budget. Unfortunately, this can overload the agenda for the project, with the result that the balance between depth and breadth shifts greatly toward breadth. If the project is indeed intended as a high level scan that will help frame more targeted agendas for a series of follow-up studies, this can make perfect sense. But when this is not the case, it can compromise the part of the value of field research that comes from going into depth. We discuss this in terms of two closely related issues, scope and focus. Although they overlap and decisions about either of these will influence how you manage the other, it is useful to separate them. Think of scope as a horizontal dimension and focus as a vertical dimension for describing the space you want to cover in the research.

5.4.1.1 Scope

We think about scope as the collection of independent variables, primary contrasts, or implicit "cells" built into the research plan. It can include the list of countries you want to visit, the list of hypothetical user segments or demographic profiles you want to include, distinctions like urban versus rural, users versus non-users, etc. The more of these you build in, the less time you will be able to spend going into depth on any one of the "cells." Depth requires spending more time per participant, and including more participants in a particular group to allow for discovering more of the variations within that cell. Because independent variables are crossed with each other in the implicit matrix of the research plan, increasing them makes the complexity of the plan grow geometrically. We have had situations in which a client's budget allowed, for example, something like 36 participants but the set of contrasting types of participants they wanted to include added up to 144 cells, e.g., [four countries] × [three usage levels] × [primarily home computer user versus primarily internet café user] × [three age levels] × [two income levels].

A good example of how too broad a scope can compromise the robustness of the research occurred when we negotiated the research plan for a study on certain aspects of online experience in China, a country where dial up users were extremely rare. One stakeholder asked us to include a single dial up user so that we could extrapolate to another country where dial up was, at the time, the primary way of connecting. There are many false assumptions built into this request: that you can generalize the impacts of a particular variable in one context to another context that differs in many respects, that an experience that is rare in one context would have a similar meaning in a context where it is common, and that a single case would be sufficient to understand the impact of that experience in either context.

With issues like these in mind, when you are planning an international study, be certain to negotiate with anyone who wants to build more and more contrasts into the study plan. Make sure that stakeholders understand what is being sacrificed for broad coverage. Consider the possibility that it may be more valuable to gain deep understanding of a small number of variations, user segments, or geographies, rather than attempting to achieve comprehensive coverage. Because deciding on geographies to visit is such an important part of scope, we discuss that in a separate section below.

5.4.1.2 Focus

While different approaches to field research vary in the amount of pre-determined structure that is applied to the data collection process, they all tend to be much less structured than scripted usability testing. In usability testing the interface itself and the planned tasks narrow down the vast range of things you could potentially study and provide an inherently structured focus for the data collection. In field research, this is not the case. This makes sense since the purpose of the research is to understand a complex interconnected network of factors. This reality brings with it the risk of the research being too diffuse. For international research, the risk of diffuseness is increased by the pressure people feel to use the opportunity of the research to try to understand everything. Focus is the key to managing this risk.

In contrast to scope, we think of focus as the vertical dimension of the information space you want to understand. In our practice, focus is not just a general statement about the basic purpose or mission of the project. Rather, it is a set of working hypotheses about what aspects of human life might be relevant to your overall topic. It takes the form of a list of inter-connected topics you plan to explore in order to gain comprehensive understanding of the phenomenon, issues, or behavior of interest and to target that understanding on the things that will make the most difference for the product. The focus includes a mix of topics that are directly relevant to a product and some that are potentially indirectly relevant. For example, in a study of computer purchasing by people in a lower-middle income level in India, we of course looked at the role of different information channels by which people learned about new computer products. But we also looked at how extended or joint families sharing a household managed their budgets overall, how they balanced individual contributions and spending with contributions to the family budget, how making occasional major purchases fit into this, the impact of whether the purchase was something that the household benefits from (a refrigerator, washing machine, a TV in shared space), versus something primarily used by an individual or subset (a motor cycle, perhaps a computer).

The focus is used in a number of ways. It primes and guides the somewhat free-form probing that occurs during the research sessions, while helping ensure that your explorations remain relevant to the product. It serves as a baseline for tracking learning, because part of what you inevitably learn in the field is that some parts of the focus turn out to be less relevant in context than you anticipated, and that other things need to be added to it. It helps guide planning of data collection activities, because it helps you think systematically about what specific data sources would shed light on each topic. As we said above, scope and focus can influence each other reciprocally (so the horizontal/vertical metaphor does start to break down). Because some parts of the focus are likely to apply more to some kinds of participants in your sample than others, it may lead you to broaden the sample.

The detailed focus comes from finding the intersection between two things: the types of product and design decisions that the product team is or should be wrestling with, and domains of human life that are likely to have implications for the user experience aspects of those decisions. Thus, it depends on insight into the product team and insight into human/social functions and potential ways in which they can vary across populations. For example, in a study on evaluating opportunities for personalized advertising during online activities, the team needed to understand issues to evaluate the contextual fit of the concept, like how capturing individual information to personalize advertising would be perceived, as well as how to collect data to drive the personalization and how to integrate the advertising into different types of activities, among many others. Among the very long list of topics to explore in context that this suggested, we needed to include things like:

- The user's distribution of online activities in a range of places
- The user's pre-existing experience with any use of personal information for any form of targeted messaging that might have implications (either by analogy or by contrast) with their response to personalization on the computer
- The user's perceptions of different types of commercial information and of the boundaries between advertising and other forms of information, in their current experience

Notice that these are worded not as research questions requiring synthesis across cases, but as areas to probe within a specific case. Also, notice that these are still broad topics, and there are likely to be many nuances and variations under different circumstances to capture even in regard to a single case. To help ensure that you probe thoroughly under each topic and look for variations, it is a good idea to specify some subtopics for each topic. e.g., for "range of places," you might list, at home, at work, in an internet café, in a friend's home, etc.

The focus topics are not intended to be a standard script that the researcher follows. You may drill into more detail on a particular topic than is specified in the focus document. For example, "Different types of information" might be elaborated as branding advertisements, product reviews, special offers, location information, etc. Furthermore, the terminology you use to identify topics and the distinctions among topics reflect your way of thinking but may not be relevant to the participant. It is up to the researcher to decide how to interact with the participant to elicit information on your focus topics, to formulate questions that will make sense to each participant, and to decide how to combine observational data and self-report. Furthermore, different participants will provide opportunities to probe on different subsets of topics within your focus, adding another layer of personalization to the sessions.

One way of generating focus topics that is particularly relevant in international research is to make explicit the basic assumptions implied in the potential usage scenarios the product team imagines, to turn these into research questions, and then to brainstorm about possible parameters of human life that are relevant to evaluating them. As we said in earlier in this chapter, culturally-based assumptions are almost always present even in the earliest stages of product thinking. These may be assumptions based on the experiences of the team members, or on what the team already believes about the intended international context of use.

You can get a sense of what the team's implicit assumptions are by eliciting stories that reflect how they imagine their product being used or the need it will fulfill in the countries to which you are traveling. If they have already formulated some marketing plans or design ideas, try to identify what assumptions these depend on. Just making these implicit assumptions explicit is extremely useful. By turning these assumptions into hypotheses and topics to cover in the focus structure, you are helping the team shift its mindset from a local to a more international one.

The international context often raises questions about fundamental aspects of life at a deeper level than would be typical for research in very familiar domestic contexts, where you could take more for granted. For example, in a study of computer purchasing in India, several things suggested to us that the team imagined a shopping process in which comparison shopping in stores would play a significant role. But this makes assumptions about things like available time in ones' daily life, ease of transportation to stores or markets where brands can be compared side by side, a culture in which sales people are viewed as (and function as) sources of product information for people who are not ready to make a purchase, and many other things. These and many more were reflected in our focus.

5.4.2 Sampling

Broadly speaking, sampling is the process of deciding where to look to gain the understanding you want. It includes deciding what range of geography you want to sample and who within those geographies to focus on, given the purpose of the research.

5.4.2.1 Where to Go: Sampling Geography

One of the first challenges in planning international research is deciding where to do the research. Sometimes there are obvious business reasons for doing the research in a particular country, e.g., that country represents such an important market in its own right that it needs to be understood in depth, or you are considering launching an existing product in a new market, so the research questions focus on a geography. However, we find that in planning multi-country studies many teams struggle with this decision. Ideally, the choice should be made based on whatever is driving the user research. However, inevitably, there are a variety of additional considerations, such as cost of the research, logistical concerns such as ease of recruiting, market share, technology penetration, and local field staff support (Dray and Siegel 2005).

Too often the decision about where to go seems to be based on somewhat arbitrary grounds or on simplistic thinking about geography rather than on research hypotheses of what differences among contexts may matter. Commonly, people think too much about physical placement on the globe and assume too much about what it means. To understand this, it helps to clarify a fundamental difference between sampling for geographical representativeness versus sampling based on anticipated variation. The latter is often referred to as strategic sampling. Blurring this distinction leads to confusion, and this is especially so in international field research. Strategic sampling means constructing a sample to include variation on dimensions that you think are relevant. Doing user research in different contexts around the world gives us an opportunity to see a wider range of differences on relevant dimensions than if we were only looking within familiar contexts. For example, using the example of a health care study, rather than thinking about regional representativeness, it may make more sense to select countries based on contrasts in the fundamental structure or economics of their health care systems, if you hypothesize that this is relevant to user experience of your product or service. Neighboring countries may provide a better natural contrast on this dimension than countries on opposite sides of the globe.

As another example, a client once asked us if Vietnam was likely to be "representative" of Southeast Asia. This would be a bad reason for choosing Vietnam. It assumes that Vietnam shares characteristics with its neighbors besides their general location on the globe and, within certain bounds, its climate. However, these are not likely to be the most relevant for the kind of research we do. Rather than hoping to learn things you can extrapolate to all of Southeast Asia, it would be more reasonable to think about what you might learn from specific dimensions relevant to your technology on which Vietnam differs from some countries and is similar to others, such as the fact that it is a country undergoing rapid economic development from a low baseline, a country with partial central planning but a strong history of entrepreneurialism, a country where stages of adoption of computer technology that countries in North America and Western Europe have gone through are being leapfrogged, a country in which there is a strong contrast between traditional lifestyles and more "wired" ones, etc.

When deciding whether to do a multi-country study, it is important to be clear on the reason for including multiple countries. Is it mainly to increase the overall diversity in the consolidated sample? Is because each market is so important in its own right that you need an equally robust and rich picture of users or potential users in each of them? Is it because you want to do a comparative study, highlighting differences? It is important that your sample within each geography be in proportion to those goals. The first one requires less commitment per geography and the last requires the most. For many people, it is difficult to see why a true comparative study requires more immersion per geography than simply developing rich portraits of a series of separate geographies. The explanation is that comparative statements are much more precise, and thus more subject to error based on vagaries of sampling and natural variation in the data within each country. They therefore require more supporting data to make them with confidence.

5.4.2.2 Whom to Study: Sampling and Recruiting Participants

The distinction between representative and strategic sampling also applies to sampling research participants within countries. Research questions that lead to commissioning international research are often worded as if the goal of the research was to characterize an entire country. This would require broadly representative sampling and averaging across this sample. However, for commercial purposes, this is rarely appropriate. It is usually more relevant to think of the goal of the research as to help identify and then characterize that subgroup of the population that presents the most promising opportunity. This means that recruiting is based on your working hypothesis about who these people are. Strategic sampling means selecting people who reflect these characteristics, or various combinations of them that you expect will be revealing of patterns.

Sometimes, the relevant population is already defined de facto: existing users. But this is not very helpful if you are trying to evaluate and identify opportunities and to design for new users. Uncertainty about this is often worrisome. What if you sample the “wrong” people and it turns out not to represent a viable target market? How would you decide whether this meant that a target market does not exist within that country, or that your targeting hypothesis was wrong? Would it mean the study was wasted? This is something that all user researchers should think about, even for domestic studies. But when working internationally, the uncertainty is greater and the stakes are higher. The investment in the study is greater, and it is too seldom feasible to redesign the sample and redo the study.

Managing this risk requires carefully evaluating how much confidence you, your client, or your company have in the hypothesis about who the target users are, and then choosing an approach to sampling that fits this level of confidence. Relatively less confidence suggests that you should sample more broadly. You will be more likely to include some participants who will represent your target, but they will be only a portion of your sample and your information about them will be less robust. On the other hand, you will learn more about the boundaries of your target, and what differentiates them from others. If confidence in your working hypothesis about how to identify your target market is relatively high, you may be able to concentrate your sample in a narrower spectrum. In this case, if your hypothesis turns out to be right, your findings about this group will be more robust, but you will be able to say less about how they differ from other groups in the population. If your hypothesis turns out to be wrong, but confidence in it was high going into the study, then this may still be very valuable since it will identify a potentially serious disconnect from reality. Of course the value of this type of finding is greatest if you can propose an improved targeting hypothesis, which is more likely if you have sampled at least somewhat more broadly than your hypothetical target.

How wide a net to cast in your sampling is only one issue. How you define the selection criteria for any of your participants is also crucial. Knowing how to translate your concept of who the relevant people might be into relatively objective selection criteria or indicators can be very challenging when you are not yet sure of what those indicators might mean in the local context. That may be part of what you need to learn from the research, so the problem can be somewhat circular. When you initially decide who you want to visit, it is natural that you will be influenced by your experience in your own or other markets. To be sure that the recruiting in this market is appropriately targeted, you must see how well characteristics translate – or don’t translate – into this locale. Never assume that you can get by making small adjustments in a standard screener you have developed for your home market – unless your goal is to test the screener criteria themselves. For example, income ranges almost always have different meanings in different contexts, as do requirements about education or technological expertise. The same is true for other indicators, such as lifestyle criteria.

In most studies using screener-based recruiting, you will have a local recruiting partner, and you should certainly consult with that partner about the selection process. (We discuss partner selection later.) To some extent, they can help you to tailor the criteria and make the implicit assumptions explicit. However you should be alert to the possibility that they will also be influenced by how easy it is to administer the criteria you decide on. This does not mean that they are guided mainly by their own convenience. It may be a data point telling you something about what is meaningful locally. Similarly, problems finding the people you have defined may mean not that the recruiting is incompetent, but that you have defined a very rare group, or have unintentionally imposed criteria or quotas that are contradictory in the local context. There are no easy answers to these challenges, but we do have three basic suggestions:

- To the extent possible, keep your criteria simple, and allow multiple pathways for qualifying. Save precise interdependent criteria and complex quotas until you are more familiar with the structure of the potential user population and have validated locally meaningful indicators of different characteristics
- Plan to engage in ongoing dialogue with the recruiter, both in clarifying your concept of who you are looking for, negotiating the specific criteria, and tracking recruiting progress. The latter does not mean just monitoring whether you have found enough participants yet. It means tracking how specific criteria are working and how they relate to each other
- Treat the recruiting process as a formal part of the data collection. For example, capture screener data not only about the people you enroll in the field research, but about the people who did not pass the screener. Many recruiters will keep statistics about how many people are disqualified by various criteria, but this is not the same as getting the complete screener data on each person rejected, at least up to the point where the screening process terminates for that person

To interpret the results of the recruiting, and to ensure quality of the sample, you need to be aware of exactly how the screening and recruiting are taking place. Recruiting methods vary widely from country to country. In some places, such as the US, market research firms typically recruit from panels, which are data bases of participants who have agreed to participate in research and who have supplied data on a number of variables that are used to pre-filter the list to increase the incidence of the specific characteristics you are looking for. For very specialized samples, other ad hoc methods may be used. In some other countries, door-to-door recruiting, “snowballing” (in which the recruiter collects additional leads from each person screened), or location intercepts are used more commonly. You need to consider the impact of these alternative methods on the sample and on your ability to make wider inferences. Even though in qualitative research we are not trying to apply statistical generalizations to a broader population, it is important to know if the sample was biased towards one particular combination of characteristics and de-emphasized something else. For example, if recruiting is being done door-to-door, you will probably have to insist on geographic distribution requirements. For intercepts, a type of "convenience" sampling, you will need to ask whether there is any reason to believe that the types of people likely to be encountered where the intercept takes places, or to respond positively to a person with a clipboard who approaches them on the street are really the ones you want to study. In our study on computer purchasing in India, marketing had previously done intercepts in computer shops. However, we pointed out that the audience we were interested in was not likely to be found there because they were people for whom buying a conventional computer was out of reach.

5.4.3 Research Perspectives and Roles

Discussions of international user research often turn to questions of who should do the research, in particular whether it should be done by a person from the product team or the product team's company, whether it should be outsourced to a researcher from the product team's country who travels to the country or countries of interest, or whether it should be done by researchers who are based in the target countries. (We save for the next section the related issue of moderation by a local person in local language versus by an outside researcher supported by a translator.) Some of the distinctions are becoming less meaningful as product teams become increasingly international. In general, we feel these questions are best addressed by thinking about the skills and perspectives that need to be integrated in the process of the research process. The various perspectives may be distributed in different ways across the research personnel, but one way or another they must be present and they must be integrated in a way that leads to information with powerful implications for the product.

For this to happen, one essential ingredient is deep understanding of the product team's concerns, mindset, dilemmas, capabilities, and goals, and the ability to carry this understanding into the field as a guide to seeking and recognizing salient information. Development of the detailed focus, as we described earlier, helps ensure this at the beginning of the research, but it is best to maintain continued involvement throughout the research as the focus evolves in response to data and as new product-related issues arise from the team. This can happen through combining direct involvement of key team members in the research with ongoing communication with the larger product team.

Next, there needs to be intensive and constructive contact between the insider perspective of the local context of the user and of the outsider perspective of the product team. In a sense, the researcher serves as a skilled proxy for either side in discovering the gaps between these perspectives and bridging or translating between them. This process can be mediated by someone leading from the insider vantage point or the outsider vantage point, provided they have skill and experience in this particular bridging role. Skill in navigating the process of moving from disorientation to understanding, guiding others through it, and translation among perspectives is separate and at a different level from the knowledge that either the insider or the outsider brings to the process. A good analogy might be the skills that an expert diplomat uses in the process of negotiating an understanding across a divide, where the parties are coming from extremely different frames of reference and have great difficulty understanding each other without mediation. The process certainly works best when there are people on both sides who are skilled in reaching out to an interested party on the other side, but the role of the mediator is crucial.

Since typically few people on the product team and few among the user population have these skills, it is a job for specialists. In most cases, one has the direct relationship with the client and others play a supporting role. For example, if the lead researcher is a foreigner, a local resource may serve as a guide to help interpret and explicate local conditions. A local person who is familiar with the population of interest may have knowledge and skills in helping to establish rapport with the research participants – a more delicate issue with some types of users than others – and may be able to help interpret ways in which findings from this population may be similar to or different from other groups. This may be the same person who is managing local logistics, a local moderator, or even the translator. If the lead researcher is based in the target country, then the outsider perspective may be provided by a user experience researcher on the product team. If the project is very large, there may be multiple researchers, local or foreign, but then someone needs to assure the integration of these perspectives.

Whether a local resource is the primary researcher or serves as a local consultant to the researcher, do not assume that local resources are experts in every aspect of their own society, every type of user in their own society, or every domain or sector of the economy in their own society. We can all think of parts of our own countries that we are unfamiliar with, whether we are talking about regions, demographic groups, sub-cultures, or industries. Just as it would be foolish to present ourselves as experts on all aspects of our own country, it is foolish to assume that your local team members are omniscient representatives of their own.

For example, in the computer purchasing project in India referred to earlier, we spent a significant amount of time in the homes of people who were in the lower middle class, just above the poverty level. They could be fairly confident about reliable food supplies and shelter, but major purchases like a refrigerator, TV, or two-wheeler (motor bike) were a once-a-year to once-every-few years experience, and purchasing a computer was a big investment. Members of the team from our client were participating in the research in India and were awaiting the arrival of a new team member who happened to have grown up in this very city in India. People on the team were sure that he would shed a great deal of light on our observations. When he arrived, he reminisced fondly about his memories of his time growing up in the city, and excitedly pointed out the polo club that he and his family used to spend time at. His only contact with people like those we were studying was when they worked as domestics in his home, and he had very little concept of their home lives. Even our local translators and project managers who were current residents of that city thanked us for the opportunity to see a slice of life that they had had no exposure to previously.

5.4.4 Language: Translation and Moderation

Another issue that has implications for research team personnel is whether moderation needs to be done in local language. Even when doing research in work settings of global companies where English may be the official language of business, it is important to make it as easy as possible for people to express subtleties and nuances that may be easier for them in their native language. When the researcher does not speak this language fluently, one approach is to use a local language moderator. It is important that the moderator and researcher also be able to communicate fluently and richly. Because the data collection is not rigidly scripted, it is important to make sure the moderator has a deep enough understanding of the focus, including its provisional nature and a sense of the complex interconnectedness of the potentially relevant topics, to be able to improvise and recognize opportunities that arise naturally to probe on important things. It is almost impossible to achieve this without having to redirect the moderator during the session, often frequently. This of course introduces its own awkwardness, and too often the default is to shift to a more structured, tightly scripted interview style. As a result of experimentation, we have increasingly shifted to conducting sessions ourselves through a translator. We have seen no indication of discomfort on the part of participants, even in situations where the cultural gulf between us and the participant is great. We do not suggest you should make this decision lightly. There are certainly situations where a local moderator may be more able to establish rapport with participants than an outsider. We simply are no longer dogmatic about this. In situations where you are not sure about this, you might use a local moderator to start the session, and then become more actively involved as it progresses and as the participant tolerates it.

While we are not dogmatic about the need for a local language moderator, the need for skilled translation is usually clear. The translation gives you access to the raw data of what people are saying, whether you are facilitating the session yourself or working with a local language moderator. To accomplish this, the translator must be skilled in understanding and capturing the nuances of communication. Usually, we require simultaneous translation, also called "interpretation." This is a specialized skill, far beyond simply being fluent in both languages. Simultaneous translators can roughly be divided into skill (and cost) level by the type of situations in which they commonly work. The most elite interpreters do diplomatic work. One step down from this are people who specialize in translation at international business meetings and professional conferences. Some of these further specialize in particular industries, which means they are fluent in the relevant specialized terminology.

The hallmark of good simultaneous translators is that they translate verbatim. This does not mean they translate literally word for word, but rather that they do not summarize. They express what all parties to the conversation say in the first person, as if the words were their own. In other words, they do not explain to you, “He said that,….” When this is done effectively, it is as if the translator disappears.

There can be exceptions to the requirement that the translator only does direct first person translation. Sometimes, it is appropriate for the translator to dialogue with the researcher to understand some nuance of the researcher’s intended meaning. It can be problematic if the translator does the same thing with the participant, however. Some people say that you can determine when the translator is summarizing rather than translating if what they say is out of proportion in length to what the participant says, or if they engage in back and forth with the participant before translating. This is not always so clear. On one hand, they may be appropriately trying to clarify some ambiguity in what the person said. However, the only way of being sure of whether they are simply clarifying semantics or if they may be influencing what the person says is to have them translate everything, including things that don’t seem to make sense, and then deciding with the researcher how to deal with this. Incidents like these may be a tip-off that the meaning of the researcher’s question or comment was not clear. Sometimes, the participant’s misconstrual of what you said or asked is important information in itself. The researcher should be given access to this information, and should be the one to decide how to restate the question, or how to ask a clarifying question.

It is ideal when the translator can be a partner in the research. It is a good idea to include the translator in debriefings. The need for a highly skilled simultaneous translator sometimes needs to be balanced with the need for a research partner who will interpret cultural concepts to you, help you understand any gaps in mutual comprehension, and strategize with you about what these might mean and how to deal with them. These skills do not necessarily coexist in the same person, especially in less cosmopolitan environments. It can be appropriate to trade off true simultaneous translation against skills in serving as a cultural guide, if you do not have the budget for two separate roles. For example, in a recent project we visited with people in a remote village in South Africa who were receiving money transfers from family members we had met with in a township. We put a higher priority on working with someone deeply versed in the local culture than in pure simultaneous translation.

5.4.5 Arranging In-Country Assistance

You are very likely to need local on-the-ground support for at least some services such as recruiting, translation (written translation and oral interpretation) and local language facilitation, assuming you go that route. Depending on your study, you may also need help with recording, navigating the legal system, advice on informed consent, transportation, etc. Some companies have these kinds of resources available for internal projects. We have done projects in a number of countries where our clients’ own local sales or marketing team has helped us to recruit, or has helped identify local translators. In other cases, we have had to identify, vet, and hire local talent to support the team's research. Over the years, we have built a large network of relationships with local vendors and free-lancers to help us do international field work more quickly and efficiently.

It is growing easier every year to find local companies who can help – both market research groups and, increasingly, local usability firms. This makes the task significantly easier, but it is still important to talk with them to assess the match with your project, including their ability to provide the variety of skills you need for your project to succeed. This can be a tricky task. Of course, being able to communicate – either in your own language, their language, or a mutual third language – is extremely important but this alone is not sufficient. If this is the first time you have been in a particular location, it will take time to identify and vet a local firm to help you.

There are a number of international research firms that have offices around the world. While this is tempting because it promises a "single point of contact" – possibly even someone in your own country – we have found that this can be misleading. For one thing, offices in different parts of the world are different, and, while some may be excellent, we have found that we never can simply trust the reputation of the umbrella organization or assume consistency. Often, large international research firms are loose consortiums of local groups. In managing the study, you will spend a lot of time dealing with the local office or offices. Trying to manage this all through a single point of contact may sound like it will simplify your life, but the additional layer of communication can introduce more ways that entropy can take over. If you decide to go this route, we would advise that you vet each branch individually before proceeding, if at all possible. Of course, in a particularly large multi-country project, you may have no choice but to work through a central contact. Try to be sure that your contact is not simply a marketing representative, but someone who will be involved enough and with as much expertise as the people in the local offices and the clout to maintain coordination and assure quality when difficult issues arise. Even if you are dealing directly with the local office, the people you negotiate the project with are not necessarily the people who will actually do the work. Try to talk to the people who will be handling tasks in a hands-on manner, or at least managing them very closely.

We create a detailed requirements document for every project. This is usually much more detailed than the RFP document we may have received from the client. When we are selecting a new partner for a particular project, this helps us to compare responses and hopefully, is also a first step in establishing our relationship. For something as important as the requirements, it is important that firms be given as unambiguous information as possible in written form, along with the verbal communication. It is also important to remember that phone communication can be more difficult than written communication. Of course this is especially true if either of you are speaking in a language that is not your native tongue. It is important to assess how well and easily you and the firm are able to communicate nuances, and to make sure that verbal communication is consistent with the understandings you thought you had based on written communication. This will be important both in assuring a smooth working relationship, and in working together about nuances in the research and in the data (depending on the role of the partner). Even with a clear understanding of "requirements," working with local resources will continue to be very communication-intensive once the research is initiated. The need for collaboration around recruiting that we discussed earlier is one example of this.

5.4.6 Managing Multi-Country Studies: Sequential Versus Parallel

An important question when doing studies in multiple countries is whether to visit them in sequence or in parallel. Doing them in sequence allows you to plan the order strategically, such as by starting with countries where you expect contrasts to be the most dramatic. This will sensitize you to things that differ. It will allow you to modify the sampling strategy based on experience. However, the logistical complexity of the project can increase geometrically. Protocol development becomes more complex. For example, as we explained in the section on sampling and recruiting, you may well have to have several versions of the screener because of differences in the meaning of selection criteria or in recruiting practices. The right places to look for opportunities to study the human phenomena you are interested in may be different from one country to another. You will have to address the challenges of negotiating with, preparing, and supervising several sets of in-country research support staff. Allow sufficient time for this at the beginning of the project. If you are visiting multiple countries in sequence, you may have to juggle oversight of some of the preparations for subsequent countries while you are involved in data collection in others (this obviously depends on the composition of your research team and the division of labor within it). For example, it is sometimes a mistake to recruit too far in advance of when you will actually be there. But try to do as much of the preparation in advance as possible.

If the project timeline requires that you have teams collecting data in multiple countries simultaneously, the challenges of coordination increase. If you do not have enough internal resources to have a researcher from your own team running the data collection in each country, you will either have to create a research group that can work closely in the planning stages and then disperse to different countries, or hire and supervise a network of local researchers. Both of these scenarios require a great deal of effort.

One way that people sometimes try to make integrating research across teams easier is to make the protocol more structured and standardized. We believe it is usually worthwhile to try to preserve the benefits of a more open-ended approach to field research, but you need to be realistic about the coordination effort required. You will need to be sure that the research planning across countries is coherent, and that all the data collection teams not only understand the formal (written) research protocols but have also deeply internalized the focus and the rationale for pursuing different types of information. If you want more than a collection of separate country profiles, you will need a strategy for integration across teams. As data collection progresses in each geography, you will have to manage the risk of different teams finding different things because of differences among the teams rather than because of differences in the realities they are studying. We cannot stress too heavily the importance of regular debriefs across geographies where the teams can share their evolving insights and hypotheses, as well as their experiences about what aspects of the data collection strategy they have needed to modify and why. No amount of history working together can substitute for this.

5.5 Thinking More Broadly About Data Sources

During international studies, time in the field is precious, and usually overloaded with work to do. In addition to data collection there is debriefing, documentation, and ongoing summarizing to do, along with staying on top of logistics. Naturally, a very high priority is typically placed on spending time with users or with people hypothesized to be potential users, people who you have recruited in advance and can schedule with to use your time in an efficient way. However, limiting your data collection to only these people can be a mistake. Just as it is a mistake to assume that local researchers are authorities on all aspects of their local context, it is a mistake to put too much weight on your participants' verbal accounts of why they do what they do or generalizations they make about their own societies, except as indications of their ways of thinking or how they present themselves to foreigners. They can be influenced by self-serving motivations, by accepted styles of explanation, by cognitive dissonance, or by stereotypes they hold. For instance, in China, one lower middle class family we studied helpfully explained their family organization to us by pointing out ways in which they were different from American families, which made us wonder not only about how generalizable their description of family life in China was, but also where their image of typical American families came from. This data expressed their image of their own life, and there is something interesting about their choosing to explain it by juxtaposing it with their image of American life, but they are not authoritative descriptions of how their society functions. In theoretical terms, they are useful as emic rather than as etic data, although they may provide clues to the latter.

One way that such data may provide more reliable and valid clues to the local reality may be when people indirectly imply something as opposed to explicitly communicating their conscious way of accounting for their behavior. An example is when the affective tone of a statement suggests that the implied meaning is common knowledge for locals, e.g., telling you something in a matter of fact tone, or showing surprise that you do not understand it. Even this does not prove that the implication is factually true – it may simply express a common belief within the culture or within the participant's reference group – but at least it suggests that the statement is not simply the participant's idiosyncratic personal opinion. A research participant told us that he had saved money for a major purchase, but had to hold off on spending it because his wife was applying for a government job. The fact that he assumed no explanation was needed of the fact that it would likely be necessary to pay someone a “gratuity” told us that this was viewed as common knowledge. (Similarly, seeing exhortations painted on the walls around the tax authority building, like “Feel good about yourself, pay your taxes!” suggested that non-payment was extremely common.)

The problems with treating informants as authoritative reporters on their own contexts should not just influence how you understand what people tell you. It should also influence your data collection plan. To assemble a more comprehensive picture, you often need to gather data about current status and trends in relevant aspects of the ecosystems surrounding your primary participants. By ecosystems, we mean any relevant dimension of the social or technical context that may be connected to the behavior of interest. Dimensions may include legal, physical, economic, technical, political, demographic, and other factors. Data about these things can come from expanding your list of participants to include a broader spectrum of people in interconnected roles. For example, depending on your focus, in addition to visiting with small business owners, try to visit with people in their supply chain, their customers, people who provide financial, administrative, or legal services to them, people who provide technical support services to them, etc. Instead of meeting only with families considering a new purchase, meet with merchants selling those products. Some questions that lead you to other relevant parts of the ecosystem may not arise until you are involved in data collection.

In order to make sure you will have the opportunity to discover what is relevant that you could not know in advance, it is a good idea to allow some additional unstructured time in the country to pursue such questions, if at all possible. For example, in our study on computer purchasing, we wanted to do observation while participants shopped for computers, using a mix of shopping destinations they chose and destinations that we chose for reasons of our own. For both types of locations, we had to allow time to visit the shops to arrange the visits on short notice, such as getting permission from shop owners or managers to come in with a translator. This gave us an opportunity to interact with shopkeepers and sales people in advance of the visits, to observe them during the visits, and to debrief with them after the visits to understand aspects of the sales process from their vantage point.

As another example, in a study on mobile phones, we saw a participant whose usage was influenced by what sounded to us like novel aspects of his payment plan. By working with him, we could understand factors that influenced him to choose this plan, and we could see how his usage was shaped to maximize the benefits of this plan to him. But we wanted to make interpretations that went beyond simply describing this person. He could not tell us whether this plan was available around the country or whether his city had been selected for a market trial. He could not tell us whether other carriers offered similar plans. He could not tell us whether plans with this structure were widely adopted or were of interest only to a small segment of users. He could not tell us whether the plan was working well from the perspective of the service provider, or was considered a failure and was about to be cancelled. Questions about contextual factors like these often arise in trying to decide how much weight to place on qualitative observations from a given participant, and they call for targeted efforts to track down answers. This requires a flexible approach that may look somewhat like investigative journalism.

A good piece of final advice is to use your entire experience in-country as a source of learning. Do not just go back to your hotel to decompress until your next participant session. Some of the practical things you have to do in-country to manage logistics of the research, to make sure you can access your email, to change money, to arrange for mobile phone service, to use local transportation methods to get around the city or region, and to make purchases of your own will give you an opportunity to experience local conditions first hand. This is an argument against outsourcing all these arrangements to a local logistics or research firm, who will try to do a good job of taking care of you and making your life easier. Sometimes these local transactions will be stressful or frustrating, especially if you have not anticipated the need to allow time for them, but try to view them as possibly relevant data.

As we have tried to show in this chapter, the process of doing international field research is complex, but it is also invaluable and extremely rewarding. By focusing on planning what you can and being flexible to deal with what you cannot, you will increase your changes for rich and useful findings that can help the team to create products and services that have the greatest chance of being useful and usable in-country.

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Part II
Country Profiles

Chapter 6
Usability in Brazil

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6.1 Overview of the Country: Demographics, Economy and Culture

Brazil is a federal republic with a democratic presidential government, elected directly by compulsory vote. Brazil is a country with continental dimensions – with 8,514,876 km, it is the fifth largest country in the world, populated by 200 million people. Brazilian political structure is composed of three powers, executive, legislative and judiciary, which are exercised at three levels, federation, states and cities. The executive and legislative powers are populated by direct elections in a multi-party structure that allows for coalition.

The federal executive Government was governed from 2002 to 2010 by a populist president, who worked with a coalition of several left parties and one big central party. In 2011 a woman became president of Brazil for the first time with the support of the previous president and the party coalition he had formed. In the recent years, the federal government has promoted a program to accelerate economic growth, by investing in public infrastructure. The existing policies work towards achieving a difficult balance between economic growth and social improvement, imposing high taxes on citizens and private businesses. The Brazilian economy has recovered from many years of uncontrolled inflation to celebrate a decade of stable economy, during which the country went from a high external indebtedness to being an international creditor. Brazil is an important player in the world economy, being the eighth largest economy, and a regional leader. The country has received investment grade and was one of the first G20 countries to recover from the last world economic crisis.

Even though federal policies have managed to reduce the social gap, inequalities still present a challenge to Brazilian society, especially in education. According to the INAF – National Functional Literacy Indicator (Instituto Paulo Montenegro 2009),

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there has been an improvement in the last years: absolute illiteracy has dropped from 9% in 2007 to 7% in 2009, while rudimentary literacy (which corresponds to the ability of finding information in a small text, adding simple sums and dealing with money) has dropped from 25% to 21%. Yet, only a minority of the population (25%) is considered completely literate. Public elementary and high schools tend not to be as high quality as private elementary and high schools. Thus, most students from lower classes who attend public elementary and high schools have difficulty passing the admission exams of the top universities, which are usually public and free. The Government has then created a program that offers lower class students with a (partial) scholarship to private universities (that they would not be able to afford otherwise). Although the program has provided more access to university to lower class population, offering an opportunity for more social mobility, there is still a wide gap separating quality education in public universities from education in many private colleges and universities.

Brazil is a multicultural and multiethnic society. Because of the Portuguese colonization, Portuguese is the official language and is spoken in the whole country. Brazilian culture has been influenced by different cultures and habits, due to immigration throughout our history.

Brazilians are historically early adopters of technology – D. Pedro II, Brazilian emperor in the late nineteenth century, was the first person to buy Graham Bell's company stocks and had one of the first telephones installed in his residence in Petropolis, Brazil. Brazilian votes are 100% collected in electronic devices since 1996. The Brazilian Payment System supports electronic banking transactions, allowing real-time liquidation of payments and avoiding chain bankruptcy, started operation in 2002 as the most advanced electronic banking system in the world.

Regarding the usage of information and communication technologies (ICTs), some interesting results can be found in the yearly report published by the Brazilian Internet Steering Committee (Barbosa 2009). This report maps usage and ownership of ICTs by users, households and companies. The report shows the increase in digital inclusion, both in rural and urban areas. In 2008, 97% of households had a TV set; 72% possessed a cell phone, 18% had computers with Internet access. The ownership of computers and cell phones is increasing, as well as the adoption of wireless communications in enterprises. In rural and urban areas, paid public Internet access centers play an important role in providing Internet access to the population and in promoting digital inclusion.

6.2 HCI History in Brazil

The field of Human-Computer Interaction (HCI) emerged in the early 1980s motivated by the increase of personal computers being used by end users who were not experts in computer science or engineering (Preece et al. 1994). In Brazil, the first researches in the field started in the late 1980s mainly within academic projects in other fields such as Artificial Intelligence, Computer Graphics and Informatics &

Education at Computer Science and Engineering departments. These initiatives were conducted by individual researchers at universities and typically presented results of small studies.

In the industry, in 1984 the Government passed a law intended to protect the newborn national computer technology industry that prevented Brazilian companies from buying computer systems from international competitors. Fostered by the new law, national technology companies were created associated with various economical segments, such as petrochemical, banking, electro-electronic. Consequently, user interfaces for several computer systems and applications had to be designed by Brazilian engineers. Examples are operation interfaces for controlling industrial processes, transportation systems and power plants; computer-aided applications used in designing telecommunications, automobile, air traffic control and aeronautic systems. This law was not completely successful in establishing a competitive technological industry; a few companies managed to build technological competence but much of the technology developed internally was replaced by more advanced competitor systems when the law was revoked in 1991. However, this period of time was important because Brazilian engineers were urged to be creative and productive, and a few were exposed to HCI issues.

In the early 1990s, some of the researchers interested in HCI at the universities started focusing their researches on HCI, offering graduate courses on the topic and advising graduate students' master dissertations and PhD thesis in HCI. In the mid-1990s, research in HCI started in other areas and departments, such as Psychology, Design, Arts and Production Engineering. In 1995, the first usability lab in Brazil (LabIUtil) was created in the informatics department at the Federal University of Santa Catarina by Professor Walter Cybis and had an ergonomic approach to usability.[1] At the end of the decade, PhD students working in HCI, motivated by their participation in the CHI conference, contacted some professors and together they created an HCI interest discussion list and a webpage that listed contact information of researchers and graduate students in Brazil who were interested in HCI. In 1997, a national SIGCHI prospective local chapter was created. Although Brazil is a large country, the decision to create a single national chapter was aimed at supporting the effort to create a local HCI community. Finally, in October 1998, Professor Clarisse Sieckenius de Souza organized the first Brazilian HCI event, IHC – Workshop in Human Factors in Computer Systems.

Meanwhile, in 1991 the market protection policy was terminated, causing a revolution in the Brazilian technology industry. The open market offered microcomputers at lower prices, allowing an increase in the use of microcomputers in homes and businesses. Also, it allowed for the entrance of international capital, both financial and intellectual, acquiring some of the most competent Brazilian technology industries. The development of interactive microcomputer applications required the application of methods and tools for designing interactive systems. In order to take their audience into account, developers who were assigned

[1] LabIUtil has been deactivated in 2003. Portuguese (Brazil) (de Oliveira, R. n.d.).

to developing user interfaces were motivated to learn about HCI and human factors themes which were then popularized by the works of Don Norman, Jakob Nielsen and others. As examples of this tendency, downsizing of banking and commercial applications required the development of GUIs to replace old alphanumeric terminals and their PF keys. Multimedia authoring tools motivated communication professionals to produce content for recreational and educational purposes, resulting in editorial products for all ages, which were widely distributed in the country – educational games, encyclopedias and complementary content to famous TV shows are some examples. A few industries with solid technological competence survived without foreign capital. Among their core products, they developed interactive software for game consoles and many special-purpose applications. In the 1990s, the usage of personal computers was quite spread in businesses and some middle and higher class households, and this scenario has welcomed the arrival of the World Wide Web.

After 1998, the HCI community in Brazil worked towards consolidating itself. The HCI event (IHC) became an annual event, and in 2002 gained the status of a Symposium and since 2006, its program committee includes members from the HCI international community. In 1999, the Brazilian Computer Society indicated Professor Clarisse Sieckenius de Souza as its first IFIP TC13 Brazilian representative. In 2000, BR-CHI, the SIGCHI Local Chapter was chartered and an HCI interest group was created in the Brazilian Computer Society. In 2001, an HCI in Latin America Development Consortium was organized within the CHI conference and researchers from Brazil and other Latin American countries participated. This initiative led to the creation of the Latin American Conference on Human-Computer Interaction (CLIHC). Its first edition was organized in Rio de Janeiro in 2003. CLIHC became a biannual event, alternating years with IHC (which also became biannual). In 2003, the Brazilian Computer Society published a reference curriculum for computer science and information systems courses, which included an undergraduate HCI course. In 2007, the TC13 IFIP conference INTERACT was organized in Rio de Janeiro, its first edition in Latin America.

The initial goal in creating the HCI community was to create a unique interdisciplinary Brazilian HCI community and event. In the first editions of IHC, there were clear efforts in that direction: researchers from the various areas were invited to the program committee and invited interdisciplinary panels were organized at the event. However, initially the Computer Science side of the community was much larger. As HCI developed in Brazil, research in different knowledge areas were also developed and new events more attractive to specific areas were also created. In 2001, the first editions of the International Congress of Ergonomics and Usability for Human-Computer Interfaces (USIHC) and of Human-Technology Interfaces (ErgoDesign) were organized. These events attract participants mainly from the areas of Design, Arts and Production Engineering. Also, other communities (e.g. Communication and Information Science) publish HCI related works within their area specific events.

In spite of having four HCI specific events, all of them are mainly academic and efforts have been made to involve more participants from the industry. Despite these efforts, only a few industrial papers are submitted to academic conferences, mostly because of non-disclosure agreements that prevent professionals from talking about their experiences. Cooperation between universities and industry occur mainly in training activities and in joint projects.

In 2005, several usability professionals united to create the first Brazilian chapter of the Usability Professionals' Association (UPA). The first World Usability Day (WUD), which happened in 2005, was held in São Paulo and since then, the World Usability Day has been celebrated in events organized by independent groups in several cities of the country. The UPA WUD event has probably been one of the most successful efforts to combine industry and academia; however, being a single day event, it works as a teaser and a means to promote the concept of usability among interested professionals. In the last 5 years, professionals have formed local UX groups, some of them associated to UPA and IxDA, signaling their will to share their experiences. They organize invited talks with other professionals and usually attract a large audience.

Nowadays, the Brazilian HCI community is very well consolidated in Brazil and is acknowledged both nationally and internationally. Members of the community feel that the people working in the field and their production have increased in the last few years. Thus, it has been decided that IHC will become an annual event once again and that there is no longer a need for having only one national SIGCHI Local Chapter and that new local communities can create new SIGCHI local chapters and strengthen their groups and activities locally. Although the Brazilian local HCI community is a success story, it still invests in overcoming existing challenges, such as promoting a better exchange between the different areas and a tighter relation between academia and industry.

6.3 HCI Education

As HCI started in Brazil in the late 1980s, in the early 1990s HCI courses started being taught, mainly at graduate level. As research in the field widened and the HCI community in Brazil consolidated itself, the number of HCI courses at graduate and undergraduate levels increased. In 1999, the Brazilian Computer Society (SBC) Education Board created the first version of a reference curriculum that offered guidelines to undergraduate programs with degrees in Computer Science, Computer Engineering and Information Systems (SBC 2003). This reference curriculum was approved by the SBC community in 2003 and recommended an HCI course that could be offered to all three degrees. The recommended syllabus included: human factors (theory, principles, and guidelines); interactive styles; command language; direct manipulation; interaction devices; interface patterns; usability (concept and evaluation methods).

The SBC reference curriculum was widely taken into consideration in the creation of new courses at the universities, as well as in the reformulation of the curriculum of existing courses. That was probably one of the factors that led to the increase in the number of HCI courses being offered at the universities in computing-basis courses, especially at the undergraduate level. In 2006, at the Symposium of Human Factors in Computing Systems (IHC) a work group to discuss HCI courses in computing-basis undergraduate degrees was organized. Members of the Brazilian HCI community who were researchers and taught HCI were invited to submit a position paper stating their experience in teaching HCI and their interest in participating HCI (2006). One of the results of the work group was a suggested syllabus to introductory HCI courses that aimed at providing students with an overview of the field (Silveira and Prates 2007). Compared to the syllabus included in the SBC reference curriculum, this new syllabus was more detailed, updated and reflected most of what was taught by some of the well-known HCI professors in Brazil.

The syllabus proposed by the HCI community organized the course into five main topics that were then detailed in subtopics: (1) Introduction to HCI (History; Interdisciplinarity; Basic concepts – interface, interaction, usability, communicability, accessibility; Return of Investment); (2) Theoretical frameworks (Cognitive Engineering; Semiotic Engineering); (3) Evaluation (What to, when to and why evaluate; Collecting data from users; User testing and benchmarking; Interpretive and predictive evaluation); (4) Interaction design (Interactive styles; Interaction guidelines and patterns); (5) HCI Design Process (HCI and Software Engineering perspectives; User requirements and analysis; Task models; Interaction models; Storyboarding and prototyping; Online help systems). It was left to professors to adapt the suggested syllabus to their courses, according to desired focus, course credits and other HCI courses offered at the institution.

Little is known about the number of HCI courses in Brazil and how they are taught. In order to collect data about HCI education in Brazil, we performed an exploratory research. The results are not meant to be statistically representative, since we did not have a known universe of the HCI professors in Brazil. The research was conducted through an electronic questionnaire that was made available through the Internet. A message asking professors to participate was sent to the SBC's electronic discussion list, as well as its HCI special interest group community electronic discussion list. Additionally, HCI researchers from other areas (i.e. Design and Communication) were individually contacted and asked to participate, as well as to forward the inviting message to other potential participants and interest lists. The questionnaire was aimed at professors who teach HCI courses or courses that include an HCI topic in undergraduate or graduate programs at universities. It was organized in two groups of questions. The first one focused on the professors' profile, whereas the other one on the courses they taught. The questionnaire was made available for about 3 weeks from end of November to mid December 2009.

Ninety-one professors voluntarily participated in the research and filled in the questionnaire. Participants were from 63 different universities (some were from different campuses or institutes within a same university), 18 different states (out of 27) and all five regions of Brazil – 56% from the Southeast of Brazil; 21% from the South; 10% from the Northeast, 9% from the Center-West and 4% from the North.

Most of the participants (89%) were affiliated to a Computing-related department (such as Computer Science or Informatics). Regarding their background, 83% of the participants had their background in a computing-based course, whereas the other 17% were scattered throughout a number of different areas ranging from Communication to Engineering, including areas such as Graphics Design, Architecture and even Oceanography. It is important to notice that this majority of professors with background in Computing-based courses could just be a consequence of the communities to which the questionnaire was distributed, and these data alone are not enough to discuss how HCI courses are distributed across programs in different areas. As a result of the data collected, the analysis discussed in this chapter should be considered regarding HCI education in computing-based courses.

Most of the participants have completed a graduate course: 55% are PhDs, whereas 38% are masters (and 31% of these are currently PhD students), the other 7% are either master students or have taken a specialization course. When asked about their research areas, 68% claimed to conduct research in HCI, whereas 32% said they do not conduct research in HCI. Considering the HCI researchers, only 7% claimed to only conduct research in HCI, the others also included other fields. The three other research fields that were popular among participants were: Software Engineering (40% of the participants; 27% of the participants also included HCI); Informatics and Education (39% of the participants; 32% of the participants also included HCI); and Collaborative Systems (19% of the participants; 16% of the participants also included HCI). Other fields were also selected or entered into the form, but most of them were of interest to less than 10% of the participants.

Professors were asked to enter information about the courses they taught that were either an HCI course or included an HCI topic. In total, the participants described 141 courses. Some participants described only one course focused on another area but that included an HCI related topic, whereas others included four different HCI courses (four was the maximum number of courses allowed in the questionnaire, but at least two participants commented they had one more course to add and sent the information by email). Fifty-four participants (or 59% of the participants) entered one course into the questionnaire and six participants (less than 7%) described four or more different courses (in an average of 1.6 courses per professor). Of the courses described, 80 (57%) are offered to undergraduate degree programs, 32 (23%) at graduate level, and 26 (18%) can be taken both by undergraduate or graduate level students.[2]

Based on the courses title and brief syllabus, courses were classified as an HCI introductory course (usually introduces basic concepts and gives an overview of the field), HCI advanced course or course in another field that includes an HCI topic. Out of the 141 courses, 57% (i.e. 81 courses) are HCI introductory courses. A brief analysis of their syllabus indicates that only a few courses (around five) cover most of the syllabus suggested by the Brazilian HCI community. However, a great majority

[2] For some courses, participants did not include to which level program they were offered.

includes part of the suggested topics. Some of them emphasize a specific topic or include specific technologies. The analysis also showed that some of the courses have implemented the syllabus suggested by the SBC reference curriculum. The HCI advanced courses represent 28% of the courses (or 39 courses). The topics presented in the advanced courses cover a wide range of topics, such as 3D Interaction, Interface for Games or Semiotic Engineering Theory of HCI. Finally, courses in other fields add up to 15% (or 21 courses) and include courses in Software Engineering, Computer Graphics, and Distance Education, among others.

In an attempt to identify HCI courses being taught in other areas, we analyzed 100 Ph.D.'s curricula registered in the Brazilian Lattes CV system[3] and related to usability. To do so, a search for CVs by the topic 'usability' was carried out, and the 100 top CVs were analyzed.[4] It was not possible to perform a detailed analysis since the information on the courses was not always available or updated. Furthermore, when it was, it included its title, course, course level and for how long it has been or was taught, but not any information on its syllabus or credits involved. Besides, around half of the courses were disregarded because they were taught as part of computing-basis degrees. At any rate, we could notice that the other areas that had more courses related to HCI were Production Engineering, followed by Design. Most of the disciplines in these areas were related to ergonomics and usability.

6.4 Research in Brazil

In Brazil, HCI research is conducted mainly at the universities. Although UX and usability methods use have increased in industry (see Sect. 6.5), there is very little HCI research outside academic institutions. Currently, there is HCI research being performed in many universities throughout Brazil (Computação Brasil 2009) in various topics. Papers are usually published in the Brazilian or Latin American conferences as well as in international conferences or journals. Among the many relevant topics the Brazilian HCI community has interest in, two deserve to be emphasized: semiotic approaches and digital inclusion.

Semiotics is a discipline that studies signs, signification processes and how signs and signification take part in a communication process. Research in semiotic approaches to HCI has been published since the late 1980s and early 1990s

[3] The Lattes CV system was created by a Brazilian Government Funding agency (CNPq) and is widely used in the country by universities and funding agencies. Most (if not all) researchers and graduate students in the country have their CV registered in the Lattes system. For more information visit Plataforma Lattes website (http://lattes.cnpq.br/english/index.htm).

[4] The help system for Lattes does not explain how the ranking is carried out. However, it is not necessarily representative, since many well-known researchers in the field were not listed in the top 100. Apparently, the ranking considered the number of times the word 'usability' appeared in relation to the authors' own references.

(Andersen et al. 1993; de Souza 1993; Nadin 1988; Nake 1994). In Brazil, there has been an interest in semiotic approaches since the initial researches in HCI. This initial interest led to many graduate students (who later became professors at universities themselves) investigating and contributing to these approaches in their researches and shaped the profile of the Brazilian HCI community.

Clearly not everyone who conducts HCI research in Brazil works with semiotic approaches, but most researchers have some knowledge of what semiotics is and the approaches being used by different research groups in the community. As a rough indication of the contribution and work on the topic by the Brazilian HCI community, a search for 'semiotic' in the HCIBib repository in January 2010 returned 60 records, 25 of them (almost 42%) were written by Brazilians (or at least had a Brazilian as coauthor). In the last three editions of the IHC symposium, the number of accepted full papers related to semiotic approaches varied from 25% to 50%. Semiotic approaches are also part of the suggested HCI course syllabus and included by many professors in their courses (see Sect. 6.3).

Among the semiotic approaches investigated in Brazil (de Souza 2005; Oliveira and Baranauskas 1999; Santaella Braga 1995), it is important to notice that one of them started as a semiotic perspective and developed into an HCI theory based on semiotics, namely Semiotic Engineering (de Souza, 1993, 2005). As HCI researchers have pointed to the need of HCI theories (Carroll 2003; Hartson 1998; Greenberg and Buxton 2008), Semiotic Engineering provides a large contribution to the HCI field. In a nutshell, the theory perceives an interactive system as a communicative act from system designers to users in which designers convey to users who are the intended users of the system, what problems they can solve with it and how to interact with it. In other words, designers communicate their proposed solution encoded in the interactive system through the system itself. As users interact with the system, they understand the designers' message.

Semiotic Engineering theory brings designers and users together at the communicative process, which is an important change from previous theoretical approaches such as Cognitive Engineering (Norman 2004). The new perspective introduced by Semiotic Engineering theory may benefit many stages of design process, from the proposal and use of new methods (de Souza and Leitão 2009; Preece et al. 2007) to approaches to UX (Norman 2009).

Differently from semiotic approaches, digital inclusion was not a topic that was investigated early in the formation of the Brazilian HCI community. But rather, it became an important topic as technology became part of the Brazilian citizen's everyday life through voting and banking systems, as well as e-Government services (e.g. electronic payments or requesting documents).[5] Although digital inclusion is a relevant research topic worldwide, the need for culturally specific solutions calls for the investment in local research and solutions. This need has been formally acknowledged by the Brazilian Computer Society in 2006.

[5] Brazilian Government pages on electronic voting and electronic Government are available respectively at http://www.tse.gov.br/internet/ingles/voto_eletronico/voto_eletronico.htm and http://www.governoeletronico.gov.br/

In May 2006, SBC promoted a workshop to define the Great Challenges of the Brazilian Computer Society for the following 10 years. One of the five challenges identified was defined as “Participative and universal access to knowledge for the Brazilian citizen.” (Grand Challenges 2006), which clearly involves digital inclusion. SBC has encouraged research focusing on the challenges by articulating with funding agencies a call for a proposal for research projects regarding the challenges and by promoting a yearly event focused on the discussion and dissemination of the results of these researches.

The main topic that has been investigated in digital inclusion by Brazilian HCI researchers has been universal usability, specifically issues regarding how to accommodate individual differences (Shneiderman 2000). Among the many challenges involved in accommodating individual differences two are noteworthy: accessibility and social-cultural aspects. Regarding research in accessibility, there are some initiatives and success stories. Probably the best known of them is the research that started in 1993 and led to the development of DOSVOX, a voice synthesizer system that provides blind people with access to computer systems, web pages and electronic documents (Projeto DOSVOX 2002), and is widely used in the country. The project continues with the development of tools to apply DOSVOX to other technologies. There are also projects focused on deaf people and translating from Portuguese to Libras (Brazilian sign language) or facilitating their access to Portuguese-based interfaces (Campos et al. 2006; Santos et al. 2009).

Brazil has a serious social-cultural gap among its citizens caused by low education and, consequently, literacy rates – the country has a high rate of functionally illiterate people. In that direction, there are projects[6] that take a broader view on the problem investigating methods and systems that could be used to allow lower educated citizens to make use of services and systems available through the web (Tambascia et al. 2008). Other projects focus on more specific solutions such as translating or creating Portuguese texts that are simpler (by changing text structure and choice of words) to facilitate its understanding by people who have difficulty reading, either due to a lack of education or to some physical condition (e.g. aphasia or dyslexia).[7]

Professionals and researchers working with accessibility and social-cultural issues of digital inclusion have noticed that there are only a few initiatives from funding agencies directed to leveraging research and development in that area and that they are not sufficient. In the industry, there are some companies that are specialized in web accessibility, but in general professionals claim that the Brazilian industry is yet to realize what this share of market may represent in revenues. Thus, although there has been an increase in the research into accessibility and into assistive technology, there is still room and need for growth in this area (Computação Brasil 2009).

Finally, it is worth noting that many HCI researchers in Brazil take an ergonomic perspective in investigating HCI issues. Most of the work based on ergonomics is

[6] A good example is the project e-citizenship (Projeto e-cidadania 2007).

[7] A good example is the project PorSimples (PorSimples Project Wiki. n.d.).

directed to the USIHC, ErgoDesign or Brazilian Ergonomics Society (ABERGO) conferences. Nonetheless, there are researchers working with ergonomics in Design, Computer Science and Product Engineering departments. By looking at the syllabus of the courses being taught, a large number of them include an introduction to ergonomics.

6.5 Industrial Activity

This overview of industrial activities in Brazil derived from interviews with 13 leading usability professionals in the country, who develop usability studies in different contexts. They were invited to collaborate in this study because of their seniority and credibility, first of all, and also because of their diversity of perspectives. We talked to professionals who own and direct the top usability consulting companies in Brazil and also to experts who are employed in user's experience teams in private, governmental and Research and Development (R&D) institutions. Participants are representative of different geographical regions in the country and their opinions reflect the past, present and expectations for the future of usability in Brazil in themes such as professional qualification, industry maturity and regional perspectives.

In this section, we present an overview of the players in the Brazilian usability market. Next, we present a brief profile of the Brazilian usability professional that includes educational background, professional trajectory as well as the techniques and processes that they master. The Brazilian user cannot be naïvely described in a few paragraphs, but we emphasize some recent changes that have come to the attention of usability professionals. Finally, we depict the dynamics of usability business, illustrating its evolution and tendencies.

6.5.1 Players in the Usability Business Scenario

Usability business in Brazil is shared by three types of organizational players: the specialized usability consulting companies, agencies (mostly marketing agencies) and their clients, as we name here the companies that for some reason value the user's experience and are consumers of usability services.

Even though HCI emerged in Brazil as a discipline in the late 1980s, the pioneers in the usability industry in Brazil are no more than a dozen people that independently became involved with the internet in the 1990s. A few of them survived in the business because of their credibility, hard and sound work and today own the most well-established and respected usability consulting companies. These companies are small, yet very competitive businesses, in which the owner is also the senior professional and team leader, followed by a small team of around ten collaborators. These people have been the "evangelists" of usability in the beginning of the World Wide Web and e-commerce in Brazil.

These senior professionals come from different backgrounds, mostly Communications. They were working in the media industry in the 1990s and were attracted to the internet as a new, promising media and by the new perspectives of technology. Many started in the internet business producing content for the internet and that was the common path for the discovery of usability as an important value to be added to their work. Consultant companies are today responsible for the more specialized usability services, such as usability evaluation and user studies, which they sell to national and international companies.

Other players in the usability scenario in Brazil are the clients: companies that buy usability studies. Most clients are companies present in the internet, in banking and e-commerce B2B and B2C. They understand users as a strategic asset and care for the user's experience. These web sites, being interaction-intensive, are usually well monitored: conversion rates are known and management decisions are based on data. In fact, we can say that the interest of a company in developing usability studies is directly related to its capacity of monitoring user's experience. Those companies that keep track of their conversion rates using web analytics tend to be the most loyal clients of usability services.

Because of that, professional usability in Brazil is 99% associated to websites. However, there are a few other opportunities than the web. Even large-portfolio usability professionals only have one or two stories to tell about non-website evaluations, such as games, multimedia devices, cars and product packages. Some services, especially those that are supported by software – help desks, for instance – are also subject of usability studies.

Other electro-electronic equipment, such as TVs, players, home computers and domestic appliances seldom undergo usability evaluations in Brazil. Their manufacturing companies have their human research team in other countries and consequently, the product arrives in Brazil with its human interface already defined and developed. A few international companies that understand cultural aspects as having a relevant impact in the consuming experience have invested in user's experience research in Brazil, hiring user studies related to how users perceive communication pieces, such as websites and manuals.

Usually, clients are large revenue companies. Usability studies have a fixed cost that often does not fit into the budgets of small to medium companies. Nevertheless, small companies are becoming more and more aware of their need of usability – and when they do contract a usability specialist, they are more prone to implementing the solutions presented by the consultant than large companies.

The Brazilian client most often does not have a domestic user's experience team. Services are hired by people from marketing or product development departments. Currently, this is beginning to change, as these companies begin to internalize the user's experience knowledge.

Agencies play an important role as "brokers" in the usability scenario. Marketing agencies' core business is not usability – it involves the implementation of clients' presence in the internet and because of that, they are aware of the importance of usability studies. Agencies are usually contracted to set up or to overhaul a company website, not specifically to perform usability studies. Usability can be part of some of the agencies life cycle process, but more often, the agency delegates the usability evaluation activities to usability consulting companies that work in a partnership with them.

Just like marketing agencies serve their corporative clients, research and development (R&D) institutes act as agencies for developing user studies for their affiliated companies, Government and small enterprise cooperatives. Some examples of R&D research centers that have usability capability are Nokia's INDT, Positivo Human Lab, C.E.S.A.R., Instituto Atlântico, Fundação CPqD, Prodesp LabIHC and several academic research groups.

6.5.2 The Brazilian Usability Professional

The Brazilian usability professional comes from different backgrounds – communication, computer science, marketing, design, and psychology are the most representative ones. There is a clear delineation of two generations of professionals.

The first generation went into business in the late 1990s, when the Internet and e-commerce began to spread in Brazil. They were attracted to the Internet as a new medium and found out that there should be a systematic approach to the user. Because HCI courses were not usually offered at the time they were at University, they have learned usability on their own. Many of them went abroad to take graduate courses, others sought international consultants to learn usability techniques. Despite the difference in each one's path to learning usability, all of them share the opinion that they mostly learned from practice.

Second generation professionals entered the field in the last 5–7 years. They have received some education in usability from the first generation professionals, either in short graduate professional specialization courses or as in-the-job training courses. Even though many undergraduate programs now include HCI courses in their curriculum, they report their knowledge of usability coming mainly from their own studies and from practice.

While the first-generation professionals are owners and team leaders of consultancy companies, professionals from the second generation populate the agencies and are gradually migrating to new UX teams with clients, where they ascend to management levels. However, since the field is still being consolidated in the industry, only a few positions are offered and it gets really hard for young professionals to gain practice in usability. Their careers are associated to website development and the existing main roles are those of the interaction designer and information architect. Both positions still have fuzzy contours in Brazil and end up including (part of) the usability analyst role. Acting as a full-time usability analyst is still a rare opportunity in Brazil.

When hiring a usability professional, companies have usually considered more the candidates' personal trajectory than their educational background. The desired professional is the one who can choose the appropriate method, matching methodological rigor to tight schedules, and who can also write reports that focus on the clients' problems. This is a consequence of the fact that, despite the many opportunities for user-centered activities in the website development process, the most demanded usability service in Brazil nowadays is summative evaluation. Formative evaluations are rare, frequently contracted by international companies as part of multicentric studies. Professionals claim that one of the reasons for not performing usability evaluation at earlier phases of life cycle is the time pressure for releasing the product. As agile methods become more widely used, professionals feel that they need processes that are able to better integrate usability practices with those methods.

The set of techniques used by Brazilian usability professionals is quite homogeneous. The most demanded technique is usability testing, involving user's participation inside a lab or remotely. Usability labs are available for renting in many locations in the country, especially in large cities (typically state capitals). Heuristic evaluation and expert reviews – sometimes a single expert review – are also broadly used techniques. Less often, but still employed by the majority of usability professionals are qualitative and quantitative user research techniques such as ethnographic studies, surveys, contextual inquiries and usage diaries. Web analytics tools are widely used, especially in pages that are relevant for understanding conversion behavior.

Early life-cycle techniques are well known by professionals, but seldom contracted by clients, because of the focus on summative evaluations. Techniques derived from cognitive walkthroughs, paper prototyping and even card sorting are "hard to sell". When used, they are part of professionals' best practices approach to the development. Eye tracking techniques, although recognized as useful, depend on expensive equipment that still cannot be afforded by usability companies.

6.5.3 Brazilian Users

Marketing research is mature and allows a deep vision of Brazilian consumers. However, user research is not as consolidated and there are only a few published studies that focus on Brazilian users' behavior and that could be useful for usability studies.

Professionals claim that although regional differences exist, they do not determine population segments. Portuguese as the single country language unifies understanding all over the country. In fact, there are other languages in the country – Libras (Brazilian sign language) is the second official language in Brazil and there are several indigenous languages spoken in tribes. These languages have not yet been considered in websites.

Even though there is a lack of detailed studies, a major change in the Brazilian consumer profile has been perceived by the industry, and requires a thorough investigation. The change is due to the increase in financial availability of Brazilian citizens, after more than a decade of economic stability. People from lower classes, represented by the most populous and poor segments of Brazilian society have experienced an economic improvement in their life styles. These segments of the population perceive technology as a factor of social upgrade, and become avid buyers of computers and cell phones, and avid users of instant messaging and social networks. However, their economic improvement has not been associated to an educational development, causing an interesting impact on Brazilian website usability. The Internet user is no longer only the higher class and well educated citizen, but also citizens from lower classes often with little education. This change becomes important because these new users, due to their poor education, have low linguistic abilities and little structured knowledge. It is important that international companies rely on local perception and knowledge to make their products suitable to this new reality, using local workforce for user studies and promoting installation of UX centers in Brazil.

6.5.4 The Dynamics of the Usability Market

Professional usability in Brazil has had a short history of about 15 years. The area now experiences a moment of expansion, because of the importance given to digital marketing and the population's interest in technology. In this short time, evolution has not been homogeneous. Today we can find three different forces that drive the usability industry: evangelism, the quest for maturity and institutionalization.

Evangelism is seen as the effort to convince a client to consider a usability approach for the first time. In the early years of usability in Brazil, which went from the 1990s until 2005, usability professionals fought a "religious" war in order to explain the concept of usability to clients. Proving the benefits was difficult because of the little previous experience; therefore, many professionals had to use their personal influence and professional credibility to convince clients to include usability approaches in their product development. Nowadays, many clients proactively demand the services, keeping usability professionals' agenda quite busy. It is interesting to notice that once clients perform their first usability study, they are likely to require new ones in the future.

All players, clients, consultants and agencies, are in the quest for improving maturity. One symptom of low usability maturity on the client's side is that a client may develop a product for which UX is relevant, but the client's process is still not user-centered. Consequently, opportunities of early evaluation of the product (and consequent improvements) are missed just because usability is not part of the development process, but something that is done after the product is fully developed and (often) released to the market. Another symptom of low maturity is that few C-level executives seem to be aware of the importance of user's experience to their product life-cycle. Contracting usability is today more a bottom-up movement than an attitude of higher levels of enterprise management.

Low maturity on the client's side poses additional burden to service suppliers. Because clients are not precise in defining their expected goals, often the results are not useful. Briefings rarely discuss things such as which population segments are important or which problems should be solved. Low maturity is evidenced in client reports that express being surprised or even offended with the results of a usability study, when they receive many improvement suggestions. The consequence is that studies are not converted into effective changes. Because low maturity clients cannot distinguish an experienced usability professional from someone new in the field, sometimes usability studies are sold with unfeasible schedules and budgets, conveying a message that usability studies are not useful.

As maturity grows on the supplier's side, usability consultants see their clients from a broader perspective and move from simple usability studies of a developed product to a complete business process reengineering, helping clients perceive user's experience as a thorough relationship with the company, including marketing, technical assistance and customer support.

From the client's side, the quest for maturity turns into a different force – the institutionalization, or the creation of UX teams as part of the clients' organization, moving inwards the strategic responsibility of managing product usability. In this movement, companies that have a significant presence in the internet or that have intranets as part of their knowledge management policies have begun hiring usability experts to take care of UX.

This inward movement in Brazil has intensified in the last 3 years, but internal UX teams are still exceptions in the low-maturity scenario. Usually, the institutionalization process starts with a high level executive being somehow exposed to the concept of usability – usually either by visiting foreign companies or by reading some material. As maturity improves, the first desire to install a mirrored room for user experiments gives place to hiring a qualified team to carry out effective studies and to perform changes in the organizations development processes.

The degree of institutionalization varies – some institutional teams have people in several UX-related roles – information architects, usability analysts, designers – while small companies hire one multifunctional professional to do the job. Despite the existence of a local team, agencies and usability consultancy companies keep being contracted to carry out the big overhauls and user researches. The local UX team acts as business analysts, understanding their products requirements and constraints and therefore contracting useful studies. When a usability study is delivered, they are the work force needed to implement the study findings. Their understanding of the values of usability and their knowledge of their company's needs allows them to implement the improvements in an appropriate rhythm. To sum up, even though usability consultancy companies and agencies still possess the core competencies of user research and usability evaluation, the presence of a local usability team can leverage the results of these studies.

6.6 Conclusion

As a result of the persistent efforts of pioneer researchers and professionals, HCI in Brazil is consolidated as a field and is still growing as focus of research and businesses. Currently, the Brazilian HCI community has over 500 members subscribed to the HCI electronic list hosted by SBC and counts on approximately 100 submissions to IHC (the most established of its events) with an acceptance rate of below 30%.

Regarding education, many Brazilian undergraduate and graduate computing-basis courses offer HCI courses to their students. We estimate that around 5,000 students are exposed to HCI per year, and we expect these students to act as vectors in disseminating HCI in their lifetime occupations.

From the point of view of research, Brazilian research is nationally and internationally acknowledged. Semiotic approaches bring an innovative take to the understanding of human-computer interaction. Furthermore, Semiotic Engineering just for presenting a theory that accounts for HCI phenomena is a relevant contribution to the HCI field. The discussion on its contribution as a theory (usefulness and completeness) is the subject of ongoing researches on Semiotic Engineering and HCI theories in general. One interesting aspect about the Brazilian research is its breadth. On the one hand, it has been able to contribute to issues that are relevant to the HCI field as a whole. On the other, it has also devoted resources to investigate and contribute to issues that are specific and relevant to the Brazilian society, as digital inclusion of Brazilian citizens. Thus, it is fair to say that the HCI community in Brazil has taken its share of responsibility in transforming and improving Brazilian society.

In the industry, there are clear signs of how usability and HCI as a whole have grown and consolidated. However, there is still room for widening the range of industries that can benefit from the user centered approach and there is also room for improvements in the industries which already value UX. Changes in the Brazilian society have been changing users' profiles and pressing the industry to better integrate usability principles and methods to their development processes. Among these changes are the social mobility from lower to middle classes, the changes in the consumer profile, and the fact that as society evolves, consumers become more and more aware of their rights and more demanding of quality.

It is interesting to notice that some of these changes in the Brazilian society may also present an opportunity for a closer relationship between academia and industry. Many Brazilian researchers are investigating how to increase digital inclusion of Brazilian citizens. Some of these solutions may be useful to companies that have noticed the change in their users and may be interested in designing systems that are better suited to them.

In our view, the HCI community in Brazil has succeeded in establishing itself and achieving the many goals it has set to itself. Looking into the future, some of the challenges we believe our community faces are:

- Better integration among the HCI community across different areas –including Computer Science, Design, Arts and Communication among others – to allow for more interdisciplinary work and cross-pollination;
- Increase in the professional activity of students who have attended HCI courses in their university programs (creating a third generation of usability professionals);
- Promotion of activities that could result in a closer cooperation between academia and industry;

- Demonstration to executives of the benefits of usability for their products and of including usability into their product-development processes;
- Education of consumers to require usability as a desired quality feature of the products they buy.

Although these are not small expectations to live up to, we believe the HCI community in Brazil has the necessary maturity and tools to accomplish them in the next 5–10 years.

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Chapter 7
Usability in China

Zhengjie Liu, Jun Zhang, Haixin Zhang, and Junliang Chen

7.1 Introduction

China is a country with a long history of civilization and a broad expanse of territory. Its population of 1.3 billion people consists of 56 officially recognized nationalities, with the Han nationality (94%) most numerous. Although there are many different local dialects and accents, Chinese writing is uniform throughout the country, owing to the long-standing efforts made by the dynasts and the governments to unify the language. By 2004, 9-year compulsory education covered 93.6% of the whole population, and the illiteracy rate of the young adult population was reduced to around 4% (Ministry of Education of P. R. China 2005).

China has attracted attention from around the world in recent years because of its rapidly increasing economic and political influence. China has experienced a consistent, rapid economic growth rate of more than 9% per year in the past 20–30 years and is becoming potentially the world's biggest market, the biggest manufacturer and an economic giant. In this process, China has been gradually changing from an agricultural economy to an industrial one: 45.7% of the population now lives in urban areas in 2008 in comparison with 26% in 1990 (National Bureau of Statistics of P. R. China 2009). In some of the most developed regions like Shanghai, the GDP per person has reached the level of 10,000 USD. Similar substantial changes have also happened in almost every other sphere in China.

The Chinese information technology (IT) sector has been a driving force in the economic growth under the government policy of promoting industrialization through digitalization. Since the 1990s, Chinese central government has issued a series of policies and plans on promoting the information industry and propelled several important strategic nationwide ICT application projects. The basic policy of promoting national economy through ICT technologies was established that

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greatly accelerated the process of ICT application in China (Ministry of Industry and Information Technology of P. R. China 2006):

- By the end of 2009, China already had the largest user population for mobile phones, fixed-line telephones and Internet in the world. The broadcast and television network has covered almost all the administrative villages in the countryside.
- The production of mobile phones and personal computers (PC) were both the largest in the world. In 2009, more than 600 million mobile phones and 140 million PCs were produced. The value of electronic information products accounted for more than 30% of China's total exports.
- ICT has been showing greater and greater impact on information services for agriculture, transformation of traditional industry and the service industry, as well as the modernization of finance, public administration, homeland defense, etc.

7.2 Background and History

The concept of human-computer interaction (HCI) was initially introduced to China in the early 1990s. A few Chinese scholars noticed this new area that had emerged in the west and since then have been engaged in research and teaching in this area. However, for quite a long period of time this endeavor has been restricted mainly to academia and was focused on the technological aspects of HCI rather than the methodological aspects such as the general concept of usability and user-centered design (UCD).

In the industry, due to the impact of planned economy from the 1950s to the 1970s in China, for quite a long time people cared little about users' needs and satisfaction. However, along with the economic growth and the evolution towards an increasingly mature market economy in the past three decades, Chinese enterprises have gradually been facing greater competition for their products and services. After China entered the World Trade Organization (WTO) in 2001, its commercial organizations endured even greater competition, while also enjoying new opportunities in a global marketplace. They have realized that in order to survive and grow they must find effective ways to strengthen the competitive edge of their products and services.

Over the past 6–7 years in China "customer orientation" has become a slogan for many Chinese enterprises. In order to strengthen their competitiveness, they are beginning to pay more attention to customers' needs and attempting to provide a better customer experience for their products/services. A shift from a product economy to a service economy is also taking place. This change is in sharp contrast to the circumstances 30 years ago.

The concept of usability was introduced into China against that background in around 2000. Before that, most companies in China did not recognize usability as a valuable aspect of products. Implementing functionality and improving technological performance was the only focus of product development at that time. Usability was taken as an emerging professional area to be widely accepted and applied by industrial and academic communities around 2004 (Wang 2003; Liu 2003, 2006). The following parts will further describe the development of usability as a discipline in China in the spheres of industry practice, academic research, educational programs and professional societies respectively.

7.3 Industry

Usability practice in China actually started from activities conducted by multinational companies. Since 2000, multinational companies such as Siemens, Microsoft, IBM, Nokia, Motorola, and eBay have been conducting various user-research projects and have even set up local usability groups in China.

Increasingly stiff international competition and the desire for development have also made user experience (UX) an important issue for many leading Chinese companies, including Lenovo, Huawei, Sina.com and Haier. They started to pay attention to and practice usability from around 2003–2004. Some maintain usability groups of over 100 people and have integrated user-centered design (UCD) into their processes. From then on, more and more Chinese companies have joined this trend. The spontaneous demands for usability and UCD have become a major driving force for this field in China.

In 2007, the Sino-European Usability Center (SEUC) conducted a survey on UCD practice in China (Liu et al. 2008). Thirteen Chinese IT enterprises with experience in UCD that represented the leading players in UCD amongst local enterprises were selected for the study. It focused on the key areas of UCD according to the UMM model (Bevan and Earthy 2001). This study gives us an overview of the current UCD practice in the Chinese IT industry. Most leading Chinese enterprises have had 2–3 years' experience in this field by 2007. Some of them achieved great success and have succeeded in making UCD well accepted by the management and product development teams. UCD teams are continuing to grow in size and number and are developing their multidisciplinary expertise.

In the following sections, case studies of UCD practice in several representative enterprises from different sectors in China, both Chinese and multinational, are described. This will help readers to better understand the situation of usability in Chinese industry.

7.3.1 Intel

The Emerging Markets Platform Group (EMPG), with its headquarters based in Shanghai, is a business group in Intel. The mission of EMPG is to develop new technologies for new markets to make people's work and life better.

EMPG has been implementing User-Centered-Innovation process since 2005. It has a small but multi-disciplinary research and definition team composed of ethnographic researchers, marketing researchers, user interface (UI) designers, industrial designers and hardware and software architects. This team takes a critical role to explore new market opportunities, understand user needs, define product roadmap, and evaluate UX status. The team has been bringing new ideas into the development process to make UX more efficient. For example, the team has created a new concept of "UXRD" (UX Requirement Document) together with traditional PRD (Product Requirement Document) for the development team to follow to better ensure the consistency between the original design and the final product regarding UX quality. The team also has been active as decision makers to make sure UX is not sacrificed easily when conflicting with other aspects such as technical limitations and schedule pressure.

Through User-Centered-Innovation, EMPG has delivered a set of new products into new markets in both China and other countries, including a special PC design for China's rural market, and an Intel-powered classmate PC.

- A special PC design for China's rural market: Based on over one year's ethnographic research focusing on "Rural China" from different perspectives, major innovation opportunities were identified and a rich set of product concepts were generated through a systematic design process. As one of the outcomes, a new PC design was developed with new features to support a sharing usage model for villages/towns in China. It was released to market in 2007 by working with a Chinese OEM (Original Equipment Manufacturer) and has gained positive market response and volume.
- An Intel-powered classmate PC: This is a category of PC developed primarily for K-8 students' use in schools. It's a result of ethnographic research in schools across geographical regions and an innovative design. This category of products helped EMPG reach a new population by making the "right technology" for classrooms that provides real educational benefits. This effort has also helped accelerate 1:1 computing usage models in schools worldwide, e.g. Portugal is implementing their version of the Intel-powered classmate PC by making PCs available to every student in primary schools in the country to greatly change and improve their education quality.

7.3.2 Samsung Electronics

Facing the strategic Chinese market, the UX team of Samsung Design China (SDC) was founded in 2006 to design Samsung products to be more suitable to Chinese people, and hence enhance the status of the brand among the Chinese people. The current members' backgrounds cover psychology, industrial design, graphic design, software engineering, electronic commerce, etc. This mix of backgrounds is typical for almost all the companies mentioned in this chapter. The team focuses on UI process design and Chinese localized GUI development for Samsung mobile phones, and also UI design and study for other Samsung product lines. The team members conduct UI analysis of competing products and trend analysis of telecom operators to provide UI improvement suggestions for Samsung mobile phones. They also get users' requirements and feedbacks through questionnaires, interviews with sales promoters, in-depth interviews and focus groups with users, and then analyze in depth their operating habits, preferences and requirements to propose new localized functions, design plans and improved designs on UI processes and GUI interfaces for Chinese-oriented Samsung mobile phones. They maintain cooperating relationships with the Samsung departments of sales, research and development to analyze consumers' requirements and discuss improvement possibilities together. Some of them go to Samsung headquarters in Korea periodically to cooperate with colleagues in the UX team there. The following are examples of user research and design by the UX team of SDC.

7.3.2.1 Youth-Oriented Mobile Phone Design

Desk research, field study and focus group interviews (FGIs) were conducted to analyze the characteristics, preferences, life styles and specific needs of Chinese youth. Based on the results of the analysis, some new youth-oriented functions and GUI themes of mobile phones were conceived and implemented by designing function flow charts, wallpapers, menu items, icons and fonts.

7.3.2.2 UX Study for Touch-Screen Mobile Phones

Desk research, expert review of competing products, interviews in markets, interviews by salesmen and FGIs were conducted to sum up the evolving market trends of Chinese touch-screen mobile phones, provide design schemes of touch-screen mobile phones for Samsung, and also present references for Samsung's marketing strategies of touch-screen products.

7.3.2.3 Chinese Input Method Improvement

Research reviews and expert reviews of both competing input methods and Samsung's input method, and third-party review of Samsung's input method were conducted to identify shortcomings of the input method for Samsung's mobile phones. Based on the results of those studies, improved schemes for both touch-screen and non-touch-screen mobile phones were proposed on the aspects of interface layout, switching methods among different input modes and Chinese spelling rules. Those improved schemes have greatly contributed to the usability of the Chinese input method for Samsung's mobile phones.

7.3.3 Lenovo

Lenovo decided to prepare to set up its own user research center in 2000 to work on the study and practice of UX. The User Research Center was founded in Lenovo Research Institute in September 2001, consisting of three laboratories, two of which are in Beijing and one in Shanghai. There are more than 30 professionals engaged in usability related design and evaluation work. Their backgrounds include HCI, computer science, sociology, psychology, market research, statistics, visual design, industrial design, mechanical design, etc.

Lenovo puts emphasis on product usability, and has integrated usability testing into the development process of consumer desktops in 2002 and then commercial desktops, laptops and mobile phones. A special UCD manual and usability checklist were issued in 2007, which indicated that Lenovo had formed its own product development processes with usability activities integrated. Lenovo also defined detailed specifications on time, resource and quality for usability activities in product development processes. Both people from management and usability specialists perform their own functions to insure usability work is well conducted in product development processes. Now, all of the mainstream computer products of Lenovo are evaluated and tested several times before they are available on the market.

7.3.4 Baidu

The UX department of Baidu was founded in 2005, and then UX design and evaluation was integrated into its product development processes. The department has a multidisciplinary team, consisting of 50 members with backgrounds in graphic design, industrial design, psychology, human factors, HCI, sociology, software engineering, statistics and marketing management. Acting as user research engineers, interaction designers and visual designers, they provide the support for user requirements/behavior analysis, UX design/evaluation and usability testing for Baidu's products related to search, commerce, community, mobile application and client application.

Baidu divides the product design & development process into phases of requirements acquiring, extraction/analysis and presentation/conversion. In different phases, different methods and tools are applied. Interviews, questionnaires, focus groups, cultural probes and eye-tracking are used in the phase of requirements acquiring; concept diagrams, persona and scenarios are used in the phase of extraction/analysis; wireframes and interaction flow diagrams are used in the phase of presentation/conversion to get visual design according to product definition. The following two cases reveal the efforts Baidu has made to integrate user research into its product development processes.

7.3.4.1 Baidu Internet Union Promotion

Baidu Internet Union Promotion (cpro.baidu.com) is a technical service product of content promotion. As an effective Internet marketing promotion method for enterprises' products, it matches enterprises' products information with content sites on the Internet and presents the information to the right audience in the right time and location. Through a large amount of studies, the team found that many factors on visual presentation could affect the interaction between users and the promotion system. Hence, they conducted many visual presentation studies related to concept delivery and object matching. Behavioral and eye-tracking tests were conducted to find what kind of visual presentation can improve interaction efficiency. The final design showed a wholly new pattern on font, color and layout and achieved a very good effect on UX. Along with the increasingly in-depth work of the UX department and more and more product data open to it, they participated in the study on promoting release and match policy in the final phase of the products, and played a dominant role in applying UCD methods in plenty of product innovation work.

7.3.4.2 Baidu Hi – An Instant Messaging Communication Tool

At the starting phase of this project, the UX department had an in-depth study on related enterprise strategy, product positioning, connections to other Baidu products and current consumers' evaluation of each product, and determined the key elements related to UX after a broad survey on competitor products. Meanwhile, the UX department organized a research & innovation group, participating in the whole design process of requirements identification, concept design, structure/interaction design, visual design and brand design. At the starting phase of the project, concept design was adopted to inspire developers on product positioning and functions of Baidu Hi. Flow diagrams and wireframes were used to discuss design schemes and new ideas for large-scale cross-department cooperative projects. Iterative user testing, discussions and redesign were conducted in the rehearsal for each scheme. And finally study documents, interaction prototypes, interface specifications and visual design guidelines were worked out. As to the contribution to the accumulation for the common design process, the standardized documents on brand architecture, interaction modes, interface widgets and visual styles were issued as guidelines for products along with the development process of Baidu Hi, and were applied to other products. A small project-oriented usability evaluation group was established to lower the risk of failure caused by severe UX problems after being online.

7.3.5 Huawei

Huawei is a rapidly growing manufacturer of communication products, expanding its overseas market based on a stable domestic market. Its main business areas include network infrastructure devices and mobile terminals, respectively in correspondence with the two business units – Huawei Business & Software and Huawei Device. They both started their usability related efforts around 2005.

Recently, communication operators, especially overseas ones, are not satisfied with just high reliability and capacity of the network infrastructure devices. They start to put more and more emphasis on rapid deployment in a short time and efficient low-cost operating maintenance after the deployment. To meet the requirements, Huawei Business & Software set up the UCD Management department in 2005, and started to design products with UX as the central focus to meet high usability requirements for its products. The UCD team, consisting of around 20 members from computer science, communication, usability engineering, psychology and industrial design, was set up by job transfer and recruitment within the enterprise that year. IBM's UCD processes and methods were introduced, and then discussed, optimized and stabilized as suitable UCD methods for the enterprise through rapid practice in pilot projects. The methods were integrated into the main processes of product development. As UCD was deployed throughout the whole enterprise, the demand for usability engineers kept increasing and the department has grown to over 100 members in less than 4 years. Because communication products vary for different customer groups, the enterprise divided the UCD team into several small teams specializing in UX of different categories of product for different target customer groups, in order to ensure the long-term accumulation and specialization of UX in each category. At the same time, special teams were appointed to be in charge of user scenarios collection and interaction design study in order to extract and accumulate common UCD knowledge. The knowledge can effectively support UCD activities of various products to ensure efficient product design and also keep consistency among the products.

The business of Huawei Device covers several technical areas – WCDMA, CDMA, GSM, TD-SCDMA, video information, application terminal, etc. It started its UCD work in 2003, and set up a UI design group in 2005. Thereafter, based on this group, two departments, User Interaction Design Group (UI) and User Experience Research Unit (UERU), were established. They both affiliate with the upper Unit – Industrial Design department. The current eight members of UERU are from psychology, HCI, usability engineering, computer science, mechanical engineering and art design. Its main responsibilities include user research, UX design, evaluation and user testing, training, external cooperation in user study, etc. The main methods adopted by UERU in user studies include semi-structured interview, cultural probe, contextual inquiry, ethnographic methods, etc. The UI group has 50 members from HCI, information engineering, software engineering, industrial design, graphic design and art design. They take part in the user studies conducted by UERU, as shown in Fig. 7.1, with their major responsibilities in interaction design, visual design, ring tone design, etc.

Fig. 7.1 Field studies by UERU, printed by permission from Huawei

Huawei Device issued the top-level UX obligations closely connected to the product development lifecycle in 2008. The obligations include: (1) user study, concept design and user evaluation in the prototype phase; (2) user testing in the implementation phase; (3) user testing in the verification phase.

UERU has a UX lab consisting of one testing room and one observation room, equipped with portable Noldus Observer behavior observing & analyzing system, a one-way mirror, projector, cameras, white boards, etc.

7.3.6 China Mobile

The User Behavior Research Lab (UBRL) at China Mobile Research Institute is the first research team specializing in user research at China Mobile. The objective of UBRL is to make UX an indispensable and integrated part of the China Mobile brand and to make "USER" a drive of innovation at China Mobile. It was founded in 2007 with a small team of four members. Now it has grown into a team of over 30, with three groups, focusing respectively on consumer psychology and life-style study, consumer behavior data mining and human-computer interaction. Their research areas are described as follows:

- **Sociological and Psychological Studies on Telecom Consumption:** Sociological studies aim to find the macro-structure of society and the characters of different social classes. Psychological techniques are used to discover people's in-depth needs and attitudes in relation to data services, and classify them into several segmentations. Different products and services will be planned for different segmentations.
- **Social Network Research on Precision Marketing based on Data Mining:** Social network research focuses on the user impact analysis, community detection/evolution and diffusion rules in phone calls and SMS relationship networks. A social network analysis and visualization tool has been developed to support the service marketing.
- **Human-Computer Interaction Research and Design:** HCI studies focus on usability testing, eye-tracking study for UI evaluation and product design. Evaluation tools used for UX include some commonly used user satisfaction measurements in the field like the System Usability Scale (SUS) (Brooke 1996), Software Usability Measurement Inventory (SUMI) (Kirakowski et al. 1992).

7.3.7 Tencent

Tencent, one of the largest integrated Internet content providers in China, was founded in 1998. By 2009, the registered accounts of its instant messaging tool QQ had reached 0.99 billion, among which 0.448 billion were active.

Since the Customer Research & User Experience Design Center (CDC) was established in 2006, Tencent has set up eight professional UX labs in Shenzhen, Guangzhou, Shanghai and Beijing. To meet the ever-increasing demands for user study raised by the business departments, small special UX groups were organized in those departments too. All these groups serve as professional resources, dynamically meeting various needs in product research and development as well as operating management. Members of the groups come from psychology, human factors, graphic design, journalism and communication, applied mathematics, etc. UX work has penetrated into every part of the whole product lifecycles, e.g. requirements identification, usability evaluation, analysis on user number decreasing, analysis on consumers' preferred roles and scenarios, etc. The UX workflow of Tencent is shown in Fig. 7.2. Apart from UX work related to specific products, CDC is also in charge of UX performance evaluation and training.

Tencent has been propelling the plan of entire Customer Engagement (CE), encouraging customers from both inside and outside of the enterprise to participate in UX activities. On the one hand, Tencent takes customer service, QQ forum, Tencent lab, experience center and product feedback channels as fields for customers to provide feedback on their experiences and product problems. On the other hand, all the staff members are encouraged, by means of training and performance evaluation, to participate in UX activities. A universal CE platform was built to facilitate people to give their feedback and suggestions on any product. UX was taken as a criterion in performance evaluation for products and staff. The following are some examples of user study work in Tencent:

Fig. 7.2 Tencent UX workflow

7.3.7.1 Study on Internet Use of the Elderly

Researchers conducted in-depth interviews at users' homes and collected information on their physiological characteristics (e.g. visual impairment, inability to sit for long periods, etc.), social connections and Internet use habits, in order to develop guidelines for product design for the elderly. For example, it was found that the elderly are less familiar with English or Chinese Pinyin and have difficulties in entering characters, so they rely more on the mouse when accessing the Internet and choose voice chatting when using QQ.

7.3.7.2 Study on the Length of Time for QQ Tips Display

QQ tips are an important way for QQ to send prompt messages automatically to users. It is important to make sure users can see and understand the tips clearly without annoyance. So, what is the proper length of time for displaying each tip is worthy of detailed study? Researchers collected data through user's subjective evaluations, memory recall and eye-tracking tests, and analyzed them to get knowledge on display time for main scenarios. This provided a scientific basis for designing tips.

7.3.7.3 Study on Art Style of Online Games

The user study group of Tencent games unit conducted an online survey on online games, and then analyzed Chinese players' features and related influencing factors to draw a classification of them according to their art preferences. This data, combined with data from in-depth interviews, were synthesized into several typical player models with life and thought. The study not only provides data support from real players for policy making related to the art factor in online game development and make the game art design user-centered, but also has its value as reference to business policy, product policy and interaction design.

7.3.8 Midea

The Midea UX research center was founded at the beginning of 2008. It is responsible for the UX research for the Midea household electrical appliances. Fifteen staff members in the center come from the areas of statistics, marketing, industrial design, UI and interactive design, usability engineering, psychology, sociology, etc. The UCD process in Midea consists of three phases – product plan, industrial design and sample production, as shown in Fig. 7.3.

According to the characteristics of household electrical appliances, Midea's UX research covers three aspects: (1) research on users' needs and product usefulness;

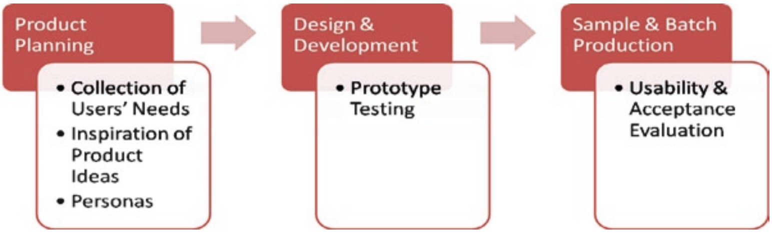

Fig. 7.3 Midea UCD process

(2) product usability evaluation; (3) evaluation on product modeling and manufacturing techniques. The following are examples of Midea's UX research:

- Field Study: Users' living environment, habits and needs for products were observed by home visits. Users were asked to operate some functions of Midea products, while researchers observed their operations. Users and their family members' stories on using the products were also collected and analyzed to get some findings that contributed to future products.
- Product Usability Testing: Users were invited to Midea UX labs for usability testing on new sample products, while development and design staff along with the researchers of Midea observed them in the observation room. Researchers made improvement plans together with engineers based on findings during the testing. And some small improvements would be implemented immediately.

7.3.9 Nokia

Since its establishment in 1994, the UX team of Nokia Research Center (NRC) has been providing Nokia with a central global resource for understanding behaviors and trends of local consumers in countries throughout the world. In 2001, with the addition of its first usability engineer at NRC Beijing, Nokia's commitment to consumers in this region was made apparent. Today, the Growth Market User Experience team at NRC Beijing has grown into a multi-talented team that includes sociologists, psychologists, designers and engineers working together to innovate for local consumers.

The primary focus for NRC Beijing UX team is the applied user-centered design approach in research and design projects. User needs and inspirations are additional focus areas. This approach starts with quick ethnographic studies that are used during planning and implementation. This allows for a more effective and non-threatening approach to users when trying to understand their life inspiration and contextual experiences. Once there is a stronger understanding of the local users, design opportunities are identified and the creation of new UI and service concepts for future adoption are implemented. Several rounds of iteration on the designs and the evaluation cycle are required before delivery of solutions for implementations and further trials are then considered. This process allows for well-planned trials that often result in solid user feedback and unexpected insights in the specific areas.

In 2009, this process was used in one of their key projects called Leho, which is a mobile service that aims to assist migrant workers in China with job matching, work experience record management and other valuable features that provide a reliable platform for success in unfamiliar cities. It was discovered through this process that although the 225+ million migrant workers in China serve as a major driving force for fast economic growth in China, several issues prevented this segment of people from finding opportunities that increase their upward mobility:

- Limited access to Information and Communication Technologies (ICT)
- Limited education and professional skills
- Vulnerability to deception
- Lack of employment history record
- Lack of maintenance of strong social ties

As a result, Leho was created as an innovative solution that makes the job hunting process easier, more accessible and enjoyable. By the end of 2009, NRC Beijing finished conducting a trial. Migrant worker participants indicated a general consensus of satisfaction with Leho and also expressed a strong interest to continue using the service.

Leho is only one of the many global projects that NRC Beijing UX team has been involved with. In addition, NRC Beijing UX team continues to be involved in field studies across various countries that stimulate new innovations, regularly conduct cross-team workshops to generate new ideas and organize joint pilot activities to experiment with new ideas that will offer true value to consumers in various regions.

7.4 Research and Education

Although some researchers in Chinese universities and academic institutes started to pay attention to and pursue research and education in HCI in the early 1990s, the main attention to usability and UCD started from the late 1990s. At present, usability related research and education activities occur in just a few university departments or research institutes related to computer science, industrial engineering, psychology and industrial design. We take the following representative institutions as examples to show the current status.

7.4.1 Sino-European Usability Center, Dalian Maritime University

The work in human-computer interaction (HCI) and usability at Dalian Maritime University (DMU) was started by Professor Zhengjie Liu in around 1989. The Sino-European Usability Center (SEUC) (www.usabilitychina.com) based in the computer science department of this university was founded in 2000 as the first center dedicated to usability research in China. Its foundation was from DMU's involvement in the UsabilityNet project (Bevan 2006) funded by EU Fifth Framework Program and under the co-sponsorship of EU and China R&D Programs.

Since its foundation, SEUC has been making efforts to increase the awareness of usability and UCD in China by organizing activities and media diffusion nationwide, especially the publication of the Chinese translation of Jakob Nielsen's book of Usability Engineering in 2004 and the five rounds of Sino-European System Usability Seminar Tours held 2005–2007 that was funded by the EU Asia-ITC program through SESUN project. It helped many leading Chinese companies to start their usability practice by its services and training.

SEUC has concentrated on research on usability and HCI, postgraduate HCI program at Master and PhD level and consultancy/training services to the industry on user experience and user-driven innovation. It aims at becoming a unique contributing part in innovation in industry.

From just a few people at the beginning, SEUC now has a team of some 30 people including academic faculty members and postgraduate students from multidisciplinary background like computer science, design, marketing, linguistics and so forth. Its lab is equipped with a stationary usability lab (95 m^2), a portable usability lab, eye-tracking (desktop, helmet) equipment and a vehicle driving simulator, etc.

Aiming at becoming an international platform for HCI research and education, SEUC has developed long-term associations with some leading industry research labs and universities in the US and Europe, including NCR Labs, SAP Research (US, South Africa, Germany), University of Maryland (UMBC), Florida State University, Chalmers University of Tech, Kaiserslautern University, Limerick University and so on. Frequent cooperative research and short or long-term visiting activities were conducted based on these relationships. Taken as a good example of this kind of partnership, a joint research lab – NCR-DMU HCI Research Center was set up in 2006 that is funded by NCR. The center has been focusing on research on HCI, cultural issues and innovation for future ICT solutions for self-service and retail. Every year, joint projects and personnel exchange were carried out under this framework.

SEUC offers postgraduate programs in usability and HCI and trains students to master expertise in user research, interaction design and system implementation. The taught courses for the PhD and Master students include human-computer interaction, usability engineering/UCD, user interface design, statistics for data analysis, ergonomics/human factors, market research and HCI research methodology & frontiers. It also provides an introductory HCI course to undergraduate students in computer science.

On the research front, work on program visualization, User Interface Management Systems (UIMS), context facilitated dialogues was conducted in SEUC in the early years. Since around 1997, the focus has been shifted to usability and UCD for the intention to be more application oriented. Although for quite a few years the effort was not so successful due to the low awareness of usability in the industry, from about 2003–2004 the situation has changed very fast. More and more multinational and Chinese companies sponsored projects to SEUC. These projects applied the UCD approach across planning/innovation, design, implementation and deployment phases in the product lifecycle. They involved various products/services in many application domains and different user groups, both mainstream and non-mainstream (like rural, elderly, disabled, children and underserved communities). In recent years, attention has been paid to keeping a better balance between HCI design and HCI technologies and between academic research and industry-oriented services. Nowadays SEUC takes HCI design for ubiquitous ICT as the strategic research direction with special emphasis on the real-life problems typical in developing worlds. The research activities in SEUC can be categorized into the following:

- UCD applications – This is to apply the UCD approach in product innovation/development, including user and requirement study, product concept study, interaction/UI design, user experience evaluation and UCD processes.
- Knowledge, methods and tools for HCI design – This includes research into better understanding of the interaction between the users and the technology, the cultural factors and the social issues. The research aims to support better HCI design by developing design guidelines. It also involves developing HCI design methods and tools to meet the changing needs and better support UCD practice, like novel UCD methods for certain application domains or users groups and models for evaluating mobile 3D interaction and tools (such as mobile remote user research tools).
- Interactive technologies – This concentrates on developing context-aware mobile interaction for ubiquitous ICT and making attempts to apply it in areas like remote user study, social network applications, way-finding & navigation, shopping assistant, living assistant for the elderly, handheld-based augmented-reality and so forth. It also involves developing innovative mobile interactions (3D, auditory cues…) and in-vehicle interaction for nomadic devices.

7.4.2 Human Factors and Ergonomics Institute, Tsinghua University

The Human Factors and Ergonomics Institute (http://www.ie.tsinghua.edu.cn/ihfe/index_en.html) is affiliated to the industrial engineering department, has six staff members with Professor Pei-Luen Rau as the head. The institute has been engaged in research in important areas related to human factors and has published papers in important journals and conferences in the human factors area. Financial support has been from the government and enterprises (National Natural Science Foundation of China, IBM, SAP, Samsung). Collaborations with many universities, research institutes and enterprises were set up to have academic communications.

The Institute has several labs for teaching and research: (1) Usability & Human Computer Interaction Lab; (2) Ergonomic Design Lab; (3) Physical Ergonomics & Safety Engineering Lab; (4) Virtual Reality & Human Interface Technology Lab.

Theoretical lessons offered in the institute include human factors, ergonomics and job design, cognitive psychology, engineering psychology, safety engineering, product virtual design and rapid manufacturing and product virtual development. Related experimental lessons are anthropometric measurement and analysis, physiological parameter measurement and analysis, environmental factor measurement and analysis, HCI experiments, human-computer environment simulation experiment and analysis, 3D human body measurement and mechanics analysis experiments.

7.4.3 Engineering Psychology Lab, Institute of Psychology, Chinese Academy of Sciences

Efforts made by Institute of Psychology of Chinese Academy of Sciences (http://english.psych.cas.cn/) in human factors started in the 1950s when an aviation psychology lab was set up. Research in cognitive science was started in the 1990s by participating in the research on Chinese characters input to computer. Many research projects on product localization and usability have been conducted in cooperation with domestic and overseas enterprises since the late 1990s.

The engineering psychology lab of the institute now has seven staff members and 15 graduate students with the backgrounds of psychology, computer science, mathematics, etc. The lab has some research platforms including an aviator special capability test platform, a Tobii eye-tracking recording and analysis device, a portable KF2 physiological measurement device and a driving simulating system.

The following are some typical research projects of the lab in recent years:

- **UI for Fire Monitoring and Control:** A series of research (Sun et al. 2009; Zhang et al. 2006, 2007) related to the UI design of a fire monitoring & control system for modern skyscrapers was conducted, including usability tests on visual interface, comparative tests between 2D and 3D interfaces, touch screen usability study, voice interface design and multi-modal interface usability study. The research provided multifold evidence for the design and improvement of the interface design.
- **Speech Alarm:** This research was focused on Chinese speech alarm signals (Li et al. 2007a). Researchers compared the speed and accuracy of people in

receiving different tones and speeds of speech under different levels of background noise. The results provided indications for designers to use speech in interface design.

- **UI of Mobile Products:** The models and functions of different brands of mobile phones as well as some mobile services were examined and some usability problems were found. Suggestions were made to provide indications for the interface design and improvement of the mobile products.
- **Keyboards and Input Methods for Computers:** Ergonomics evaluation on different keyboards was conducted on their input accuracy, speed, learnability and fatigue degree for operators. As to input methods, a user performance model of handwriting Chinese character input system based on temporal and spatial parameters was deduced and proved. The results can be used as guidelines to design efficient comfortable keyboards and input methods.
- **Usability Research Methods:** (Li et al. 2007b; Sun and Shi 2007; Wu and Liu 2007): Taking the method of thinking aloud as an example, communication methods between usability professionals and users under different cultural backgrounds and its impacts on the performance of usability tests were examined through a study in Denmark, India and China.

7.4.4 HCI and Multimedia Lab, Peking University

The HCI and Multimedia Lab at the School of Electronics Engineering and Computer Science in Peking University (http://www.graphics.pku.edu.cn/) was established in the 1980s. The lab first was involved in computer graphics and UI research and then in multimodal human computer interaction. In the spring term of 2000, an undergraduate course on Human Computer Interaction (HCI) was started. A textbook on Human Computer Interaction authored by Professor Shihai Dong and Professor Heng Wang was published in 2004 in Chinese. Several universities have used the book as textbook and the first edition was sold out in 2008. Graduate teaching in HCI has started in 2009 and students were actively involved in recent advances in the field. Both undergraduate and graduate courses include cognitive models, standards/guidelines and usability engineering. Through the course, students get familiar with the principles of usability, which are theoretically driven from psychology, computation and sociology.

The lab has carried out many research projects on HCI that are funded by the public funding bodies. Some representative research work involved Internet based multimodal UI, pen and speech based multimodal interface, intelligent HCI in pervasive environment based on context awareness, intelligent multi-modal HCI based on user's preference, etc. The researchers have published papers at various international conferences like ACM MobileHCI, HCI International as well as many national conferences and journals. In some of the projects, user centered approach was used to better understand the users and their tasks, and to drive the technical solution development and its evaluation to make it fit for users.

7.4.5 HCI and Intelligence Engineering Lab, Institute of Software, Chinese Academy of Sciences

HCI and Intelligence Engineering Laboratory (http://iel.iscas.ac.cn/) at the Institute of Software, Chinese Academy of Sciences has been involved in usability related research since 2003. Usability design methods, design guidelines and evaluation methods have been developed for pen-based interaction techniques and applications. A usability evaluation framework for pen-based interfaces and multimodal interfaces has been built. Usability research has been included in some projects in the lab. In recent years, more than ten papers on usability research were published at major national and international journals and conferences.

The following cases highlight the usability related projects for pen-based and multimodal interfaces:

- **User-Centered Scenario-Based Design Method:** Scenario-based design and user-centered design were combined to put forward this approach. It has been used to provide an effective method for the development of pen-based interfaces and the applications.
- **Evaluation Methods for pen-based and multimodal UI:** For better evaluating pen-based and multimodal UI, usability evaluation methods based on interface scenarios and a number of evaluation principles have been developed and an evaluation framework consisting of the evaluation methods, indicators and processes established. This has been used in the evaluation of a series of pen-based applications including a meeting system, and edutainment applications for children and so on.

7.4.6 Department of Psychology and Behavioral Science, Zhejiang University

The predecessor of the Department of Psychology and Behavioral Science of Zhejiang University (http://www.css.zju.edu.cn/english/departments_5.php) is the Psychology Department of Hangzhou University, which was founded in 1980. It is one of the earliest psychology departments in Chinese universities. It is noted for its applied psychology, especially industrial psychology, as a significant research and education unit in psychology in China. Its main areas cover human-computer system design in modern industrial production, intelligent HCI and virtual reality, and usability is one of its important research directions. The one and only national key laboratory of psychology in China – Industrial Psychology Laboratory of Zhejiang University, is affiliated to the department. The department now has 31 staff members including 12 professors and 6 associate professors, around 50 Ph.D. candidates, 170 Master graduate students and 220 undergraduates.

7.4.7 Industrial Design Department, Xi'an Jiaotong University

The industrial design department (http://www.xjtu.edu.cn/yxsz/jxxy_3.html), affiliated to the mechanical engineering school of Xi'an Jiaotong University, was founded in 1999 by Professor Leshan Li, and started the undergraduate educational program that year. It started the programs for a master's degree in art theory in 2000, and a doctoral degree in engineering art design in 2002. Nineteen graduate students have got their degrees in art theory since then. The department has been trying to develop interaction design education based on traditional industrial design programs and has made plenty of explorations and innovations in teaching materials and instructional methods for students.

A series of textbooks were published by them in recent years, including Industrial Design Psychology, Human-computer Interface Design (Theory Part), Industrial Sociology and Fundamentals of Industrial Design Thoughts. Each of them is the first one in China. Several books published in the west were translated and published by them, including Design Geometry, Design Elements, Industrial Design Material and Processing Handbook, etc. Several research-oriented courses were set up, and all the undergraduate students completed their graduation projects in industry and 60–70% of the projects were directly adopted by the enterprises. Students of the department won a design competition in Osaka four times and have received 12 visual design patents.

7.4.8 Digital Media Research Center, Sun Yat-Sen University

Digital Media Research Center (http://www.hci.sysu.edu.cn/en/index.asp), affiliated to the School of Communication and Design of Sun Yat-Sen University, was founded in 2005, focusing on human-computer interaction, human-machine interface design, 3D GUI interface design and usability testing.

They have financial support from the China Natural Science Foundation (Microsoft Research Asia Joint-funded projects) and the China Natural Science Foundation (South Korea Cooperation Fund). They have published 13 academic papers and visited several famous universities in recent years.

7.5 Organizational Activities

The earliest academic activities and conferences in China can be traced to the beginning of the 1990s. A HCI session was included in the International Conference for Young Computer Scientists (ICYCS) held by China Computer Federation (CCF) in Beijing in July 1991. That may be the first HCI session in a conference held in China. Then, a HCI-related panel was included in the National Conference for Young Computer Scientists (NCYCS) held by CCF in Beijing in October 1992.

The ICMI (International Conference on Multimodal Interfaces) was held in Beijing 1996, 2000 and 2010. The fifth Asia Pacific Conference on Computer Human Interaction (APCHI2002) was held in Beijing in November 1–4, 2002 (Center for International Scientific Exchanges and Chinese Academy of Sciences 2002). One hundred and thirty researchers from over 20 countries attended the conference. Some internationally well-known HCI experts (John Carrol, John Karat, Daniel Siewiorek, Masaaki Kurosu, Aaron Marcus, etc.) were invited as keynote speakers. HCI International (2007) was held in Beijing 22–27 July, 2007. It had about 2,300 participants from 76 countries, including some 150 attendees from China and 700 attendees from the rest of the Asian region. IEA (International Ergonomics Association) 2009 held in Beijing 9–14 of August, 2009 (Linkedin 2009) covered many HCI and usability issues and attracted over 1,000 attendees from more than 60 countries including around 300 from mainland China, Taiwan and Hong Kong.

Along with the growth of the usability field and a community of interest, some usability-related professional organizations like ACM SIGCHI China and UPA China have established these years and have been actively organizing various activities to foster research, education and practice in the field.

7.5.1 ACM SIGCHI China

ACM SIGCHI China (http://iel.iscas.ac.cn/sigchichina/) was founded in 2004. It consists of the major leading HCI and usability players from academia and industry in China. China Human Computer Interaction Conference, held by ACM SIGCHI China Chapter, is the only conference specializing in HCI and usability in China. The conference has been held annually as a part of the Joint Conference on Harmonious Human Machine Environment (HHME) since 2005. Its themes cover the work in theory, technology and design methodology in HCI. Research and practice related to usability, UX and interaction design are important parts of the conference, with a wide range of involvement of UCD applications in different products and domains, UCD processes, accessibility, cultural factors, social issues etc.

ACM SIGCHI China co-sponsored the five Sino-European System Usability Seminar Tours held in 2005–07. It was sponsored by the EU Asia-ITC program funded project SESUN and organized by Sino-European Usability Center. In this series of tours, each tour covered three major cities across China and held a 1 day seminar at each city that was given by 3–4 leading usability experts from Europe. It attracted over 1,000 practitioners in industry and university students from all around the country. Many people involved in usability in China nowadays actually became aware of the usability concept and got their introductory knowledge of this field from this series of events. Moreover, SIGCHI China also sponsors the Serial Lectures on Human Centered Information Society since 2008 to provide a platform to broaden the influence of HCI by bringing together the HCI experts in China to address to university students and practitioners in industries who are interested in this domain, and to facilitate the communication between academia and industry. It has since been held in different cities in China, like Beijing, Guangzhou, Jinan, Wuhan, Qingdao and so on. With the support from ACM SIGCHI, the recently launched China Distinguished HCI Speaker Series by SIGCHI China attempts to bring together the HCI research community in China, expose community members, especially students, to some of the leading research going on both inside and outside of China, and to catalyze connections and exchanges between the community members. This is accomplished by a set of guest lectures that will rotate among the key HCI research institutions in China. The distinguished speakers are invited from both industry and academia, across Asia, North America, and Europe, who have already made a strong impact in the HCI research community.

7.5.2 Usability Professionals Association (UPA) China

UPA China (www.upachina.org) was founded in 2004 in Shanghai and had some 280 members by 2009. It has organized the User Friendly conference every year since then. The conference is for usability practitioners and designers from the industry. It has activities such as invited talks, training seminars, workshops, round-table sessions etc., covering almost all aspects of usability practice including strategic usability, user research methods, interaction design, WEB usability, mobile usability, innovation, organizational issues, etc. In recent years, UPA China also started to organize local community activities in some regions in addition to the User Friendly conference.

7.5.3 Chinese Ergonomics Society

The Chinese Ergonomics Society (http://www.cesbj.org/) was founded in 1989 and has 450 members under several specialized technical committees. The society holds annual conferences and one congress accompanied with seminars every 4 years. The journal of the society, Chinese Ergonomics, is published quarterly. The society hosted the 17th World Congress on Ergonomics (IEA 2009) in August 2009.

7.5.4 Chinese Psychological Society

The Chinese Psychological Society (http://www.cpsbeijing.org/) was founded in 1921. Now, it has 15 Special Interest Groups (SIGs) and around 8,000 members distributed in 31 local provincial chapters. The contents related to usability or HCI often appear in the annual Chinese Congress of Psychology (CCP) held by the society and in the periodicals issued by it.

7.5.5 Industrial Design Institution of Chinese Mechanical Engineering Society

The Industrial Design Institution of Chinese Mechanical Engineering Society (http://cids.dolcn.com/) was founded in 1986. It organizes the annual China International Industrial Design Seminar, National Industrial Design Academic Conference, Product Innovation – Chinese Industrial Design Forum, Chinese Enterprises – Product Innovation Design Awards Ceremony, etc. Those activities often involve interaction design of products in recent years.

7.5.6 UCD Book Club

UCD Book Club (http://ucdchina.com/club/) was founded in 2007. Its activities are initiated by UCDChina.com online and participated in by product designers offline. Nine cities are included in the host list, and communication/discussion activities are held simultaneously in the cities every month. The club is evolving into an influential organization in the domain of Internet product design with around 200 members. The First Congress of UCD Book Club was held in Guangzhou in November 2009, with activities of expert forums, round-table meetings, workshops, parties, etc. Over 400 product designers attended the congress.

7.5.7 Websites and Blogs

Apart from the professional organizations, some grassroots websites and blogs were also created by individuals to facilitate communication and spread usability-related knowledge and experiences.

ChinaUI.com once was the biggest website for UI designers in China in the early 2000s with several thousand registered users. People gathered there actively discussing on various UI design and usability related topics and sharing relevant information. Another example is uiGarden (Moraveji and Liu 2008), a bilingual on-line magazine that first published in 2005, providing opportunities for researchers and practitioners who work in UX, information architecture and UI design fields in the Chinese and the English speaking worlds to publish their thinking and exchange views with each other. There are also some other websites and blogs of this kind, which can be found at the link page of UCDChina.com (http://ucdchina.com/123/).

7.6 Trends and Challenges

As stated above, usability, which was previously an unknown concept, has within the past decade become common in many leading enterprises and is now a prosperous area of research and practice in China. In industry, most leading Chinese enterprises in this area have had several years of experience in UCD practice. Just like those described previously for the industry practice in this chapter, some of them achieved great success and have succeeded in making UCD well accepted by the management and product development teams. UCD teams are continuing to grow in size and are developing their experience and multidisciplinary expertise. UCD practitioners are generally optimistic about the outlook and are satisfied with the current situation. In academic research and education, usability and UX has become an important component in the HCI field. HCI research in China has changed from the situation where people just focus on technological issues to a situation where design methodology of interactive systems and UCD is increasingly becoming an organic component and an important measure in the research. In addition to seeking technical solutions for interactive systems, people are now also starting to think about what and why to build and how to validate and evaluate. It is approached more from a multidisciplinary perspective than it was 10 years ago. Usability and interaction design has become a well accepted educational program in industry. Several professional organizations are active in this field from different angles.

All of this progress is indeed satisfying. However, there are still a lot of challenges to face in this area, such as:

- After the original fresh experience of introducing UCD methods to achieve great impacts, new challenges of deepening UCD application to meet people's ever-increasing expectations are arising.
- Due to problems in experience and capability of usability practitioners and the acceptance of usability by enterprises, the survival and development of UCD teams in some enterprises is still uncertain.
- The expertise of UCD teams needs to be accumulated and improved continuously by an established scheme. The UCD activities need to be systematically integrated into the processes so as to gain a long-term sustainability.
- The value of UCD in earlier stages of the product lifecycle needs better recognition in many enterprises and the processes to enable its contribution to innovation need to be better developed.
- Like the pervasive problem existing in Chinese academia and industry, a well-established synergy scheme between academic research and industrial practice is still to be explored and achieved. This way, the academic research can better meet the needs of the industry and the industry can benefit more from the latest results of research.
- The education and training for usability professionals needs to be strengthened. On the one hand, the educational programs of related disciplines in universities should be developed to systematically train more students in this profession. On the other hand, the on-the-job training for usability practitioners should also be

developed and improved according to various needs to let more practitioners enhance their UCD expertise.

- Only 10–20 universities offer HCI courses for undergraduate and graduate students at present. Efforts should be continuously made to make HCI courses included in the central government controlled nationwide unified syllabuses for computer science, design and other related disciplines. This will greatly propel more universities to set up such kinds of courses and therefore substantially enhance the awareness of usability and UCD.

The major driving forces for the great progress in usability and UCD in China in recent years are mainly from two areas. On the one hand, it is the ever-increasingly pervasive ICT applications in various domains of people's life and work. On the other hand, it is the trend towards the ever-increasingly globalized market and continually rapid growth of the Chinese economy. These will be the fundamental trends for the foreseeable future. Moreover, the value of people-orientation, which has been widely recognized and regarded in Chinese society in recent years, will be an added driving force for the progress. We therefore have enough reasons to believe that usability in China will definitely have an even brighter and broader future if we can get the fore mentioned problems solved.

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Chapter 8
Usability in the Czech Republic

Pavel Slavik and Zdenek Mikovec

8.1 Overview of the Czech Republic

The Czech Republic is located in Central Europe and is one of the smaller countries in Europe. The area of the country is about 80,000 km^2. The population is slightly above ten million inhabitants. The capital city is Praha (Prague), where most of the important institutions are located. Most of the population works in industry and services – only about 2% of the population works in agriculture. This is related to the fact that 53% of the population lives in cities.

The Czech Republic is a member of the European Union (EU), which means that it is closely interlinked with the economies of other EU countries. The country joined the EU in 2004 and belongs to "new EU member states". The economic level is below the average level of all EU states taken together. Currently the economic level of the Czech Republic is about 70% of the average for the EU. There are two large industrial sectors in the country: car manufacture and IT based industry and services. Industry in the Czech Republic employs about 39% of employed people (this is the largest share of this type in the EU). The share of the working population in agriculture is about 3%. The rest of the actively working population is employed in services. Last years were heavily influenced by the penetration of IT technologies both into the national economy and private life. For example, the percentage of households with an internet connection is about 41% (data from 2008) and the percentage of mobile phone users is 132% (data are also from 2008).

This economic structure is supported (besides other factors) by a good system of higher education. There are about 20 state funded universities in the country that are oriented towards education in the field of technology or natural sciences. Every year they produce thousands of graduates in the above named fields (and of course in many other fields as well).

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The history of the Czech nation goes deeply back into history – the first state was founded about 1,200 years ago. Such a long historical tradition reflects itself in the economy and also in cultural heritage that can be admired virtually in every place of the country. The spectrum of cultural heritage that can be seen in the Czech Republic is very wide – from architecture and literature to music. The names in the field of music like Dvorak, Smetana, Janacek etc. are widely known all over the world. In the field of architecture we can trace activities of giants in the field like Mies van der Rohe, Adolf Loos and many others. For centuries Praha was an important place for science where important results were achieved. To name just a few of the many scientists who worked in Praha: Tycho de Brahe. Johannes Kepler, Albert Einstein. Many prominent artists have also spent some time in Praha, often paying visits to Czech artists. When walking through Praha we can see many memorial plates with famous names in the field of culture like Mozart, Beethoven and many others.

The country does not just rest on its glorious past. In recent times, many interesting results have been achieved. A few decades ago Czech artists were pioneers in the application of modern audiovisual technologies in the field of art. Just to name a few examples: Laterna Magica (in the year 1958 – combination of movies, theatre and live music), Kinoautomat (in the year 1967 – where the cinema visitors could interactively influence continuing of the movie). This tradition forms good conditions for research and application of new methods in various fields, especially in cases where human factors might play an important role.

8.2 Overview of the Usability in the Czech Republic

Usability issues have a rather long tradition in the Czech Republic. We can consider these issues at the time they were investigated. The first period of time can be dated about five decades ago when usability was of interest in the "pre-computer" era. The investigations were oriented towards problems of working with user interfaces that were used in various technological environments like train driving, airplanes, power plant control etc. The methodology used in those times differed substantially from methodologies used nowadays. Nevertheless, many of the findings from this very field were integrated into psychological aspects of usability testing later on.

The second period of time is characterized by usability research in the computer environment. In this paper our attention will be concentrated on usability issues linked up with computers. Before usability as such appeared as a scientific discipline first HCI as a scientific discipline had to appear in our country. Like in all other countries the problem of communication between people and computers appeared exactly at the time when computers started to be available for a wider population (work with computers was not limited to a small group of computer experts). Wider availability of computers for a wider audience came later to this country (formerly Czechoslovakia) than to other European countries (we mean industrially developed countries in Western Europe) – as there was a technological gap between East and West European countries. This situation had mainly political reasons – such as the embargo imposed on Eastern and Central European countries, which excluded the possibility of benefiting from advances in the field of IT technologies achieved in the US and in Western European countries. Another reason was the structure of research in our country (mainly oriented towards heavy industry). In general this era was characterized by obsolete computer technology that did not provide much scope for HCI research.

The situation started to improve in the first half of the 1980s when PC like computers reached wide markets in Eastern and Central Europe (including our country) – although not to a comparable scale with Europe in general (or in the US). From that time (about mid 1980s) an interest in the theory and practice related to HCI started to grow in our country. At the very beginning of this process (in the first half of 1980s) the systematic approach was experienced in individual classes of applications where interaction between people and computers took place – like graphical interaction, interaction by means of voice based interaction, textual based communication etc.

The very first attempts to evangelize a systematic approach to the design of user interfaces were made at Czech universities. Besides research in the field, corresponding education started – including courses for people from industry. The first special courses dealing with problems of user interface design were run during the above-mentioned period of time. After political changes in Europe the number of companies dealing with software design increased dramatically. Nevertheless, the research of HCI issues was performed in small scale only. The situation changed sharply when large multinational companies like IBM and Sun Microsystems established their research units in the country. In both cases some topics they investigated were closely related to the design of user interfaces.

The next logical step was the establishment of cooperation between universities and these research centers. As the first step the fields where the cooperation should take place were defined. From this point on we will describe our personal experience with collaboration between the Czech Technical University in Prague (CTU) and industry (in this very case IBM and Sun Microsystems). While the cooperation with IBM concentrated on development of speech-based interfaces, the main topic of cooperation with Sun Microsystems was design and implementation of user interfaces for handicapped users (especially visually impaired). It is necessary to stress that in our understanding the usability issues are seen as an integral part of the user centered design (UCD) approach to the user interface design. As such, usability issues are involved in numerous joint projects between CTU and the two industrial partners.

This sort of cooperation had very positive influence both on research by industrial partners and on research and education at CTU. The research by industrial partners took the form of student projects that were in effect feasibility studies. This had the benefit of creating a wider spectrum of pilot solutions for investigation. This approach resulted in a higher quality of solution being achieved. At the university the research topics were included into the curriculum and students got to participate in real research where the usability played a key role. The educational activities were mainly concentrated around the usability lab that was shared by CTU and Sun Microsystems. The CTU students got an extraordinary opportunity to work in the only usability lab in the country. In several cases the results achieved were on a very high level and they were published in a form of papers at international conferences.

Deeper research at the university was performed within the framework of PhD studies. As a result several PhD thesis oriented towards UI design and usability were successfully defended (starting from 2006).

The above activities created a very good base for future cooperation between CTU and industry. After working on small size projects it was possible in further phases of cooperation to start with much wider cooperation (see below). In this wider cooperation a very important role was assigned to the interconnection between research (performed by both sides) and educational activities. Students got deeper insight not only into the way of performing research in large multinational companies but they also got idea about research management in such an environment.

This kind of knowledge played an important role later when students graduated and applied for jobs at various companies and institutions. It is important to stress that usability issues (in the form they are handled in the framework of cooperation described) are of highly practical value. This means that the students are aware from the very beginning that the problems solved are part of a bigger picture and their results will be used in a certain context. Our experience shows that this feeling (the results will be used by someone) is very motivating. This specific framework (where research and education meet) is in a certain sense rather unique and as such it brings a lot of challenges. From the pedagogical point of view it is very encouraging that students are able to work with up-to-date technology and to work in the research environment. In such a way, it is possible to identify students who are in some form predestined for PhD study. The immediate consequence of this approach is that the quality of PhD study in the field of UI design and usability can steadily increase. Another potential activity linked up with usability issues might be organization of courses for people from industry who are interested in obtaining proper knowledge in the field of usability. A big challenge is extension of the research performed in the field into areas that are more human factors oriented – current research covers these issues. It is desirable in the long term to make a study in these fields in more depth. This is caused by the fact that the number of new applications (like virtual and augmented reality) are steadily increasing and thus new approaches specifically tailored to these applications should be developed – based on appropriate research.

Another big challenge is certification of software products (and user interfaces in particular). First steps have been done to introduce some kind of system by means of which it will be possible to evaluate user interfaces (and mainly their usability) according to some kind of standardized approach.

8.3 Usability Activities in the Czech Republic

8.3.1 Usability as a Part of University Curricula

As it was mentioned in Chap. 2 usability issues have been part of the educational process at Czech universities for several years. They are part of lectures dealing with design, implementation and testing of user interfaces. It is necessary to stress that some courses are dedicated to special user interfaces – and specific aspects of usability linked up with these special interfaces are discussed in the framework of these courses. In other words we can say that usability issues are distributed across courses dealing with user interface issues in general way.

CTU was a pioneer in introducing HCI issues into university curricula – see the homepage of Department of Computer Graphics and Interaction (2010). Other universities in the country introduced similar courses much later. That is why we will describe the history of HCI education in the curricula of CTU.

The first course dealing with HCI topics started in 1986 as a part of special training program for people from industry. Eight years later other courses were introduced for specific study track. At this place it is important to stress that these few courses dealt with technical issues like formal description of dialogue, interaction styles, automatic or semiautomatic generation of user interfaces, some basics of graphical design etc. This means that user oriented issues (like user research, UX etc.) played a minor role in these courses. The situation changed dramatically after year 2000 when cooperation between CTU and Sun Microsystems started. As the research unit of Sun Microsystems in Prague was oriented toward usability issues a fruitful cooperation between both institutions started.

Usability activities started in a stepwise manner with small joint projects first. These small projects allowed the gradual build up of the infrastructure needed for the cooperation. The project undertaken also enabled a check on the readiness and abilities on both sides. In our experience the ideal approach was through student projects. The projects were clearly defined and the course of problem solutions was relatively straightforward. Students were supervised by researchers in the company and more formally by university teachers. Our experience showed that it would be rather unwise to assume that the solutions provided by students could be immediately integrated into some products. Firstly, not all solutions showed themselves to be reasonable (for whatever reasons). Secondly, the maintenance of the solution was not ensured after the students completed the course.

The solution was to offer students some projects that had nature of a pilot study. More potential solutions could have been elaborated into final products (even those that were not promising at the first glance). Researchers and programmers in the company elaborated the very best solutions that emerged. In such a way the concept "learning by doing" was realized at CTU in collaboration with external researchers. After the success of this approach the same scheme was used in cooperation with other companies – such as the IBM research centre in Prague. Also, the usability issues played a more and more important role (as has been already mentioned the usability in this particular case is related to speech-based user interfaces).

One of the results of this cooperation was identification of demands for practical knowledge in the field of usability that companies expect from CTU graduates. This information was used for preparation of new courses in the field of HCI. Currently one course (Testing of User Interfaces) is taught within the framework of the BSc study program. In the MSc study program there exists several courses:

- Design and Implementation of User Interfaces
- Interaction between Human and Computers

- Interaction in Mobile Environments
- Special User Interfaces

In all of these courses usability plays an important role. Besides these courses, usability issues are discussed in several other courses where questions of interaction between human and computers play an important role. For example, courses like Web and Multimedia, Management of Electronic Documents in Companies, and Data Visualization. A support course called "Introduction in Applied Psychology" is currently under development.

As principles of usability testing are acquired during BSc studies it is possible to deepen knowledge during MSc studies in the framework of specific courses (oriented towards some particular issues). Also in these specific courses the students work on projects that come from practice (first of all from Sun Microsystems and IBM). The students have to demonstrate their knowledge of a large variety of user interface testing approaches, including methods with and without users. They should be able to prepare an experiment, conduct the session, evaluate the data obtained and write the final report on the test (containing findings and recommendations).

Most usability testing takes place in the Usability lab that was founded as a joint lab by CTU and Sun Microsystems in 2003. In such a way students can exploit all functionality offered by such a professional lab.

There are also other fields with courses where interaction (and in a certain degree also usability) are taken into account. These activities take place in IIM (Institute for Intermedia – see http://www.iim.cz). This institute is part of CTU and is shared by two faculties of CTU (Faculty of Electrical Engineering and Faculty of Architecture) and by Film Academy. Here students from these faculties work on projects where information technologies are used in the field of art (architecture, movies, theatre etc.). These activities represent a big challenge for the future as many specific usability problems have appeared that need to be solved.

8.3.2 Industrial Activities in the Field of Usability

These activities can be divided into three parts:

- Activities based on cooperation between universities and industry
- Activities with "industrial flavor" – in this case we have in mind first of all work on international projects funded by the European Commission
- General non-academic activities performed in the country

As already mentioned the cooperation between CTU and industry is very intensive (with many benefits for both sides) – and as such has also "industrial flavor". The first stages of cooperation had a form of small size projects. After the success of this form it was necessary to find another means by which the cooperation could be deepened. In the case of Sun Microsystems the solution was found in establishment of the Centre of Excellence. This Centre was established in the framework of a world wide program organized by Sun Microsystems where individual research topics are investigated in cooperation between Sun Microsystems and universities world wide. In the case of CTU the Centre is oriented towards problems of accessibility and usability – the project acronym is SUCESS (SUCESS center of excellence 2010). The project has three main goals. The first goal is to modify at least two web development toolkits (which can be embedded into NetBeans IDE) to generate accessible rich internet applications (ARIA). Based on the experience with implementation of the ARIA the feedback will be given to W3C by means of comments to the ARIA working draft [http://www.w3.org/TR/wai-aria/]. The second goal is to modify NetBeans to help developers to build accessible web applications with at least two web development toolkits. The last goal is to modify NetBeans to support developers with visual impairment.

Projects funded by the European Commission play a very important role in the development of usability. These projects enable usability in the Czech Republic to attain the same level of acceptance as it does in the more established EU countries (e.g. UK, France, Germany), where usability penetrates more activities relating to design and development. By means of these projects it is possible to transfer patterns used in the process of development into countries (in this case new EU member states like Czech Republic) where usability, and systematic UI design in general, is not as developed as it is in the more established EU member states.

Industrial activities in the Czech Republic dealing with usability can be divided into two parts:

- Activities performed by software developers (we have already given some examples like Sun Microsystems),
- Activities oriented towards the development of UI that have large-scale impact on the population. A typical example of these activities is development of a UI for various web applications or projects oriented towards impaired users.

One of the main industrial players in the field here in the Czech Republic is Sun Microsystems. The company has a very long history in the field. On the other hand, here in Prague, Sun Microsystems had to start from scratch. A local branch was built on top of the acquired startup NetBeans (in 1999) and all usability know-how and processes had to be established from scratch (mainly by Sun Microsystems experts in California). It included creating a local full-featured user experience (UX) team and a usability lab.

The main challenge was hiring, since up until a few years ago there was no dedicated curriculum for UX at any local university and no other company employed UX experts. So it was necessary to hire people interested in working in this field and with an appropriate talent. The best hiring tool turned out to be projects with the local university (CTU in Prague), which allowed Sun Microsystems to observe students for several months and pick the best ones.

In Prague Sun Microsystems was historically focused on the NetBeans integrated development environment (IDE) and also all other projects developed in a local engineering center (e.g. Java FX Mobile SDK, Sun Grid). The whole lifecycle was covered: user research, interaction design, visual design and usability evaluation. Sun Microsystems also has a local usability lab, which is the only Sun non-US usability lab. It is worth noting that the work on NetBeans is open sourced (see ui.netbeans.org), which is very unique in that all the designs, prototypes, reports from usability studies, visual design elements etc. are all publicly viewable.

As in other countries, in the Czech Republic web applications play an important role in various economic activities. Because a wide audience had to communicate via web – it was necessary to take into account usability issues in the web environment. The first attempts towards spreading usability and accessibility knowledge in the Czech Republic appeared in 2002 together with the Dogma W4 – a private initiative of web designers Petr Stanicek, Marek Prokop, Martin Kopta and Pavel Kout. The Dogma W4 strived to set web design principles with a set of basic rules. Some of the Dogma W4 authors went on with publishing articles about usability at web design and IT magazines (Interval.cz, Lupa.cz, Zive.cz) published in the Czech language.

In 2003, Dobry web (Good web) consulting center was established by the Internet Info consortium and it became the first major commercial organization focusing on corporate web site usability. From the very beginning Dobry web offered services to a wide audience (companies, institutions, enterprises). The services included web usability testing, consultation on web design and related activities. Later on, Dobry web started organizing public lectures dealing with web usability. Usability itself became a widely discussed topic among web professionals, very often reaching for inspiration from abroad – Jakob Nielsen and Steve Krug articles and books were the essentials. Informal discussion groups, where web designers took part, were established. Later the web design community joined in the activities of the local ACM SIGCHI chapter.

In 2004, the Ministry of Informatics published Czech web accessibility guidelines. The rules needed an update in 2006 when the WCAG 2.0 were approaching. Based upon a public tender, the document was worked out in cooperation with H1.cz (internet consulting company) and Tyflocentrum Brno (company that produces supportive tools and software for blind people). As a result, the final accessibility guidelines were published in 2008.

Besides specialized agencies, several major web design studios are currently offering web usability services. There are also new usability blogs appearing – for example pouzitelnost.info or pouzitelnost.com (pouzitelnost means usability in Czech).

8.3.3 Conferences and Organizations in the Czech Republic

Usability conferences are relatively new in the Czech Republic. There are conferences dealing with specific forms of interaction in general without a specific focus on usability issues. A good example of such a conference is WSCG (Winter School for Computer Graphics) (http://wscg.zcu.cz/), which runs on annual basis at the University of West Bohemia in Pilsen. Here certain aspects of graphical interactions are discussed. Another conference that is in a certain sense HCI oriented is TSD (Text, Speech and Dialogue) [http://www.kiv.zcu.cz/tsd2009/] that also runs on an annual basis (jointly organized by universities in Pilsen and Brno). Here some aspects of interaction problems in speech-based interfaces are discussed – nevertheless in the last year it is possible to register a thematic shift towards more general problems of human computer interaction. Both above mentioned conferences are international conferences. In 2004 CTU was the organizer of Tamodia conference, which was oriented towards Task Models and Diagrams [http://ihcs.irit.fr/event/tamodia2004/generalinfo.html].

On the national level there is a series of regular events that are usability oriented. These events are organized by local SIGCHI chapter (ACM SIGCHI 2010). The most important event is participation in Prague WUD (World Usability Day 2010). It is the biggest and oldest "pure" HCI event in the Czech Republic, which has been organized by the local SIGCHI chapter since 2005. This event contains several tutorials and workshops in the field. Keynote speakers are mainly from abroad – in such a way local usability experts have the possibility to come in touch with "gurus" in the field. This event (that runs on annual basis in November) helps to create usability community in the country. The number of participants in WUD is about 150–200 people (depending on the topic discussed). Other activities that target this community are lectures and tutorials organized by the local SIGCHI chapter. Approximately six to seven times a year a lecture dealing with some important aspect of usability is given. It is possible to say that there is a sort of usability core in the country that consists of approximately 50–60 people. The local SIGCHI chapter (http://www.sigchi.cz/) has a project to create a new community interested in UX (User Experience) in the near future.

8.4 Examples of Usability Oriented Projects in the Czech Republic

In this chapter we will illustrate a sample of usability-oriented projects in the Czech Republic using several examples from the past. All these projects strictly followed the UCD approach. In all of them extensive usability testing was conducted throughout the design and development process using many test subjects.

8.4.1 Interaction in Special Environments

Here we will introduce several projects dealing with special environments, where the user interaction takes place.

The first project was called ELU (Mikovec et al. 2006) and it was an EC funded project (2006–2008), concerning the user interaction of a digital TV environment (iDTV). Here the aim was to develop a special user interface where an elderly user communicates with an interactive educational course by means of a TV remote control. It is obvious that the possibility of interaction is much more limited than in the case of traditional interaction devices like a keyboard. This limited interaction creates demanding requirements on the quality of the design of the user interface. The usability testing had to be conducted in all phases of the user interface design and implementation, to ensure user acceptance.

Introduction of interactivity to elderly users sitting in front of the TV set with a remote control brought several usability issues. The most important one was related to situations where the audio-visual stream had to be combined with interactive components of the application (e.g., quizzes). The problem was the user focus, which was split between two stimuli – AV stream and the interactive component, which appeared on the TV set. In the first designs the users could observe the AV stream and the components at once. This led in our target group (elderly) to an inability to concentrate on any of the two information sources (AV stream and interactive components) appropriately in order to follow the educational course. The final design (see the left screenshot in Fig. 8.1) avoided two information sources and during the user's interaction with the components (e.g., quiz) the AV stream was stopped. During the interaction the user interface components covered the whole screen hiding the stopped AV stream.

The user tests were focused on two aspects: first on the overall usability of the user interface of the iDTV educational course and second on evaluating the influence of the interactivity on learning efficiency.

The second project we would like to introduce was the MUMMY (MUMMY project 2009) project (EC funded research project 2002–2005). In this project one of the goals was to develop an editor for interaction with complex CAD

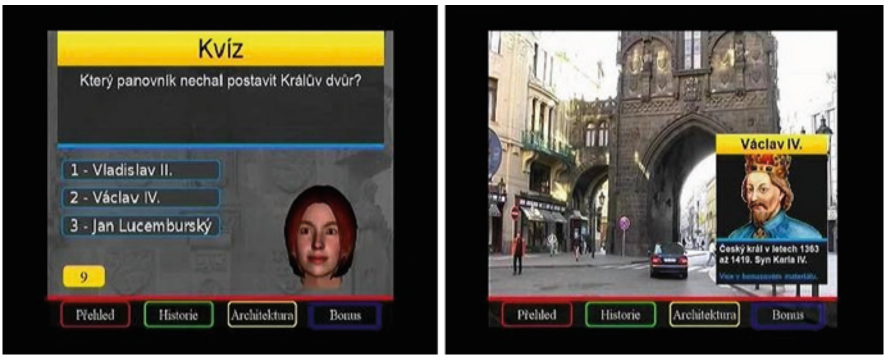

Fig. 8.1 The user interface of iDTV educational course

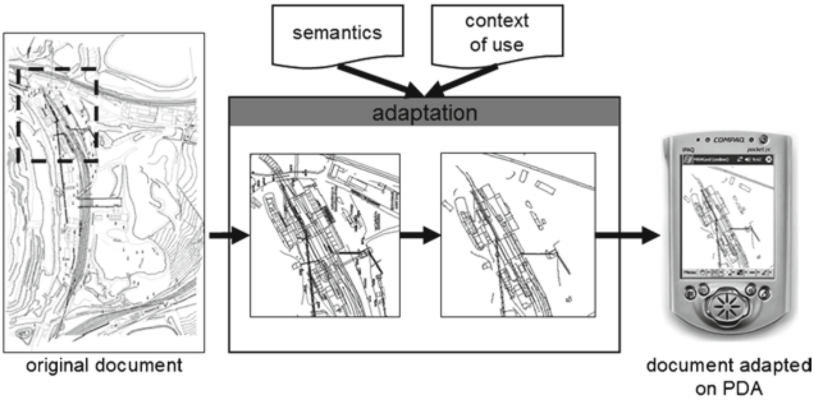

Fig. 8.2 Structure of the semantic based adaptation process driven by the context of use

drawings in mobile collaborative environment. The drawing's complexity was reduced by means of semantic based adaptation driven by the contextual information (see Fig. 8.2).

One of the usability problems was connected with the visualization of the CAD drawings. Unfortunately the PDAs were not suited for processing vector graphics (lack of math coprocessor) and this seriously affected the zooming and panning of the drawing. The editor was not able to redraw the drawing in real time during the panning action.

Some kind of alternative visualization of the panning process had to be designed and was a subject of the usability testing. The first panning visualization (see Fig. 8.3 on the left) was designed to draw an arrow in the direction of the next move in the drawing. The usability tests showed that this visualization did not work. Based on this finding, a second visualization using a grid metaphor was designed (see Fig. 8.3 on the right). This way of panning visualization was clear to the users and no other usability issues occurred.

8.4.2 Multimodal Interaction

Here we will introduce several projects dealing with multimodal interaction. All projects use voice as an additional communication channel.

The goal of the first project (Mikovec et al., 2006) was to implement voice control of a system for inventory processing. The audio communication between the system and the user had to be based on natural language dialogue. The issue here was how to increase the reliability of the voice recognition system to an acceptable level.

The approach to the multimodal interaction designed in this project is based on dynamic restriction of the conversation language (see Fig. 8.4). The restriction of

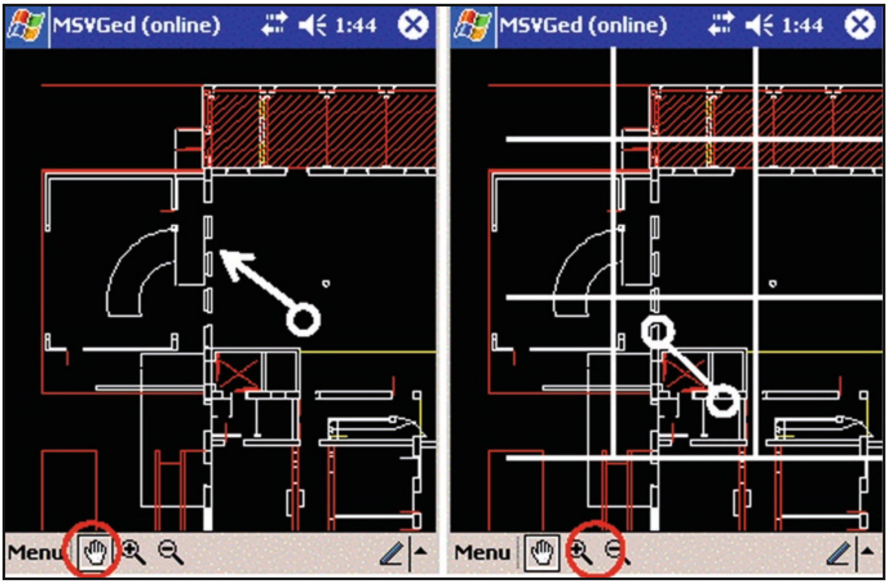

Fig. 8.3 Usability issues during panning operation caused by low performance of the CAD plan editor on PDA

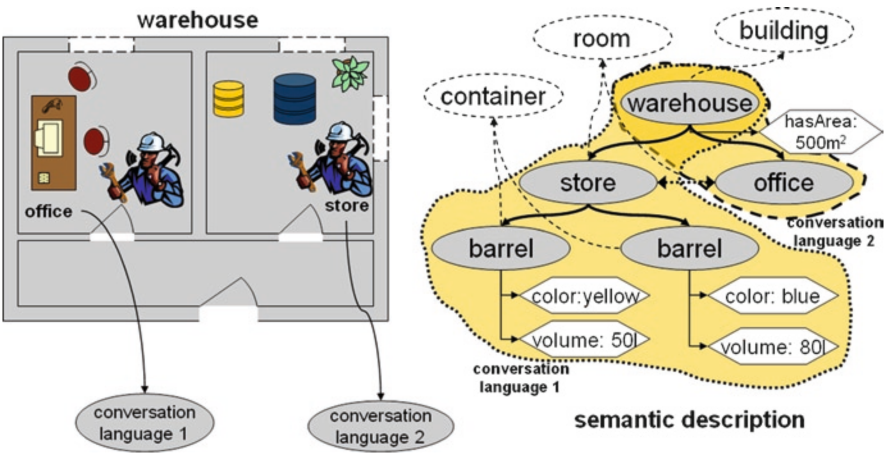

Fig. 8.4 Construction site inspection: The worker location specifically restricts the conversation language

the language is done with respect to the current context of use. In this case the position of the worker in the warehouse restricts the conversation language, which is generated from the semantic description of the warehouse.

The usability tests were focused on two aspects:

Fig. 8.5 Non-verbal vocal gestures for mouse gesture simulation. X-axis represents time and Y-axis represents the pitch

- Determining the extent of the language where the speech recognition system is still reliable at the required level,
- Testing the hypothesis that during the conversation it is possible to reduce dynamically the input language (according to the current user context – worker's position) in such a way that the users will not feel any restriction in their speech queries during the work process.

A second project (VitalMind, 2010) was focused on the usage of voice for mouse cursor control. In particular the problem of how to simulate mouse gestures like click, right-click, double-click, drag-n-drop, scroll-up, and scroll-down by means of non-verbal vocal gestures was solved (see Fig. 8.5). The main usability issues in the field of voice interaction are: reliability, speed, ease-of-use and cultural independence. The non-verbal vocal gestures are recognized much faster than verbal commands and can be used for real-time control. They are also culturally and language independent. The problem here is that this is a very unusual way of interaction and the users have to get used to it.

The usability study was focused on evaluation of the non-verbal vocal gestures efficiency. For this purpose a comparative test was prepared. There were four interaction methods for mouse gesture simulation included in the test. Besides the non-verbal vocal gestures, speech commands, keyboard and a pie menu simulated the mouse gestures. During the usability test the efficiency of the mouse gestures was measured (speed and error rate). The non-verbal vocal gestures were the second most efficient method after the keyboard.

8.4.3 Users with Special Needs

The Czech Republic, in common with most other EU countries, has an increasing share of aging population. Currently the share of elderly is over 15% of the population, and this is expected to rise. This situation represents a challenge and one of the possible approaches to coping with it is the use of information technologies. IT can provide support to elderly people in all kinds of situations they may face. This approach reflects the fact that elderly people suffer from gradually worsening health – some IT based solutions have to be developed in order to compensate for problems of this type.

The project NaviTerier (2010) was focused on visually impaired users. The aim of this project was to develop an indoor navigation system for blind people. The system works as a guide and provides the user with a description of the building and navigation instruction. This is done by means of a text-to-speech synthesizer

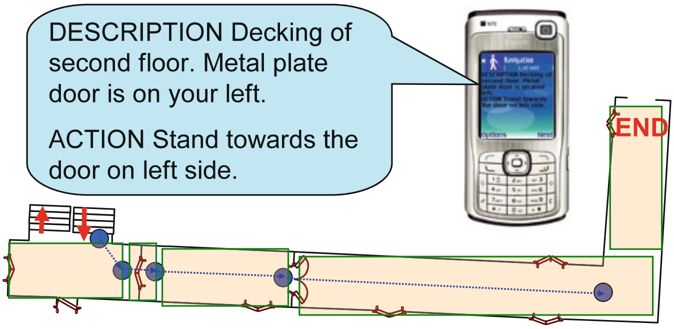

Fig. 8.6 The building description is divided into several segments, which are then one by one presented to the user during the user navigation in the building

Fig. 8.7 The aim of the i2home project is to provide the elderly with integrated user-friendly control of household appliances

which reads the instructions. The description of the building is divided into several segments (see Fig. 8.6) between those the blind user navigates her/him self. The objective of the extensive user testing was to define an efficient description language and to determine the optimal length of a navigation segment. The usability issue here is that we need to use the audio input of the user, which is at the same time necessary for orientation in the environment.

Usability tests of the system were conducted continuously during the whole development process, starting with low-fidelity prototypes tested by means of the Wizard of Oz method and ending with a fully functional high-fidelity prototype, where blind users navigate in the building without any assistance.

The i2home project (2010) was targeted on elderly users. In this project the aim was to design an intelligent household, which can help elderly users live independently and safely control all their household appliances. This should prolong the time the elderly live independently at home before being moved to supervised retirement homes (see Fig. 8.7).

The main goal of the user testing was to determine the right way of interaction, an optimal design of the user interface and the flow of activities of elderly users.

The main issue was to develop the complicated control of all home appliances in a way, where no hierarchies are introduced, where at every stage the user can get safely to the starting point and where only the very minimum of controls are present at one time.

8.5 Conclusion

We have provided an overview of the current state of the art of usability in the Czech Republic. The Czech Republic in general is a country where usability is not as mature as in countries with a long tradition in HCI and related fields. Nevertheless, key activities that led to the current situation (when usability is of interest to enterprises and companies) were described. The development in the field was documented mostly with activities performed by the Czech Technical University in Prague (CTU). The reason for this approach is obvious: CTU was the founder of the HCI (and related usability issues) in the country. It is possible to say that this situation (when CTU is the most influential academic institution in the field) persists. This fact is well documented by a recent survey of usability research publications (Bartneck and Hu 2009). In this survey the Czech Republic takes 32nd place and all authors of Czech papers work at the Czech Technical University. CTU also plays an important role in establishing HCI and UX community in the country. The experience described in the paper gives a good overview of the situation in the field in the Czech Republic (covering important aspects of the issue discussed).

HCI and usability activities have a relatively long tradition in the country but the real boom started just a few years ago. The reason is that the interest in usability issues has started to increase dramatically because of an increasing number of international companies (like Sun Microsystems, IBM etc.) in the Czech Republic and also the local small/medium sized enterprises (SMEs), which now employ usability in their software products. The most important fact is that there is already a well-established usability community in the country where intensive communication among individual members takes place. Another important issue is that Czech usability activities are well linked to usability activities worldwide (e.g. organization of World Usability Day – to give just a single example). In general it is possible to say that this usability community has exceeded a “critical mass” and there is a good chance that this community will contribute to the development and evangelization of usability in the country and to the tightening links with similar communities abroad as well.

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Chapter 9
Usability in India

Anirudha Joshi and Saurabh Gupta

9.1 India in a Nutshell

The span of known history of India covers more than 5,000 years. It began with a mysterious culture along the Indus River (now in Pakistan). Archaeological evidence suggests that at the end of the fourth millennium BC, an urbanised civilisation had emerged in India that used materials such as iron, copper, gold, silver, cotton, and ceramics, planned towns such as Harappa, Mohenjodaro, Mehrgarh, and Lohtal, and had active trade links with Mesopotamia. The culture of India was subsequently shaped by constant integration of the migrating people with the diverse cultures with the indigenous culture – the Aryans from Central Europe in ancient times, the Persians, Iranians, and Parsis from West Asia in the medieval times, and within the last 500 years, the European traders and colonisers – the Portuguese, the French, and finally the British who colonised most of India in modern times.

India acquired independence of British rule on August 15, 1947. Today, India is a sovereign socialist democratic republic with a parliamentary system of government. The country is organised as a federal union with 28 states and 7 union territories. The republic is governed in terms of the Constitution of India, which came into force on 26th January 1950. India is the world's largest democracy and the second-most populated country with an estimated population of 1.18 billion people in 2010 (which – to give an idea of the scale – is more than the populations of the European Union, USA, Brazil, Russia, and Australia combined).

India is a land of diversity bordering on contradiction – for anything that one could say about India, the opposite could also be true. India has more than 2,000 ethnic groups, and every major religion is represented. The most modern technology co-exists with oldest traditions within the same city, often within the same family. While a few Indians are counted among the richest in the world, millions must be considered among the poorest. Human degradation may be witnessed at an

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unprecedented scale in India, but also heights of moral ascendancy – parents who endlessly sacrifice for their children, friends who are loyal, strangers who are kind, and roadside vendors with dignity.

Languages spoken in India add to its cultural diversity. India has 22 official languages and several more dialects. Hindi is the language understood most widely and is the national language. According to the 2001 census, Hindi is spoken by 41% of the people as their first language and another 10% people can speak it as their second language (Census of India 2001). While much of the central administration, corporate business, and higher education happens in English, less than 15% of the people can speak English, and mainly as a second or a third language. That still would add up to 180 million English-speaking people in India, a substantial number.

Variety is to be seen in education and occupation as well. On the one hand, India boasts of the second largest pool of engineers and scientists in the world. On the other hand, a substantial 35% of the Indian population was not literate in year 2001, and another 28% had studied up to primary school or less. Externally, India is thought of as the destination of choice for technology outsourcing – internally, a large majority in India still depends on agriculture. While the country is urbanising rapidly, 72% of its population lived in villages and 58% of the workers directly depended on agriculture for a livelihood in 2001 (Census of India 2001).

Not surprisingly, the first four decades after the Indian independence saw a socialistic economic policy with an emphasis on self-reliance, employment generation, and promotion of agriculture. With the help of an agricultural movement called Green Revolution, India managed to move out of a period of mass famines and hunger deaths by the 1970s. However, in this period urban development suffered and industrial growth stagnated. Several businesses such as steel, mining, machine tools, electricity, airlines, telecommunications, banking, and insurance were nationalised. The period was marked with an industrial policy that came to be known as the license-quota-permit system that led to pervasive corruption, slow growth, absence of competitiveness, and outdated technologies.

While an emphasis on inclusion continued to be a part of the government's economic agenda, economic reforms started in the second half of the 1980s and have continued since, more or less independent of the political party running the government. Sectors such as consumer electronics, automobiles, education, banks, telecom, media, airlines, retail, and insurance opened up one after the other, introduced real competition, and this created an unprecedented choice to the consumers and an unprecedented growth in the economy. This economic growth has persisted despite the recent turmoil in the global financial markets. It created several new jobs, mainly in the cities, and induced waves of migration into urban areas. Meanwhile, the government has tried to respond by improving the infrastructure such as roads, airports, railways, water supply, and power. While the infrastructure is still far from adequate and lags behind the growth curve, it is indeed much better today than it has ever been.

According to the International Monetary Fund, the economy of India is the eleventh largest in the world by market exchange rates and the fourth largest in the world by GDP measured on purchasing power parity basis (International Monetary

Fund 2010). Goldman Sachs predicts that India could be the third largest economy of the world – just after the United States and China by year 2035 (Poddar and Yi 2007).

There are indications that the recent growth has been real and equitable across economic strata in the country. Bijapurkar states that when compared on a like-to-like inflation adjusted basis, the total number of households in the lowest two (out of five) income groups have actually declined sharply between years 1995 and 2006, while the sizes of top three income groups have grown (Bijapurkar 2007). She expects that the number of lower income households to continue to decline at 10% annually.

India is a young country with 54% of its population below the age of 25 (Census of India 2001). India's "demographic dividend" is expected to come in the 2020s (Nilekani 2008). Nilekani feels that this dividend can only be cashed if we can bring in substantial improvements in our school education and infrastructure.

9.2 Information and Communication Technology Industry in India

A large proportion of Indian information technology companies are in the business of doing outsourced work. The information technology and business process outsourcing (IT-BPO) industry existed in its nascent stages through the 1970s and the 1980s. It grew very fast through the 1990s and the 2000s as the high-cost economies in the US and Europe off-shored jobs to a fast-growing pool of talented young engineers passing out of the newly-privatised higher education system in India. The spread of the internet and telecom networks, the English-speaking abilities of the young Indian graduates, the arbitration opportunities afforded by the Indian Rupee against major international currencies, and phenomena such as the Y2K bug, all helped this growth.

According to the National Association of Software and Services Companies (NASSCOM), in the year 2008 the industry employed 2.23 million people directly and another 8 million people indirectly (NASSCOM 2009). In the financial year 2009, the Indian IT-BPO industry achieved estimated revenue of USD 72 billion of an estimated worldwide market of USD 967 billion. Despite the slowdown in the global economy in that period, NASSCOM expected the global off-shoring market to grow, as the addressable market is more than five times the current market size.

The growth has not been only in numbers. In the early years, contracted software development companies from India were perceived to be involved in coding and testing of the software "as required" by their clients. Over time though, many of these companies have evolved and achieved higher levels of process maturity. Currently, the Indian contracted software development companies offer full-lifecycle services in planning, modelling, construction, deployment, and maintenance of software. As of December 2006, over 440 Indian companies had acquired quality certifications of which 90 companies were certified at SEI CMM Level 5 – higher than any other country in the world (NASSCOM 2007). Today, the Indian IT industry comprises of both Indian and international service providers.

Despite the presence of a large IT-BPO industry, until very recently it would have been fair to say that the shoemaker's son went without shoes in India. Traditionally, the availability and use of information and communication technologies (ICTs) within India has been poor. In year 1991, India had about 5.5 million phone lines (Jhunjhunwala 2001). Penetration of computing devices was similarly miniscule. Only in the last few years, that usage of ICTs (and particularly mobile phones) has picked up. Yet, of the total IT-BPO revenue of USD 72 billion, the domestic sector accounted for less than USD 25 billion, the largest segment within which was accounted for by the domestic hardware sales (NASSCOM 2009).

The use of the desktop PCs, the internet and related services is seen primarily in urban areas. Apart from offices and universities, a large part of internet usage comes from internet cafes in large cities and small towns. India currently has 9 million broadband connections (TRAI 2010) and an estimated 81 million internet users with a penetration on 7% (Internet World Stats 2009). That is a significant growth from less than three million internet users in 1999, and a large population in itself, which is serviced by several local and international internet companies. Even so, a large portion of the Indian population does not use the internet or any other desktop application yet. Apart from high costs and poor infrastructure, language and education form significant barriers. Majority of PC-based technology usage in India is in English. The Wikipedia homepage reflects this in an interesting manner – none of the Indian languages has more than 100,000 articles, compared to, for example, 3.3 million English articles and 600,000 Dutch articles (the Netherlands has a population of 16 million people).

The first telecom revolution in India was triggered in the late 1980s, when the then government-controlled monopoly telecom company enabled small entrepreneurs to set up public call offices (PCOs) that generated instant bills for cash payment. Given the low teledensity, this phenomenon quickly became successful as it generated employment and provided connectivity at the same time through several hundred thousand such PCOs.

Around the turn of the millennium, the PCO-model was tried out to provide Internet services in rural India with the help of a local entrepreneur. Helped by government subsidies in some cases, the idea was picked up by several NGOs, research groups, and commercial organisations, some of which deployed thousands of rural Internet kiosks. The kiosks brought in several tangible and intangible benefits. However, unlike the PCO, the economic sustainability of the kiosks on a larger scale remained difficult, and the success of a kiosk was primarily associated with the entrepreneurial skills of the individual kiosk operator (Toyama et al. 2005).

The second telecom revolution was the phenomenal, self-sustaining, and largely unexpected growth of mobile telephony. The mobile phone finally put the ICTs in the hands of a majority of Indians for the first time. Mobile services were first introduced in 1994, but with their high hardware and services costs, were mainly targeted to the rich. The inflection point came in the year 2000, as new operators were introduced, competition among mobile operators intensified, and costs of hardware and services dropped. At the time of writing this, there are 601 million mobile phone subscriptions in the country (out of a total 638 million telephone subscribers), and the overall teledensity has crossed 54% (TRAI 2010). India currently adds about 17 million mobile phone subscribers each month. Much of this recent growth is comes from rural areas, as the urban areas are already saturating with about 80% penetration.

9.3 HCI Maturity in the Indian Industry

Historically, Indian IT companies have been "service" companies, who deliver to the specifications of the clients. They generally did not have a voice in defining the specifications. Often, in such situations, HCI activities became a voluntary contribution that had, at times, a disruptive (and therefore undesirable) effect. Moreover, a large section of Indian IT industry relied on cost arbitrage as their unique selling proposition. This left little scope for anything that was not agreed in the contract and budgeted for, unless the clients explicitly asked for usability inputs. Though times have changed somewhat, the history of HCI maturity in the Indian IT industry must still be viewed under this limitation.

We use the Usability Maturity Model (UMM) (Earthy 1999) as a framework to describe the maturity of HCI in the Indian industry. The UMM categorises technology companies based on their usability maturity in six levels – unrecognised, recognised, considered, implemented, integrated, and institutionalised. A company would be at the unrecognised level if most people in the company believe that there are no usability problems in its products and investments in developing HCI skills are not warranted. A progression to the recognised level is typically unsystematic. Occasionally, a sensitive employee reads a book or attends a seminar. More often, a disaster strikes – a client rejects a job or a product fails in the market – before the problem is recognized. It is marked with possibly sincere, but haphazard attempts to resolve the usability issues. A company moves to the considered level when it starts making financial investments in HCI, either in terms of hiring consultants on specific projects, or by training employees in HCI. A company moves to the implemented level when it sets up a specialized group of HCI professionals. At this level, the company has the capability of producing usable products, but it does not use this capability in all projects. Typically, the HCI group is small and can only handle projects that have 'critical UI issues', and, usually, where a client is willing to pay explicitly for this involvement.

A company becomes integrated when its usability activity becomes mainstream and routine. By this time, the group sets up feedback loops and knowledge-sharing mechanisms to ensure HCI process improvement. At this level, the company consistently produces usable products. A company would be considered institutionalized when it starts considering itself as a human-centred solutions company that cares about the entire user experience. This change of vision is driven by the top leadership of the company. A company at this level not only consistently produces usable products; it produces products that are desirable to its users.

In this path to maturity, and given the current context in India, two level changes have been the hardest to achieve. Moving from the unrecognized level to the recognized level represented the first – a major cultural change for a typical technology company. In the past, technology development capability had been the strength of the company, and was always sufficient to deliver what a client asked for. However, the success and the spread of technology changed the world. This change may not have been obvious to the 'industry-insiders' in the sense water is not visible to the fish. It has been hard to recognize that success of the past is the reason why the future would be different.

Once the company recognized that their current processes are not leading to usable products, it could usually figure out how to solve the problem. It could make the investments, set up a specialized HCI group, and moved to the implemented level. Next, it faced two challenges as it strived to move from the implemented to the integrated level. Firstly, it was a significant change of scale, particularly given the size of the India IT industry and HCI education scenario – it was not any more the relatively simple matter of hiring a small group of people. Estimates of the amount of HCI effort required in a mature operation vary from 5% to 15%. That can be quite a task for a company with 50,000 people and 5,000 projects annually. Secondly, to have truly integrated processes, the company would need to invest time and money in ongoing process improvement, something that would strain the already limited workforce.

Following is a brief review of the last 20 years of HCI in corporate India as interpreted by the authors using the UMM:

9.3.1 1990–1995 – The Dark Ages

The Apple Macintosh phenomenon of the mid-1980s had demonstrated the power of user-friendly interfaces, and these were lapped up by the world of desktop publishing. However, this had made only a small dent in the universe of what would then be considered as 'serious computing'. In India, early 1990s was a period when the real transition began as the 'green-screen' mainframe computer terminals were being replaced by Microsoft Windows, Intel x86 based personal computers (PCs), also called the Wintel platform in those days, and a growing number of stand-alone applications that ran on them.

Many of the mainstream Indian IT companies such as Tata Consultancy Services, Tata Unisys, Wipro, Patni Computer Services etc. were already established in the business of contracted software development. Then, as now, a substantial part of their revenue came from projects done for international clients. While the industry was very small, it was growing fast. Computing was shifting from the traditional command-line interfaces to the graphical ones, and there was plenty of 'migration work' happening that kept the mainstream Indian IT industry busy.

This was also the time when with its higher salaries and opportunities of international exposure, the mainstream IT industry started attracting many engineering professionals from non-IT/CS backgrounds. Large software services companies typically had extensive training programmes to induct their new employees into the world of software development. A few of these training programmes did have a course on "graphical user interfaces" (GUIs) in their training schedule, but the quality of these courses was often poor and they almost never touched upon deeper HCI issues. HCI was rarely taken seriously in real projects because it was rarely asked for by clients.

Meanwhile, black-and-white personal computers started becoming 'multi-media' – they supported colour displays and developed the capability of playing audio, video, animations, and games. PCs moved from offices to homes and schools and started touching lives of a lot more people. Developing multi-media content for school education and corporate training sounded like an attractive new business. In India, many small multi-media companies mushroomed and tried to carve out a niche for themselves. These were the first few technology companies to hire designers, illustrators, writers, and animators. These professionals were new to software development, and some of them started enjoying themselves as they applied their skills in this new field. However, these companies were no way near the 'mainstream' and too few and too small to count in the bigger picture.

9.3.2 1996–2000 – The Pioneering Net Years

The Wintel platform continued to dominate the second half of the 1990s. Meanwhile, the mainstream Indian IT industry found itself with a unique business opportunity – older computer programmes that represented the years with two digits (e.g. 94, 95 etc.) were expected to pose a problem when the year 1999 rolled over to year 2000. These older programmes needed to be inspected and corrected, and in many cases ported to new platforms. With their rapidly growing number of employees, the mainstream IT companies were in a good position to expand their business to meet this new opportunity. This was also the period when the BPO industry started in a small way, as the telecommunications channels opened up and bandwidth into the country increased. All this was interesting business, but it needed few HCI inputs.

The thing that shook up HCI community the most in this period was the sudden popularity of the World Wide Web – later known as the 'dot-com boom' period. This was the period of the first generation web sites, search engines, portals, and several big new ideas. It opened the potential of start-ups and angel investors. People talked about the 'internet time', where 1 month of experience was equivalent to 1 year and 1 year was equivalent to a decade. PC and internet usage in India, though small in comparison to the population, was growing fast and many companies were formed to cater to the needs of this niche market.

The dot-com boom attracted talented, largely self-taught professionals into the HCI fold. In the second half of the nineties, some of the early multimedia companies evolved into more mature web and e-learning operations with active interface design, information architecture, and instructional design groups. Some of these companies had stable internal groups, and would be at the implemented level of UMM, while others were at the considered level and worked with freelancers.

Around this time, several multi-national companies (MNCs) set up software development centres in India. These were mainly product companies such as Oracle, Microsoft, VERITAS (later acquired by Symantec), General Electric, HP, Intel, SAP and Adobe, though consulting companies such as IBM, Accenture and Cap Gemini did the same a few years later. In line with their international practices and organisational structures, some of these companies also set up HCI design groups. These 'India Development Centres' varied a lot in terms of their usability maturity – from unrecognised to integrated level.

However, both the internet companies and the MNCs constituted only a small proportion of the Indian industry at that time, while the mainstream industry was still largely dependent on outsourced software development, the Y2K bug, and BPO. A few medium-sized mainstream software service companies in India began making investments in HCI in these years. They recognized that the web was increasingly becoming an important medium of software delivery, and delivery on the web needed significant design inputs. For about 10% of Indian software companies, this was the transition from unrecognized to considered levels of the UMM. However, most of the Indian software industry was at the unrecognized level till the end of the nineties.

9.3.3 2001–2005 – The Transition

The dot-com bust in the year 2000 'deposited' many young, creative professionals into the IT industry. Just after the bust saw a period of sustained growth, not only in India, but worldwide. The "serious" web applications emerged in this period – intranets, e-learning, airline, train and hotel bookings, e-commerce. While interest in the broader internet had not waned, it was certainly less than in the last two 'dot-com' years of the previous decade.

These 5 years saw a significant transition in the HCI discipline in India. Increased awareness and business demands were an important cause for this transition. HCI design groups in companies often found themselves operating at multiple levels of maturity at the same time – following a substantial part of the design process in one project while running an 'ambulance service' to salvage a project gasping for UI attention.

The few software services companies that had started out early with HCI design groups "crossed through" the implemented level and sat 'on the verge' of the integrated level of the UMM. The interaction design practice within these organizations was rapidly moving to the mainstream. Some geographical locations and some verticals would always have significant HCI inputs, but they faced the challenge of scaling this up to all locations or verticals. Some process improvement actually took place. Also in this period, a couple of international companies that offered services in HCI design and usability set up offices in India. Meanwhile, many of the larger software services companies moved fast from unrecognized level to the considered and implemented levels in these 5 years.

9.3.4 2006–2010 – The Local Growth

The lasting impression that this period left on most people's minds was the global recession. The sub-prime crisis in the US that started in 2008, followed by the poor fiscal management in some European countries in 2009 threatened to pull the whole world into a recession, though quick action by governments and central banks seems to be putting out 'green shoots of recovery'. At the time of writing this chapter (second half of 2010), it is not easy to predict how exactly this crisis will finally play out, but the emerging economies such as India seem to have been the least affected so far. A relatively small number of Indians – mostly the urban higher middle class that depended on export earnings, were affected by the global slowdown. The GDP of India grew at an average of 8% in these 5 years, and even in the worst year, the rate of growth was 6.7%. By 2010, this period of sustained growth in India has been the longest in its modern history.

In terms of HCI, this period saw the "two-point-o" phenomenon when the interaction design community started looking at everything afresh. Web 2.0, social networking, crowd sourcing, digital cameras, smart phones, net books, multi-modal interaction including the touch screen devices, and open source development boomed in this period of consolidation.

HCI design seemed to have settled well in Indian IT companies. A survey conducted by the Usability Professionals Association (UPA) Hyderabad chapter in 2006 shows that a large majority of the 183 respondents (81.36%) worked for IT companies and only 9.04% work in usability consulting firms (UPA Hyderabad 2007). None worked in government bodies, and very few in academics. 91% of the respondents came from five cities – Bangalore (29%), Hyderabad (24%), Chennai (15%), Pune (13%), and Mumbai (11%). 87% were in the age group of 26–35. 49% had experience of 5–8 years. 47% had an undergraduate degree, while 48% had a graduate degree. There were only three PhDs. Almost half the respondents were from education fields other than Visual Communication Design, Product Design, HCI, or Fine Arts. There was no apparent effect of the educational background on salaries.

In terms of usability maturity, the top three quarters of the mainstream IT services industry seems to have moved ahead from unrecognised stage. The top quarter is well beyond the implemented level, but not quite into the integrated level. The problem of scale has not gone away, though many companies have found some workarounds. The middle two quarters have been shaken out of their slumber and are between recognised and considered. A fringe bottom quarter continues in the dark ages of an unrecognised state.

The interesting change in this period, though, was not merely the gains derived from the arbitrage opportunities presented by international offshoring. The local opportunities seem to have become an important growth driver in ICTs. Interactive devices, particularly mobile phones are playing an important role in India's growth, not only in terms of bottom lines delivered to the ICT businesses, but also through an overall improvement in the efficiency of the country. It is now clear that the mobile phone and its applications are not going to be used by only the urban, office going, English speaking, educated few, and will reach much beyond – possibly including everyone in the country. The number of mobile phones in India grew more than ten times in 5 years, from 54 million in 2005 to 601 million in 2010 (TRAI 2005, 2010), and has now started reaching the hands of those who are barely literate.

At the same time, the last 5 years saw corporate India using interactive products extensively in their service offerings. The popularity of self-service delivery systems such as automated tellering machines, interactive voice response systems and web sites grew in this period to include areas of banking, railways, airlines, hotels, insurance, taxation, and retail. This led to a greater demand for local HCI design talent to be used for local problems. The shoemakers were making shoes for their children for the first time. Several international product companies – particularly the internet and hardware companies – recognised this trend, set up research and development facilities in India and started looking at Indian users seriously.

In this period of growth, ideas for the bottom of the pyramid no more seem to be merely wild dreams of barefoot designers, but very sustainable growth drivers in the modern business context (Prahalad 2005). At the same time comes the recognition that India is not one large monolithic market, but made up of several niches, each with its own aspirations, capabilities, and needs (Bijapurkar 2007).

9.4 Education and Research

Ergonomists brought in the early emphasis on empirical studies in improving human productivity with man-made objects. The first postgraduate school where an ergonomics course started is the Department of Physiology, University of Calcutta in the year 1970. Today ergonomics is taught in several engineering colleges as a part of the production engineering, agricultural and mechanical engineering courses. Ergonomics is also taught in the design schools and family resource management courses. The focus in these schools has been on the physiological human capabilities, health hazards, ergonomics issues in women etc.

India has several universities with departments of psychology for a long time focussing on social psychology, organisational behaviour, human resource management, neuro-cognitive psychology, personality studies, cultural variables in understanding human development, psychotherapy, forensic psychology etc. In comparison though, relatively few universities specialise in cognitive science, and almost none have a sustained interest in HCI and in applying cognitive psychology in the development of interactive products. Similarly, departments of library science and sociology maintained their distance from this field.

Design schools equipped with a broad-based, multi-disciplinary approach to education were ideally suited to step in this area of unmet demand. Unlike in many other countries, in India the HCI design discipline flowered in design schools. Industrial designers entered this field because of their strong user orientation and technology exposure. Visual communication designers entered this field because the primarily screen-based interfaces required extensive visual design.

Like everywhere else in the world, the first few professionals were self-taught and pushed the envelope while still at college. Individual students, rather than their institutions seem to have been thought leaders in working on HCI related projects. The first masters student thesis related to design of an interactive product in India is from 1987 (Goswamy 1987), while the first documented usability test of an interactive product in a student thesis can be found in 1989 (Patil 1989).

Informal teaching of concepts in interaction design may have started early in the 1990s, as design teachers started including assignments related to design of interactive products. Formal courses and programmes followed. The first formal course on user interface design for professionals was taught in 1994 by Anirudha Joshi. The first credited course on interaction design in a university was offered in Indian Institute of Technology (IIT), Bombay in 1999 by Ravi Poovaiah (1999). The first formal masters design programme on New Media started in National Institute of Design (NID) Ahmedabad in 2000 (Sabnani N., 2010, personal communication). The first formal credited HCI course in an IT/CS discipline was offered by Anirudha Joshi in the Indian Institute of Technology, Bombay in 2000 (Joshi 2000). The first undergraduate programme in design to include HCI inputs was IIT Guwahati in 2003 (Yammiyavar P., 2010, personal communication). The first masters programme on HCI in an engineering institute started in Indian Institute of Information Technology (IIIT) Allahabad in 2008 (IIIT Allahabad 2008). By 2010, an estimated 400 students have graduated with significant formal inputs in HCI/interaction design from different universities in India.

Research in HCI followed education. Initially, a lot of research was funded by the government, though corporate research has been on the rise in recent times. The first major research project in HCI was perhaps the Interfaces for All project that was funded by Media Labs Asia in year 2001. The first research laboratory dedicated to HCI research was set up in IIT Guwahati in 2002 (Yammiyavar 2009). The first PhD in India in a topic related to HCI was awarded by BITS Pilani in year 2005 (Katre 2005).

As can be expected from India, areas of research interests vary widely. The research areas in ergonomics started with physiological and occupational safety in 1970s. Today it has moved into areas such as biomechanical approach, cognitive and psycho-physical approach, behavioral approach etc. Design of interactive products for Indian needs is a broad area that obviously interests many researchers and covers topics such as design for low literacy, low-cost computing, and applications for multiple cultures and languages. Multi-modal computing is also drawing attention, including research into voice, character recognition, touch-based interaction, and applications and interfaces for mobile phones. Given the global nature and process-consciousness of the Indian IT industry, software development processes and related usability tools and techniques is another broad area of interest.

Some of the academic institutions involved in teaching and research at different levels in HCI or an overlapping area include Birla Institute of Technology and Science Pilani, IIIT Allahabad, IIIT Bangalore, IIIT Hyderabad, IIT Bombay, IIT Delhi, IIT Guwahati, IIT Kharagpur, IIT Madras, NID Ahmedabad, NID Bangalore, Osmania University Hyderabad, Srishti Bangalore, University of Pune, Vishwakarma Institute of Information Technology Pune and Vishwakarma Institute of Technology Pune. Organisations that currently offer regular training programmes for professionals include Design Incubator, Human Factors International, IIT Bombay, NID Ahmedabad, and NID Bangalore.

HCI research is done in non-teaching government funded research organisations such as CDAC Chennai, CDAC Kolkata, CDAC Mumbai, CDAC Pune, and Media Labs Asia. HCI research contributions are forthcoming from the labs of several local and multi-national organisations including ABB, Computer Associates, CKS, Design Incubator, First Usable, Google, HP Labs, Human Factors International, IBM Research, Intel, Microsoft Research, NIIT, Nokia, Oracle, Patni, Persistent, Samsung, SAP, Tata Consultancy Services, Tech Mahindra, and Yahoo.

A few international research networks were formed that enabled collaboration between universities. The Indo-European Systems Usability Partnership (IESUP) – an EU funded project – was the first network that organised a series of seminars and culminated in the first peer-reviewed conference in 2004. The CULTUSAB project between the Danish, Chinese and Indian research institutes, and the UKINIT network between UK and Indian institutes organised several research meetings and workshops.

9.5 The Community

The HCI design community became active after year 2001. The first and so far the largest community of interaction designers is a mailing list of HCI professionals from India – HCIIDC. From about 100 members in 2001, the list has grown to above 2,000 members in 2010. The list continues to add about 20 new people each month showing the growing popularity of the group (Fig. 9.1). The group has enjoyed a healthy mail volume of about 70 mails per month that includes discussions on HCI topics as well as jobs and events announcements. Other mailing lists have that have been active are UsabilityMatters.org, CHIBangalore and CHIMumbai.

While there has not been a single sustained annual conference in India that can call itself as 'the national conference' yet, there have been at least 25 conferences and large events related to HCI in India in the last 9 years and more promise to

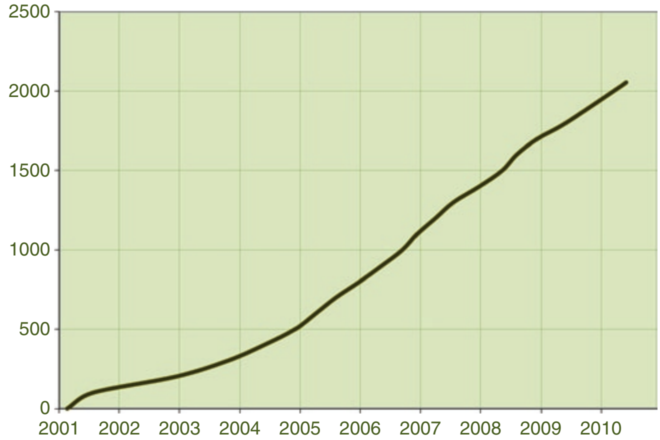

Fig. 9.1 Numbers of members in the HCIIDC mailing list

come in future. The first HCI conference in India was the Easy conference organised by the South India chapter of the Association of Computer Machinery – Special Interest Group on Computer Human Interaction (ACM SIGCHI) in 2001. Between years 2001 and 2007, the chapter organized seven conferences. Usability Matters Organisation (UMO) in association with the Usability Professionals Association (UPA) organised five multi-day community events around the World usability Day in Hyderabad since year 2005. The Usable Software and Interaction Design (USID) Foundation organised three annual conferences in Bangalore since year 2007. Both UMO and USID have announced that they will continue their events in 2010. There have been several other events related to the World Usability Day in several locations.

The first peer-reviewed research conference in the country was India HCI 2004 in Bangalore. There have been several more research events since then – Indo-Dan HCI Research Symposium 2006, Guwahati, National Conference on Human Computer Interaction 2007, Erode, Conference on Advances in Usability Engineering (CAUE) 2008, Pune, Human Work Interaction Design (HWID) 2009, Pune, International Conference on Intelligent Human Computer Interaction 2009 and 2010, Allahabad, and India HCI 2010 and Interaction Design for International Development 2010, Mumbai.

There have also been many informal, bar-camp style events. The Interaction Designers Group (IxDG) has had several face-to-face meetings in Mumbai and Pune. Mobile Mondays (MoMos) groups meet in several cities.

There are a few local chapters of international HCI organisations, though their activities have been sporadic. ACM SIGCHI has a South India chapter. UPA has a chapter in Hyderabad. There are plans to form more ACM SIGCHI and UPA chapters and possibly a national body of professionals.

9.6 Looking Ahead

These are dynamic times, and any possibility for the future of HCI in India cannot be ruled out. Yet, as we observe the current trends, some outcomes in the medium to long term seem more likely than others. This is where we stick our neck out and hazard predictions about what we expect could pan out in both the domestic and international businesses.

Looking at the current momentum, we expect the usability maturity process of Indian IT industry to continue to move forward. Schaffer had suggested that HCI was adapted by the innovators in the 1990s, by the early adopters in the 2000s, and will move to the early majority in the near future (Schaffer and Chavan 2004). While HCI has been accepted widely, total integration of HCI in all processes remains to be achieved. By 2015, a majority of the large IT companies should have moved to an integrated level of the UMM, while others would at least be at the implemented level. This implies that a majority of the products that the industry delivers will necessarily get process-driven HCI design inputs. If and when it actually happens, the impact on the industry would be dramatic. The industry has already moved ahead from the perception of being ‘cheap, outsourcing destination of largely low-end work’ to being ‘providers of complete solutions and services in a highly process-driven, professional environment’. HCI design inputs can help the industry improve the usability and desirability of the delivered products – thereby improving customer satisfaction and increased return business. It can help pro-actively identify innovative business opportunities and improve margins in fixed-bid projects.

With increased penetration of mobile computing devices, applications, and services, the domestic Indian market for ICT products will get bigger. With all the underpinnings – such as infrastructure, affordability, and critical mass – in place, it seems to be a market waiting for a few breakthrough interfaces and killer applications to enable widespread usage of digital information systems. In terms of HCI, we are still in uncharted waters here, as many challenges are new and many questions are yet unanswered. The HCI designers will play an important role if these envelopes are to be pushed and if these devices and applications are to succeed.

A client-centred (a opposed to user-centred) approach to development in many companies is still a challenge faced by the HCI professionals in the IT industry today. The lack of an established business proposition that demonstrates the return on investment in HCI in the Indian context and imported HCI methods that are still not thought to be suitable enough for the business models in India, are the other things that make the job of an HCI professional hard. However, given enough management support and entrepreneurial vision, these challenges are not very hard to overcome as some companies have demonstrated.

Lack of formal HCI education in the mainstream curriculum (particularly the IT/CS curriculum) is proving to be a bigger challenge. Even today, few engineering students have the option of taking a course in HCI. Though not exceptionally hard or numerous, HCI skills need to be learned systematically before they can be used reliably and confidently. Lack of education causes two related challenges – lack of skilled people and poor awareness about HCI methods. Given the size of India, its IT industry, and its young demographic profile, the scale of these challenges makes them hardest to circumvent. A 'pull' from the industry and a coordinated 'push' from the government are needed to make a visible difference.

There are indeed several challenges to be overcome before much of the potential is realized – but things look bright as of now. Whether the Indian HCI design community can develop appropriate resources and overcome the challenges in the emerging business environment remains to be seen.

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Chapter 10
Usability in Israel

Omri Eliav and Tomer Sharon

10.1 Overview of Israel

Israel is a country located on the south-eastern shores of the Mediterranean Sea. The country lies at the junction of Europe, Asia, and Africa and borders Egypt, Jordan, Syria, and Lebanon. The country occupies a land area of about 21,000 km^2 (about 8,000 square miles) and has diverse geographic features within its relatively small area. The climate is Mediterranean, characterized by hot, rainless summers and mild winters. The capital of Israel is Jerusalem, which is the most populated city in the country with about 760,000 people, and where its government resides. Other major cities are Tel-Aviv, which is the financial and cultural life center, and Haifa, the main city in Northern Israel. Israel's population is about 7.5 million people, of which approximately 5.62 million are Jewish. The largest ethnic minority is the group denominated as Arab citizens of Israel, while religious minority groups include Muslims, Christians, Druze, Samaritans, and others (Central Bureau of Statistics, Government of Israel). Israel has two official languages, Hebrew and Arabic (both written from right to left). English is a common language in signs, television programs, and businesses, which is taught starting early grades. Stemming from diversity of population, Israel's culture is diverse and rich. Established on global Jewish immigration, it is a melting pot of cultures, religious traditions, customs, and belief systems from around the world. The large Arab minority group has also left its imprint in many aspects of life.

The state of Israel was established in 1948. Since then, the country is in a condition of conflict with many of its neighboring Arab countries. While peace treaties have been signed with Egypt and Jordan, tension still exists with Lebanon and Syria, as well as with the Palestinians, especially in the West Bank and Gaza strip. Israel is considered the only free democracy in the Middle East due to its broad array of political rights and civil liberties (FreedomHouse. Org. 2009). It is also

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considered as the most progressive country in the region in terms of freedom of the press, business regulations, economic competition and overall human development (Reporters Without Borders Org. 2009; World Bank, Ease of Doing Business Index; World Economic Forum, Global Competitiveness Report, 2009–2010).

Israel is a global leader in development of cutting-edge software, communications, and life sciences technologies. Many high-tech multi-national corporations such as Intel, Microsoft, Google, IBM, Cisco, HP, SAP, and more, opened research and development centers in the country. Israel has the second-largest number of start-up companies in the world (after the United States) and the largest number of NASDAQ-listed companies outside of North America (NASDAQ Press Release, 2005). Israel also leads in water conservation. There are about 250 companies working in the water sector, of which 50 are designated as start ups. 70% of all wastewater in Israel get recycled, three times the figure for No. 2 in the world, Spain (The Israel Export & International Cooperation Institute). Tourism is another important industry in Israel. While attracting mostly religious tourism, the country's temperate climate, beautiful beach line, archaeological and historical sites, and unique geography are also drawing many tourists. Despite limited natural resources, intensive development of the agricultural and industrial sectors over the past decades has made Israel largely self-sufficient in food production. Imports to Israel, include fossil fuels, raw materials, and military equipment. Leading exports include fruits, vegetables, pharmaceuticals, software, chemicals, military technology, and diamonds (CIA 2009).

10.2 Overview of Usability in Israel

10.2.1 History

The practice of usability in Israel has a relatively long history. Human factors research goes back to the early 1970s. Cognitive psychologists were involved in engineering development back in 1970. The Israeli Air Force initiated HCI activities in 1972, and other army research and development organizations followed. In the 1980s, the first civilian body began HCI-related activities. The first publicly known project that involved HCI researchers was also military-oriented and was part of the Lavi project, Israel's attempt at manufacturing an advanced fighter jet that was canceled for budgetary reasons in 1987. Although the government's bottom line was not a new Israeli fighter jet, its investment in the Lavi project paved the way for the significant development of many technological skills, including HCI and usability (Sharon 2004).

Later in the 1980s, human factors, usability, and HCI professionals began to get involved with commercial software development. HCI and usability companies were founded. Today, many large organizations, such as banks, communication enterprises, and high-tech corporations, use their services – even better is the fact that many companies have internal groups of usability and HCI professionals (Sharon 2004).

The army is highly influential in the field, and the military-oriented industry was a pioneer in integrating human factors and usability professionals into development and deployment projects. Many of the leaders of this discipline came from within the industry as employees or consultants. But the military-oriented industry wasn't good at following its own lead. There was a time during the Internet bubble when the civilian high-tech industry pushed the HCI field forward, and then the military-oriented industry followed when it realized it lagged behind (Sharon 2004). In the beginning of 2010, there is an estimated number of about 200 active HCI, usability, and user experience practitioners nationwide.

10.2.2 Unique Perspectives and Problems

10.2.2.1 Hebrew

The Hebrew alphabet is written from right to left. It has 22 letters, five of which have a different form when they appear as the last character in a word. In its traditional usage, and to some extent nowadays, the Hebrew alphabet is in fact an abjad writing system in which only consonants, not vowels, are represented among the basic graphemes. The reader must supply the appropriate vowel. Like in other abjad scripts, meanings were devised later to indicate vowels by separate vowel points, known in Hebrew as niqqud.

The word שלם in Hebrew (translate: whole), without niqqud can be simply read as "Shlm", or if one tries to interpreted it as: "Shalam", "Shelem", "Shelam" and other combination. With niqqud it looks like: שָׁלֵם and read no doubtfully as "Shalem".

The original "Hebrew script", emerged around the tenth century BCE, was widely used in the ancient kingdoms of Israel and Judah until they fell in the eighth and sixth centuries BCE. Following the Babylonian exile and the translation of religious books to the local script, Jews gradually stopped using the original Hebrew script, and instead adopted the Aramaic script, which was another offshoot of the same family, Phoenician script (*The Book of Hebrew Script History*, Ada Yardeni, 2002). The Aramaic script, as used for writing Hebrew by Jews, later evolved into the Jewish, or "square" script, which is still used and known today as the "Hebrew alphabet". The Hebrew alphabet was later adapted in order to write the languages of the Jewish diaspora (Karaim, Judæo-Arabic, Ladino, Yiddish, etc.), and was retained as the alphabet used for writing the Hebrew language during its rebirth in the eighteenth to nineteenth century (History of the Ancient and Modern Hebrew Language, David Steinberg).

10.2.2.2 Right-to-Left Direction in User Interfaces

Hebrew scripts are written in a form known as right-to-left (RTL), in which writing begins on the right-hand side and concludes on the left-hand side of a page. This is

Fig. 10.1 Navigation icons

different from the left-to-right (LTR) direction used by most languages in the world. Consequently, Hebrew (as Arabic, Persian, and other less popular) user interfaces require a different layout than those targeted at left-to-right reading audiences (w3.org).

The direction of writing influences how information is to be placed on pages and screens. For left-to-right languages, the most important information is usually placed in the top-left-hand side. This is because the eye begins scanning in the upper left and therefore attends that information first. Traditional Z-shaped or F-shaped scanning and reading patterns developed accordingly online. However, right-to-left readers start scanning pages on the top-right-hand side, therefore the most important information is to be placed there. As a general rule of thumb, user interface layouts designed for right-to-left readers should be mirror-imaged, so that the information on the left should be swapped to the right and vice versa. Since writing direction dictates mirrored layouts, images and icons are also flipped. Special attention is needed when icons have meaningful direction, and when providing step-by-step instructions or representation of flow using images (Fig. 10.1). For example, the following well known interaction concept: The four button images represent logical functions – First, Previous, Next, and Last. They are intentionally mapped to the reading direction. Going forward in reading direction means advancing – Next, then Last. Going backwards means Previous, then First. So far, it is the same concept for any user in any language. However, for a left-to-right reader, the left-most button means First, while for the right-to-left reader it means Last. Interaction will be interpreted differently by users with different reading orientations (i18nguy.com).

10.2.2.3 Bidirectional Culture

Let us take a similar but more complex example (Fig. 10.2). These media player software controls are borrowed from real world devices – tape recorder and VCR. Initially, their arrow directions were mapped to the direction that the tape went. Hit Play, and the tape always flows from the left roll to the right one. Hit Back and the tape rolls from right to left. Nowadays, when the average teenager has never saw a tape recorder, these marks are still very much in use with digital portable and home entertainment devices. In modern devices there is no significance to arrow directions. However, designers always keep these historical orientations consistent with familiar standards.

Back to software. How would a right-to-left reader expect to interact with it? As shown here, where the play arrow points to the right, or with a localized mirrored layout such as the one we said it should be? There is no definitive answer and we

Fig. 10.2 Media player buttons

Fig. 10.3 Google search results pagination elements in English (*top*) and Hebrew (*bottom*)

Fig. 10.4 Walla.co.il pagination element

are not aware of a study around this specific issue. We suspect however that the majority of users will feel uncomfortable with mirrored localized layout in this case, while some users might feel the opposite. In any case, this demonstrates how a global left-to-right culture affects Israeli users in their everyday life.

The same problem can be presented using a search engine's Next-Previous interface. Google chose to keep the same orientation for the Next and Previous buttons in the Hebrew version of their search results interface (Fig. 10.3). To go to the next page, one must click the right button both in the English and in the localized Hebrew interface. Walla, a popular Israeli search engine, chose the mirrored approach (Fig. 10.4). The Next button is on the left, to reflect reading direction advancing, while Previous is on the right.

Another factor is that many software applications simply don't have a localized Hebrew version. This situation creates mixed environments with left-to-right and right-to-left applications. Such environments are hard to learn and get used to. Consistency is broken, mistakes often occur, and frustrations rise. To avoid confusions and mistakes, many Israelis prefer to use and get used to non-localized version (usually English), even when there is one available in Hebrew.

10.2.2.4 Bidirectional Text Presentation

When left-to-right text is mixed with right-to-left text in the same sentence or paragraph, each type of text is written in its own direction, which is known as bi-directional text or "BiDi", in short. Although Hebrew text is written from right-to-left, numbers are written the same way as with left-to-right languages. That is, numbers are written with the most significant digit positioned left-most. That alone often turns Hebrew text into a bidirectional one. Additionally, text written in other scripts (e.g., English) is often mixed in with the Hebrew writing. The writing direction of these other scripts remains left-to-right even though embedded in right-to-left text. The complete outcome is therefore bidirectional in nature, a mix of both right-to-left (RTL) and left-to-right (LTR) writing.

Many computer programs fail to display and allow writing of bidirectional text correctly. Most web browsers usually display bidirectional text properly. However, situations may arise when the browser's incomplete bidirectional algorithm results in incorrect presentation. These situations occur mostly when embedded text, such as a quotation, is also bidirectional, in use of mirrored characters such as parentheses, brackets, and the like, and in line breaks.

Examples:

Right (Fig. 10.5):

Fig. 10.5 BiDi text presentation example

Wrong (Fig. 10.6):

Fig. 10.6 BiDi text presentation example

Right (Fig. 10.7):

Fig. 10.7 BiDi text wrapping example

Wrong (Fig. 10.8):

Fig. 10.8 BiDi text wrapping example

10.2.2.5 Bidirectional Text Editing

Bidirectional text editing is even a bigger challenge. As shown in the example above, HTML authoring requires special attention and treatment when it comes to BiDi writing. Word processors, email clients, interactive websites, forums, and comments infrastructures, often have limited support (if at all). Defaults for writing direction are seldom configurable. Different approaches and implementations of text selection can represent some of the inherit problems of bidirectional writing. Consider the following example: let us take the string “latinIDIB”. Assume that the start point of selection is between “a” and “t” and the end point is between “I” and “B”. There are three possible approaches:

Visual approach: the highlighted text will be “tinIDI” (latinIDIB). The corresponding selected text in the text buffer is NOT contiguous.
Logical approach: the selected text will be from “t” to “B”. The highlighting will affect two parts: “tin” and “B” (latinIDIB; not contiguous highlighting).
Despotic approach: whenever a selection creates a non-contiguous highlighting or a non-contiguous selected text, the selection is extended automatically to the minimum that will still have everything contiguous. In that case, that would be “tinIDIB” (latinIDIB).

The despotic approach lacks flexibility and is irritating for users. The visual approach is more natural and predictable (the selected portion does not jump wildly like it does with the logical approach). However, the logical approach is the one which makes sense when the selection is initiated by a program, as in highlighting a search expression found in text.

Though the BiDi requirement mandates logical selection when the selection is initiated by a program, and an implementation of visual selection is recommended for manual, especially drag selection (using an input device), it is rarely fully implemented (Allouche 2001).

Overall, bidirectional text editing carries many challenges for engineers, but mainly for users. The simple reality that users who need to edit bi-directional text have more than one language to manage on their operating system is enough to create numerous mistakes and extra functions, sometimes daily. Multilingual keyboards do not make it any easier on users. These keyboard designs impose dense and hard to identify characters, with or without color clues. The standard Hebrew “QWERTY” keyboard layout is especially error-prone and makes things even harder. Punctuation mark locations are not aligned with those of the English keyboard, and some similar characters in the Hebrew alphabet are located next to one another.

10.3 Extent of Activities

10.3.1 Universities with Educational Programs

Many universities and other academic institutes offer courses and activities in the fields of human factors, HCI, usability engineering, and User Experience. However, very few dedicate full programs to these domains.

10.3.1.1 Ben-Gurion University of the Negev: The Department of Industrial Engineering & Management

Human Factors Engineering MSc and PhD Programs

The programs' goal is to train professionals and researchers to design, build, research, and evaluate advanced technology systems and interfaces. Students come mostly with academic backgrounds in industrial engineering and management, psychology, computer science, and mechanical engineering. The programs are research-oriented. The MSc program requires writing a thesis and a direct PhD program is also offered. The human factors research in the department is conducted by three faculty members in collaboration with numerous other faculty in the department, the university, and abroad. This is the largest human factors group in any university in Israel. Research facilities include the only full-size driving simulation laboratory in Israel, instrumentation for conducting physiological measurement and monitoring eye movements, and advanced computer systems for research of dynamic graphic displays. In addition to lab-based research, human factors research is also conducted in various field settings, including intensive care units in hospitals, industrial plants, and fleet studies on driving safety. Research is funded by industry, non-profit organizations, the Israeli National Science Foundation, and the Israeli government (namely the Ministry of Health, the Ministry of Transportation, and the Ministry of Defense). Human factors research strongly involves students. Many undergraduate students conduct their final projects on topics related to human factors, and a relatively large number of MSc and PhD students conduct research in this field. The human factors group also hosts post-doctoral researchers and visiting researchers from abroad for shorter or longer stays with the laboratories.

10.3.1.2 Technion, Israel Institute of Technology: The William Davidson Faculty of Industrial Engineering and Management

Industrial Psychology MSc and PhD Programs

The Technion programs integrate aspects of industrial and organizational psychology, as well as human factors. The programs expose students to both disciplines while allowing them to specialize and concentrate their research thesis in human factors engineering. The graduate program provides students with advanced training in scientific theory, methodology, and applications relevant to individual and group behaviors in organizational systems, and to the design of organizational structures and processes. Similarly, the program deals with different aspects of integrating the human operator with the engineering systems. The program includes both master's level and doctoral level students and is limited to students with a degree in psychology.

10.3.1.3 Interdisciplinary Center (IDC) Herzliya: Media Innovation Lab (miLAB)

BA in Communications, Interactive Communications Program

The Media Innovation Lab (miLAB) at the Interdisciplinary Center (IDC) Herzliya is an HCI research and prototyping lab. Prototyping areas include ubiquitous computing, context-aware computing, and mobile HCI. Research areas include motivation for participation, engagement, and media experiences that promote behavior change, among others. The learning process is an iterative process of prototyping and evaluation, starting with a user-centered design approach and low-fidelity prototyping, and continuing with higher-fidelity prototyping and field research.

miLAB was founded at the Sammy Ofer School of Communications, in collaboration with the Efi Arazi School of Computer Science.

10.3.2 Academic Research

In recent years there is a growing activity of academic research in the realms of human factors, usability, and design in Israel. Several researches regularly publish papers and conference proceedings. A few of them earned well-established worldwide acknowledgement and recognition.

Donald Norman opens his book *Emotional Design* with the words, “Noam Tractinsky, an Israeli scientists was puzzled. Attractive things certainly should be preferred over ugly ones, but why should they work better?” (Norman 2004). Norman tells the story of Tractinsky’s research of aesthetics and apparent usability. In this research and in following ones, Tractinsky tested the relationships between user perceptions of interactive system’s beauty and usability (Tractinsky 1997; Tractinsky et al. 2000; Lavie and Tractinsky 2004; Tractinsky 2004; Tractinsky et al. 2004; Tractinsky and Zmiri 2005). His general quest was to conduct a series of empirical studies to assess the relative importance of aesthetics in systems design. With time and findings Tractinsky even showed a note of criticism toward the disciplines of MIS and HCI while arguing that the increasingly important dimension of aesthetics is missing from the human-computer interaction research agenda.

In the first research, Tractinsky, a Ben Gurion University researcher, validated and replicated, in a different cultural setting, the results of a study by Japan’s (Kurosu and Kashimura 1995). The experiment concerned the relationships between user perceptions of interface aesthetics and usability (Tractinsky 1997). To his surprise, results supported the basic findings in the original Japanese research. Extremely high correlations were found between perceived aesthetics of an interface and a prior perceived ease of use of the system.

The second experiment, (Tractinsky et al. 2000), used a computerized application as a surrogate for an Automated Teller Machine (ATM). Perceptions were elicited before and after participants used the system. Pre-experimental measures indicated strong correlations between the system's perceived aesthetics and perceived usability. Post-experimental measures indicated that the strong correlations remained intact. A multivariate analysis of covariance revealed that the degree of the system aesthetics affected post-use perceptions of both aesthetics and usability, whereas the degree of actual usability had no such effect. In other words, like the name of the study implies, "What is Beautiful is Usable", not only that users perceived usability to be better on aesthetic systems before they interact with them, they also thought they were more usable before, during, and after they used them.

In following researches Tractinsky and his colleagues try to develop a measurement instrument of perceived web site aesthetics (Lavie and Tractinsky 2004). They show how remarkably consistent and immediate is the aesthetic impressions of web pages (Tractinsky et al. 2004), and through the usage of skins (Tractinsky and Zmiri 2005), suggest studying emotions to explaining user satisfaction, by looking at how applications are evaluated by users on three distinct attributes: usability, aesthetics, and symbolism.

Throughout his studies Tractinsky showed and proved how visual aesthetics plays an important role in user satisfaction, in how users perceive usability and how they immediately judge interactive systems. Noam Tractinsky is active in many other research fields of HCI, human factors, and design.

Tractinsky and David Shinar, a colleague researcher from Ben Gurion University, presented a CHI paper they called "Do we bump into things more while speaking on a cell phone?" (2008). The name might look funny. However while examining Shinar's body of work, it makes perfect sense. David Shinar is focused on human factors and behavior in traffic safety. Shinar published dozens of journal articles and conference proceedings in this field. In this particular study they observed more than 8,800 cases of people passing by obstacles. With some surprise, the results were contrary to their hypothesis. Talking on a cell phone while walking does not significantly affect the effective visual field. Therefore, walking and talking on a phone does not compromise safety, at least under the study conditions (Shinar and Tractinsky 2008).

Israel has a relatively high rate of casualties per motor vehicles (Factbook.net 1999). Usually, "the human factor" is at blame. Shinar claims in his research that sometimes the cause for accidents is non-conforming to human factors principals, to standards that shape driver expectations, and bad design rather than inappropriate driving.

Following a police report which stated that failure to heed signs is one of the most frequent causes of accidents, Shinar and his colleagues examined whether there are situations in which experience might paradoxically impair detection and timely identification of traffic signs (Borowsky et al. 2008). The Hypothesis was that experienced drivers have a well-learned schema for scanning the roadway, and will have difficulty detecting traffic signs when their location violates the expectations. The researches discovered that drivers were less likely to identify signs when they were located at unexpected locations. Their conclusion was that schema, which drivers bring to the road, enables them to handle large amounts of information, but the same schema can endanger drivers if traffic sign placement does not conform to it schema.

In previous study (Shinar et al. 2003) that evaluated comprehension of traffic signs in four different countries, Shinar et al. showed that comprehension level varies widely and is apparently related to the extent of guidelines for good design that the sign incorporates. To directly test the relationship between comprehension probability of signs and the extent to which they comply with design principles, he conducted another test. The test was focused on three principles: sign-content compatibility, familiarity, and standardization. Participants were presented with 30 signs that were previously evaluated by human factors experts. They asked to describe each sign's meaning and then evaluated each sign in terms of each of three principles. Analyzing the results showed great variability in sign comprehension, but high correlations between the comprehension level of each sign and the extent to which it complied with compatibility, familiarity, and standardization principles. Their conclusion was that the more signs conform to universal principles of good design, the more likely they are to be comprehended by drivers of different cultural backgrounds (Shinar et al. 2003).

David Shinar's academic research spans for over 30 years. His work has concrete implications on traffic designers and engineers, car manufacturers, law and governance worldwide.

While David Shinar was one of his Ph.D. advisors, Joachim Meyer's work is varied and diverse. His human factors and psychology research goes from medical environments through human-robot systems and information technology, to behavior, task analysis and decision-making, and more. In one of his last conference proceedings however, Meyer and his colleagues presented a study that seemed closer to his former professor's area of interest. The paper examined the effect of color and graphic style of in-vehicle navigation systems, on usability and aesthetics perception (Lavie et al. 2009). They performed two studies to examine four different color schemas, and one to evaluate three map graphic styles. In all of the studies the participants completed orientation tasks using the maps in the navigation system while performing a main task, tracking or simulated driving. The study results were that color schema did not affect perceived aesthetics and usability ratings. However, graphic style clearly did. Particularly in one of the map styles. Their conclusion was that colors are not enough. Emphasis should be given to the overall graphic style and the way colors are applied. The study also strengthened the notion that Tractinsky pursues, that usability and aesthetics perceptions are closely related.

Meyer published a paper that asked why physicians do not always use information from computer-based decision-support and clinical reminder systems, despite their potential to improve clinical outcomes (Vashitz et al. 2009). The paper studied the determinants of physicians' adherence to clinical advice regarding the management of dyslipidemia. Results showed that overall, the clinical reminders increased physicians' adherence to the clinical guidelines. However, physicians were more compliant with the reminders when they experienced a greater patient load, when they were less acquainted with the patient, and when more time has passed since the last major cardiac event. The findings of this study can help predict physicians' adherence and improve the usage of clinical reminders for the benefit of patients, physicians, and HMOs.

Meyer shows great interest in human-robot collaboration. In one of his studies he tested whether or not the introduction of a human operator helps simplify the robotic system and improve performance in unstructured environments (Bechar et al. 2007). Robots operating in such environments must cope with uncertain, unpredictable, and dynamic situations, resulting in lack of information. In previous work he presented a methodology to determine the best collaboration level for an integrated human-robot target recognition system in unstructured environments. The target in this research was to expand it and to include operational and time costs that are both important for evaluating and optimizing system performance. Results indicate that optimal collaboration of human and robot in target recognition tasks will always improve the optimal performance of a single human detector.

Joachim Meyer started his academic career in behavioral sciences and psychology and now works in industrial engineering and management department while specializing in human factors engineering. Accordingly, His research is multidisciplinary and widely influential.

In the Technion, Israel Institute of Technology, resides the Research Center for Work Safety and Human Engineering. The center is an interdisciplinary facility, which is a joint endeavor of the Faculty of Industrial Engineering and Management and the Faculty of Medicine. Researchers at the center are engaged in a wide range of applicative projects in the fields of Human Engineering and Work Safety (Technion.ac.il 2010).

The center that was established in 1974 is a pivot of interdisciplinary research and teaching activities on topics of behavioral, physiological, medical and engineering aspects of safety at work, as well as general studies on human factors and ergonomics in engineering systems. It focuses on the capabilities and well being of human operators in the work environment (Technion.ac.il 2010).

During its decades of operation, the center has become a national and international leader in its field. Projects involve members from the faculties of Aerospace Engineering, Architecture and Town Planning, Chemistry, Computer Science, Mechanical Engineering and Biomedical Engineering. Many of the graduate students who are involved in the different projects work towards the M.SC. and Ph.D. degrees.

Research projects that have been conducted in the center can be classified into four major problem areas:

- Human Performance and Ergonomics.
- Physiological and medical aspects of work conditions.
- Industrial Toxicology.
- Organizational factors, and management policy related to safety at work.

While many projects have been conducted in the controlled environment of the laboratory, an equal number have been carried out in industrial plants and work sites across Israel. The cross-fertilization of this dual effort has yielded theoretical as well as practical outcomes (Technion.ac.il 2010).

10.3.3 Industrial Activity

Similarly to other worldwide markets, usability appears in several shapes and forms in the commercial and industrial markets in Israel:

1. Consultancies: Several consultancies were established in the 1980s and 1990s and a few more since the year 2000. These consultancies hold the majority of the market share and have an estimated total of about 200 clients nationwide. Among the leading consultancies are UI (www.ui.co.il, located at Netanya), Aman UI & Design (www.pamam-scp.co.il, located at Bnei-Brak), Imagine1 (www.imagine1.co.il, located at Ra'anana), Netwise (www.netwise.co.il, located at Be'erot Yitzhak), TZUR (www.tzur.co.il, located at Ra'anana), Hexoo (www.hexoo.com, located at Kfar Saba), and Netcraft (www.netcarft.co.il, located at Tel Aviv). These consultancies provide both usability research as well as user experience design services. Some of them complete their services with product management and engineering solutions, and a few of them offer lab usability studies in-house. Some of these consultancies successfully engage with government agencies and ministries, large corporations, and local offices of global corporations.
2. Product companies: An estimated number of 10–20 companies that market Internet, software, or hardware products employ in-house usability practitioners or dedicated user experience groups. The largest groups can be found at Microsoft, HP, Check Point Software Technologies, Kodak, SAP, Intel, IBM, Amdocs, Comverse, and Rafael. In-house groups are usually found in R&D departments, with the exception being Marketing and Product Management departments. Group members practice in design, research, visual design, and sometimes, technical writing.
3. Self-employed freelancers: Several dozen freelance user interface/experience designers offer their services. Some of them are well known and are extremely experienced in certain verticals such as banking, military, and healthcare.
4. Academia: An estimated number of a dozen university professors are active in the fields of human factors, HCI, and usability engineering.

The following are key Known issues that can be considered as weaknesses of the industrial sector of the Israeli usability industry:

1. Immaturity: The Israeli hi-tech industry is extremely mature in terms of entrepreneurship but very much less so when it comes to usability and user experience. For an industry with about 3,000 software and hardware companies and an estimated number of 100,000 engineers, one would expect a lot more than 200 active user experience practitioners.
2. Biased recruiting: There are no UX study participants recruiting firms in Israel. In most cases, when research participants are required, snowballing is the preferred method. In snowballing, the employees of the UX consultancy or the hi-tech company in look for participants contact their friends and family and invite them to participate. This sampling by convenience was not invented in Israel and it is

practiced worldwide, but still creates a bias. In case external non-biased recruiting is required, the only option is to contact companies that offer polling services.

3. Less focus on research: Generally speaking, Israelis favor design and rarely invest in research to support it.

10.3.4 Professional Associations and Conferences

UPA Israel is the most active professional association in the usability scene in Israel. UPA Israel is a community of Israeli professionals in the fields of usability, user interface design, human factors engineering, user experience design and the gray areas that lie in between. The organization is a formal chapter of Usability Professionals' Association. UPA Israel addresses all those who are working or interested in usability and user experience; practitioners, vendors, consultants, lecturers, researchers, existing and potential agency clients, and all those who wish to develop a career in these fields. Key target audiences of UPA Israel are professionals in development and management of technology based products as well as the people who use technology. The goals of UPA Israel are threefold (UPA Israel, n.d.):

- Increase awareness for the need of convenience, simplicity, and fun of using technology.
- Develop a platform for networking among professionals.
- Constitute an Israeli body of knowledge.

Members of UPA Israel come from various fields such as software, hardware, and Internet product development, graphic design, and industrial design. Hundreds of professionals are registered in the community, including consultants, professors, students, user interface designers, industrial designers, technical writers, marketing managers, human factors researchers, Website editors, and more (UPA Israel, n.d.).

The organization was established in 1999 by Dr. Avi Parush, an HCI researcher from the Technion (Israel Institute of Technology), in response to the demand to have an HCI-related professional community in Israel. This need kept on coming up among the few Israelis that attended international conferences and lamented the lack of such events in Israel. During the years 1999–2000, Dr. Parush gathered some of the leading people in the field and they discussed the possibility of founding the local SIGCHI chapter, which he later named IsraCHI. The initial goals were to meet the above mentioned needs by organizing periodic meetings in which one or more lectures on various topics in the field were presented. There was very little public relations and advertising for the events, and publicity was mainly through word of mouth. The response of people in the field was overwhelming, and attendance in every meeting was high (about 100 attendees per meeting). When Dr. Parush relocated to Canada in 2004, a steering committee was established to replace him in his duties as the organization leader. The chairman that was selected was Tomer Sharon, Check Point's usability expert. Sharon led the chapter for almost 4 years to many additional achievements; conducting five professional events annually that introduced local and global practitioners who gave various talks. Among the world-known experts who gave talks were Aaron Marcus, David Malouf, Elizabeth Rosenzweig, and Jakob Nielsen. The organization's website was launched in 2005 at www.upaisrael.org. An important milestone for the organization was the first ever World Usability Day event that was celebrated in a full day conference with 250 attendees in 2005. The activities and the website brought more people to the organization and it encompassed nearly 1,000 professionals in 2007. In 2006, Sharon, with the support of additional members founded the organization as a formal Chapter of Usability Professionals' Association and changed its name to UPA Israel. When Sharon relocated to the USA in 2007 Eva Tsur was named as President of UPA Israel. Tsur still leads UPA Israel to great achievements; many professional events are held, World Usability Day is celebrated every November in a huge event that is usually themed based on the international UPA decision, and members of the chapter regularly publish website reviews in the most influential news website in Israel (UPA Israel, n.d.).

The Israel Ergonomics Society, established in 1981, consists of researchers, professionals, and corporations that are active in various domains within the discipline of ergonomics. The society represents Israel in the International Ergonomics Society (IEA) and is managed by a chairperson and a committee that formally represent the members of the society. The primary goal of the society is to advance the knowledge of ergonomics and its implementation in work environments. The society initiates various activities, such as conferences and workshops, in order to advance ergonomics knowledge and promote the cooperation between organizations, researchers, and professionals (Israel Ergonomics and Human Factors Society, n.d.).

10.4 Projects and Research

The following is a selection of five industry projects and academic research carried out in Israel. These projects were contributed by usability practitioners throughout Israel specifically for this book and represent the breadth and depth of the Israeli usability practice.

10.4.1 Medical Alarm Standards

Contributed by Avi Harel, Chair of the Technical Committee for Usability, The Standards Institute of Israel.

10.4.1.1 Introduction

What if there are too many alarms and nobody notices the real threats? Professor Ehud Zmora is the head of the department of Neonatology at Soroka Medical

Center, the largest of its kind in Israel. Long ago he realized that the alarm systems installed in his department generate excessive alarms, and that the medical team is unable to judge which of the many alarms requires immediate response. In order to improve the safety of the newborn infants, he initiated a study about the relationships between the alarms and the staff actions. The study, conducted at the Ben-Gurion University, found that the nurses' responses to alarms did not correspond properly to the infant's situation. In 2007 the Technical Committee for Usability at the Israeli Institute of Standards established a workgroup about medical alarms, and the member of the research group joined this workgroup. The first mission of this workgroup was to review the current standards, and to learn how they enforce protecting patients' safety (Website of the Technical Committee Workgroup of Usability Standards for Medical Alarms, n.d.).

10.4.1.2 Method

Manufacturers of medical monitors are required to comply with Chapter 8 of the IEC 60601-1 standard. Therefore, the review focused on evaluating the guidance and instructions of this chapter. The evaluation was based on the premise that when the users are facing too many alarms, they might fail to notice some of the real threats. We call such situations "perception errors". Accusing users for not noticing the threats does not help solving the problem. Therefore, the review focused on the standard effectiveness in preventing perception errors.

What if the alarm is off and nobody hears it? A common practice of alarm management, enabled by Chapter 8, is to disable the alarm when it is disturbing. The problem is that after disabling the alarm the users sometimes forget to re-enable it. We call such risky user actions "operational errors". A second premise underlying the evaluation was that "to err is human": user errors are normal, especially when the users are busy treating patients under risk. If the system enables the users to err, eventually they will. Accusing users for disabling the alarms does not help solving the problem. Therefore, the standard should enforce the manufacturers of alarm systems to design defenses against operational errors. Accordingly, the review also focused on the standard effectiveness in preventing operational errors.

How should the responsible organization get to prevent the next accident? A common practice of stakeholders in the responsible organization is to avoid accountability, by accusing users for negligence. In response, users need to consider their own job security, besides patients' safety. Moreover, accusing users disables the ability to learn from incidents. We call this common practice "accountability bias". Therefore, the review examined how the standard acts to diminish such biases. The review was based on a 'standard risk analysis', presented by lists of typical perception errors, operational errors and accountability biases. The list of typical perception errors included eight failure modes (operational situations) in three categories: missed alarms, nuisance, and misinterpreted alarms. The list of typical operational errors included 57 failure modes in typical operational activities, including: setup, daily operation, and learning from accidents. The list of typical accountability biases included five common blames. Subsequently, the workgroup reviewed the way the standard guides and instructs to mitigate these risks.

10.4.1.3 Results and Discussion

The main findings were that the standard includes many warnings about possible use errors, but it does not provide sufficient instructions for how to prevent them or how to protect from them. Also, the standard is not effective in reducing the accountability bias.

The review identified various reasons explaining why the standard might not be effective in ensuring error-prone design. One reason is the strategy of custom risk analysis, implying that the patient safety relies on the risk analysis that the manufacturer should conduct. Accordingly, Chapter 8 avoids specifying the risks of alarm usability. However, such risk analysis is unreliable, because the manufacturer's attitude to the patient risk is biased by marketing and cost-effectiveness considerations, such as one-size-fits-all. These considerations conflict the need for specificity in the instructions. Following these conclusions, the workgroup proposed changes to the standard that will improve the effectiveness of alarm systems. Many of the conclusions are applicable to other usability standards. Recently, the Committee published a Guide for evaluating usability standards, which enables writers, reviewers, and readers of usability standards to identify common barriers to effective usability enforcement (Website of the Technical Committee Workgroup of Usability Standards for Medical Alarms, n.d.).

10.4.2 The Story of Using ClickTale at DiversityJobs.com

10.4.2.1 Introduction

Scott Baylor is the Online Marketing Strategist for LatPro.com, the biggest online Hispanic and bilingual job board which services 90% of top Fortune 100 companies in the US. Their daughter company, DiversityJobs.com, addresses the needs of large companies looking to enhance their workforce by bringing on talent from minority communities. Having been in the internet industry since 1996, Baylor has tried many analytics tools and techniques to optimize his site, from traditional web analytics and A/B testing to expensive and inaccurate focus groups.

10.4.2.2 Method

Baylor decided to try ClickTale after getting frustrated with the current standard of usability testing. ClickTale, a service provided by an Israeli start-up company carrying the same name, records actual in-page data of visitors on the site, including every mouse move, click, scroll, and keystroke. By creating videos of visitors' entire browsing sessions, as well as heatmaps and other behavioral analytics, it lets companies understand exactly how visitors use their site. It's like focus group testing but on a massive scale, and much more accurate.

10.4.2.3 Results and Discussion

Once ClickTale was in installed on DiversityJobs, Baylor started seeing usability issues almost right away. "After 12 years working on the same site, you tend to become blind to certain things". Everyone working at DiversityJobs obviously knew the site very well, having designed and created it from scratch, and this blinkered their perspective. But knowing how their visitors, used their site, really opened up their eyes.

They discovered that their original homepage (Fig. 10.9), was too confusing for most new visitors. The vast majority of visitors wasn't using the advanced search parameters, which were shown by default. More importantly, it was discouraging these visitors from using the search, and those who did try it often missed the basic "keyword" search box. All this was having an unfavorable effect on their conversion rates, as visitors simply were not getting what they wanted out of the site.

They started by simplifying the search box, and then started stripping away page elements one by one, testing the conversion rates at every step. As ClickTale works in real-time, they could see results almost instantly.

Eventually, the homepage was streamlined into two simple fields (Fig. 10.10), and their conversion rates improved significantly.

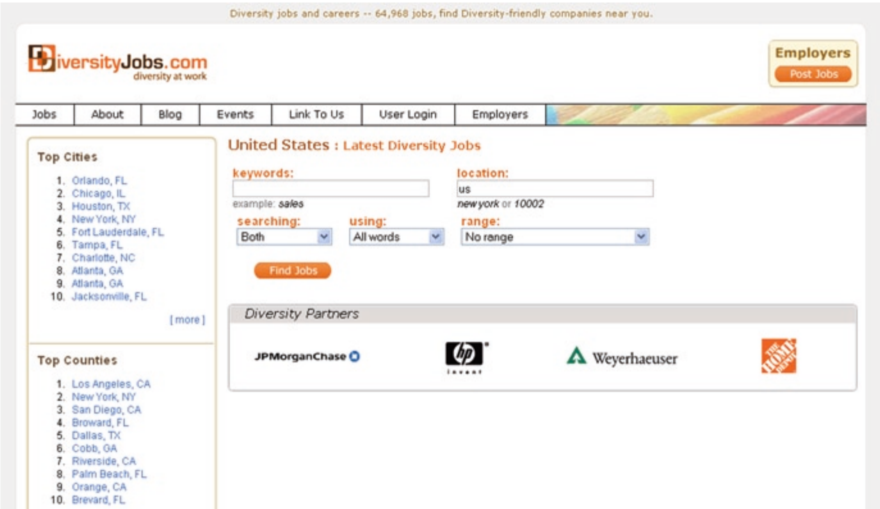

Fig. 10.9 DiversityJobs's home page prior to using ClickTale

Fig. 10.10 The revised DiversityJobs.com home page after implementing findings based on the ClickTale service

10.4.3 Eyeblaster's Campaign Monitor

Contributed by Ami Rotter, Eyeblaster Israel

10.4.3.1 Introduction

Eyeblaster is a provider of ad serving, global campaign management and digital advertising solutions. In order to support traffickers in large digital media agencies, Eyeblaster designed and built a dashboard tool called Campaign Monitor. Media campaigns in such scales are characterized by vast amount of information which is constantly changing. The main goal of the design was to allow users to monitor data, to be proactive in their approach to campaign management, and to detect problems quickly and easily in real time.

10.4.3.2 Method

User profiles and common task scenarios were identified and documented in the initial market requirements document by a product planner. High level wireframes were then created by the program manager and an interaction designer created the first prototypes.

The first Interactive prototype was tested with Eyeblaster account managers. Data was collected, discussed, and processed into a second prototype. Four feedback sessions then were conducted with four different account managers.

The feedback collected was worked into the product and changes were made to visualize the most important and easy to understand information.

Based on demos, feedback and testing, the product was built and went into alpha stage. The design process continued during the alpha stage with two usability testing sessions using Morae.

The usability team prepared written and video reports for the development team outlining problems and difficulties that may be encountered by users. This led to more changes, which were incorporated into a beta version. Each week, the Eyeblaster team contacted beta users to seek feedback and conduct interviews. Users were also asked to fill-in questionnaires about different product functions. Feedback was validated against actual usage patterns, collected in logs.

10.4.3.3 Results and Discussion

Most of the changes to the design were made during and after the tests with Eyeblaster's account mangers. Though they are internal employees, account mangers use the product on a daily basis and have a frequent, direct contact with users. We assumed these tests gave enough feedback to put the design on the right track to satisfy general user needs and goals. Relatively few changes were made at the end of the beta period. The entire information collected in various methods, during this period, showed that users were happy with functionality and ease of use.

Campaign Monitor was released almost a year after the product was first sketched and envisioned. Total usability spend was about 20% of the development budget. Six months after the product was released about 80% of Eyeblaster clients monitored their campaigns using the Campaign Monitor with almost no formal training and almost no calls to support.

Campaign Monitor was honored to be listed among the ten best-designed application user interfaces of 2008, by the Nielsen Norman Group, and mentioned on Designing Web Interfaces blog as one of ten Great Flex Applications.

10.4.4 Human Factors in the Design of a Shock-Trauma

Contributed by Roni Sela, Avital Zik, Eyal Zur and Prof. Daniel Gopher, Research Center for Work Safety and Human Engineering, Technion. With the interaction and contribution by Dr. Moshe Michaelson, Gila Hyams, and the Emergency department and Trauma Unit team, Rambam Health Care Campus.

10.4.4.1 Introduction

The Trauma Unit in the Department of Emergency Medicine at the Rambam Health Care Campus is the busiest in Israel. It serves as a center for treating severely injured patients from throughout northern Israel, and as a referral center for nine hospitals in addition to IDF and UN Forces military casualties. The unit hospitalizes some 4,000 trauma patients each year more than 700 of them severely injured.

As a part of the renovation of the whole emergency department, the Trauma Unit went through the process of doubling its capacity of treatment bays. Each bay is designed for the two-side operation of a double trauma team with two surgeons and two nurses.

Under the IBM-Technion-Rambam Healthcare project, a team from the Research Center for Work Safety and Human Engineering at the Technion was asked to assist in human factors and usability considerations in the design of new cabinets and storage spaces as well as the general layout of a bay.

10.4.4.2 Method

The work included the construction of a real-size carton-board mockup of the new cabinet in one of the emergency department rooms (Fig. 10.11). The mockup allowed representation and rearrangement of all drawers, shelves, medical equipment and communication devices, which were planned for the new workstations.

As a first step for building the mockup the work process was characterized and a detailed list was prepared, with all the required instrumentation and inventory. Subsequently, requirements for the general layout of a bay were specified. Considerations for the general layout included, for example, a ‘mirror-image’ arrangement of drawers and shelves on both sides of the workstation to allow a two-side activity of the trauma team, a ‘high-accessibility area’ for medications and critical equipment, and location of special equipment for children that would fit to both regular and mass casualty situations.

Mockup development and testing were carried out. This process enabled evaluation and anticipation of potential design problems in a proactive way, and an efficient decision making regarding solution alternatives.

10.4.4.3 Results and Discussion

The work was summarized in design sketches and a list of recommendations for building cabinets and specification of their measures and inventory. Conducting this work in an early stage of the renovation also enabled an efficient customization of the room design. The new workstations are in use since November 2009 (Fig. 10.12).

In addition to its practical value the work has helped to better conceptualize the relationship between the equipment, its layout, and team efficiency and safety. This case demonstrates the benefit of academy-industry-healthcare cooperation.

Fig. 10.11 A Carton-board mockup (Picture courtery and permission of Trauma Unit – Ramban Health Care Campus)

10.4.5 Symbol Design for Safety Signage in an Industrial Plant

Contributed by Yael Marom-Tock and Gabriela Goldschmidt, Industrial Design, Faculty of Architecture, Technion

10.4.5.1 Introduction

Many work environments of industrial plants are characterized by visual clutter. The implementation of design tools may improve the availability of safety related information and promote safe behavior.

Fig. 10.12 The new workstation ready for operation (Picture courtesy and permission of Trauma Unit – Rambam Health Care Campus)

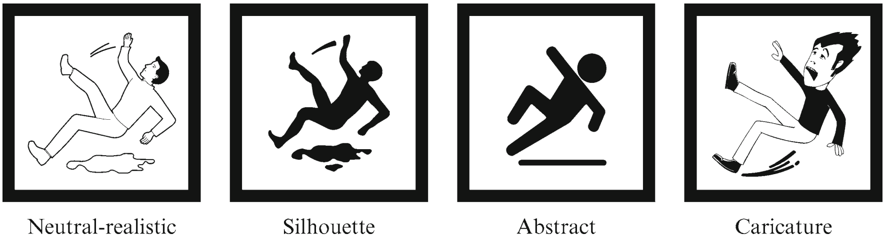

Fig. 10.13 Symbol design: slippery surface

Safe behavior has been theoretically assumed to involve a particular set of information processing stages. Failure in any one of these stages – Noticeability and Attention, Comprehension and Memory, Attitudes and beliefs, and Motivation – is argued to hinder the desired safe behavior.

While ample research in the field of safety symbol design has been devoted to either the Noticeability and Attention or Memory and Comprehension stages, few studies have examined the issue of Risk Perception located in the Attitudes, Beliefs and Motivation stages. Hence, the primary aim of this study is to compare the levels of risk perception of four different design genres – Abstract, Silhouette, Neutral-Realistic, and Caricature – commonly used in representations of safety information (Fig. 10.13).

10.4.5.2 Method

The study took place in a factory, which supplies laundry and sterilization services to most hospitals and clinics across Israel. We designed relevant symbols for eight risk factors found in the plant and represented each risk factor using the four design genres. We expected symbols that represent the human figure in an unidentified and simplified form (Abstract and Silhouette genres, respectively) to elicit higher risk perception.

The study sample included 44 randomly selected employees. The experiment was composed of a fixed set of symbol evaluation questions, which were repeated for eight different symbols. Participants were given a card-sorting task, followed by subjective evaluation of symbol preference. Each subject evaluated symbols for all eight risks in a Balanced Uniform Mix of two symbols from each genre.

Customarily, safety symbol are required to fulfill a comprehension evaluation standard before they are implemented. The ISO (International Organization for Standardization) and the ANSI (American National Standard Institute) use comprehension criteria of 67% and 85% comprehension, respectively. The results of our experiment fulfill the standards threshold criteria for comprehension testing, however we did not have the minimal number of subjects (50) to fully qualify with them. Nevertheless, the overall high level of comprehension found allowed us to assume that the subjects mastered the initial stage of the information process model. Therefore, we could address the Risk Perception results with more confidence.

10.4.5.3 Results and Discussion

To examine the influence of Genre and Risk-type on Risk perception, two statistical models were employed on the collected data. The first (two-way ANOVA) indicated a significant main effect for Risk-type and a significant main effect for Genre; however with no interaction between the two measures. The second (one-way ANCOVA) showed a significant effect for Genre. A Post-Hoc analysis revealed that both the Abstract and the Silhouette genres received a significantly higher mean score of Risk Perception than the Neutral-Realistic and Caricature genres.

Finally, to examine whether participants indeed differentiated between the genres, subjects were asked to divide the eight symbol cards into design and shape groups. The absolute majority of subjects performed the task without error. When asked to explain the rationale behind their sorting of symbols, the majority of subjects indicated that their choice was guided by either general or specific characteristic of design. Furthermore, the Abstract genre was found most “popular” and the majority of subjects preferred either the Abstract or Silhouette genres. Subjects indicated that both had either resembled familiar signposts or seemed most dangerous.

Overall, results confirm our initial hypothesis in which genres of unidentified form would elicit higher risk perception, and suggest that given high comprehension, symbols that aim to communicate safety information should preferably be represented with the design genres of Abstract or Silhouette, which are perceived as most "risky".

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Chapter 11
Usability in Japan

Masaaki Kurosu

11.1 Introduction

In Japan, usability activity started in the 1980s and is still growing among hardware and software industries, service providers, public systems and web systems. During 30 years of its history, usability activity has changed very much, from the evaluation to the user research, from the design process to the whole lifecycle, from the hardware to the software and the web, from manufacturers to service providers, from the ergonomics to the cognitive psychology then to the ethnologic approach, etc.

In this chapter, the history of usability activity will be described starting from the background information about the country, then three typical periods in the past will be explained. In the second section, organizational aspects in terms of the usability activity will be described. The last section refers to the latest trends in usability engineering activity.

Regarding the early history of usability engineering in Japan, the reader should refer to the comprehensive review in Kurosu et al. (2004).

11.2 Historical Overview of Usability in Japan

11.2.1 Background: Overview of Japan: Demographics, Economy and Culture

Japan is an island country consisting of 6,852 islands and is located in the west side of the Pacific Ocean. Total area is about 378,000 km^2 and the residential area including farmland is about 121,000 km^2 (32%). This means that the population density is rather high especially for big cities such as Tokyo (5,541 people/km^2) and

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Osaka (4,652 people/km²). These high density places serve as the industrial and commercial center of Japan.

The total population of Japan was 127 million in 2008 and the number of young people less than 25 year old is less than the number of middle aged and seniors, as can be seen in Fig. 11.1. It is anticipated that the population over 65 years old will be 31% of the total population in 2030. In other words, Japan is coming into a super-aging society and the usability for seniors is becoming more important.

Although the number is rather small, there are about two million foreigners living in Japan. Many of them came from China (including Taiwan), Korea, Brazil and the Philippines. Hence, for example, there are signs written in Japanese, English, Chinese and Korean in major railway stations (Fig. 11.2). In some stations such as Hamamatsu where Japanese Brazilians are many, the sign is also written in Portuguese. There is still a language barrier among Japanese even for English because of the

Fig. 11.1 Population of Japan in 2008 (National Institute of Population and Social Security Research 2010)

Fig. 11.2 Sign at the ticket office

difference of the language structure of Japanese and English and of the educational system for foreign languages that puts emphasis on reading and writing. But English signs and menus can be found throughout cities and young people are much more comfortable speaking English compared to seniors.

Japan has a long history of more than 3,000 years and during that time it has adopted many aspects of its culture from China, Korea (in ancient times and up to fifteenth century), the Netherlands (in sixteenth to eighteenth centuries), Germany, France, United Kingdom (in the nineteenth century), Soviet Union (in the 1950s) and the US (after WWII). A typical feature of Japanese culture is that it is not just a mixture of those imported cultural elements but is the result of an adaptation and absorption of such elements. One example is the character system. Japanese use Kanji (Chinese character), Hiragana, Katakana and alphanumeric characters for writing where Hiragana and Katakana were invented in Japan by taking parts from corresponding Kanji.

Localization is a serious theme now for manufacturers especially for those that export products because exports are a big source of income for Japanese industry. On the contrary, imported goods are generally accepted as they are with a small number of exceptions such as the notation of date and time, the unit of measurement, etc.

One of the typical industrious characteristics of Japan is the manufacturing industry such as cars, electronics, chemicals etc. Recently, it is a threat for them that other Asian countries have developed and now export inexpensive and good quality products.

Most Japanese people are not very religious although Shintoism and Buddhism are prevalent throughout Japan. Today, people go to shrines and temples for celebrating a new year, for example, but it is half for religious purpose and half for fun. Some people pray at shrines or temples for serious purpose and pray at the family altar offering incense stick every day, but there are almost no religious events and taboos in the everyday life of most Japanese people. For example, the combination of black and white is used for funerals but people can use it in various places such as the web.

11.2.2 Advent of Usability Engineering (up to 1990s)

Before the 1980s, activities that can be categorized as usability were conducted mainly by ergonomics specialists. They focused on the physical environment and anthropometric measurement, and they tried to adapt the labor environment, especially the office, to the physical and physiological characteristics of human beings. One of the main targets of the research at that time was the VDT that was used for the terminal of large and mini computer systems. Adjusting brightness, contrast and resolution of the display was the main goal of the activity so that the users could work in an adequate physical environment.

The 1980s was the real starting point for usability in Japan. There were very simple PCs such as TK-80 (by NEC in 1976) and MZ-80K (by Sharp in 1978) in the late 1970s, but the real popularization of the PC was started by PC-8001 (by NEC in 1979). At the same time, there emerged Japanese Word Processors such as JW-10 (by Toshiba in 1978) and OASYS100 (by Fujitsu in 1980) not as software but as independent hardware. The reason why there were so many Japanese Word Processors at that time was the difficulty of the entry method for Japanese text. There are various entry methods based on the special characteristics included in the Japanese text. SIG Japanese Text Entry Method of IPSJ (Information Processing Society of Japan) played an important role for the standardization of the text entry method. This SIG also served as a core for the future usability engineering activity in Japan.

The advent of the PC and Japanese Word Processor enlarged the market size, including the number of novice users. The user interface was difficult to use in its various aspects at that time, thus manufacturers had to start considering how to improve the ease-of-use of such devices. Besides, there were users of mini computers and office computers who pointed out that such devices did not work well in terms of the work goals they were required to achieve. These demands from the user side pushed the development of usability engineering in Japan in the early period.

At first, it was thought that the difficulty of using such devices was caused by the poor quality of the documentation. It was true that user manuals at that time were almost similar to the specification documents in terms of the terminology and the way of description, and they presupposed background knowledge in technology. By applying the knowledge of cognitive psychology on reading that focused on the mental process of cognition and memory, and the understanding process, the initial approach in this direction was triggered in academia. Then technical writers started their activity based on the guidelines provided by the people in academia based on the cognitive psychology. In 1989, the first meeting on documentation was held in Tokyo and 600 technical writers participated. In 1992, JTCA (Japan Technical Communicators Association) was organized, and since then it has been holding the TC symposium every year to exchange experiences and know-how.

The quality of user manuals gradually improved, but the usability problems of IT devices and systems did not decrease. It was realized that the usability of the device itself is more fundamental and important. Hence those who were involved in usability activities organized the "usability discussion group" not hosted by any existing academic society around 1994. The goal of that group was to consider the cause of usability problems by applying the cognitive psychology. It held a total of 25 meetings and about 190 people joined as members. At the regular meeting, they exchanged ideas to make the use of user interfaces easier and more convenient.

Later in 1994, this group was incorporated into the SIG HI (Human Interface) of SICE (The Society of Instrument and Control Engineers), and SIG HI of SICE became an independent society in 1999 as HIS (Human Interface Society). Accordingly, the usability group became the SIG USE of HIS in 2001. In 2004, HCD-Net (Human Centered Design Network) was established of which details will be described later. In 2008, SIG HI of HIS was incorporated into HCD-Net and ended its activity. Today, the central activity of usability engineering is conducted in HCD-Net.

During 1980s, there was a shift from Japanese Word Processors to the PC as people realized that the function of word processing could be provided by application software on the PC instead of a dedicated hardware device. Ichitaro, the Japanese word processing software, came into the market in 1983 and became popular in mid-1980s. At that time, people did not show the reluctance to use the 109 type alphanumeric keyboard based on JIS X 6002-1980 that is customized to the Japanese text entry and is different from 101-type keyboard that is popular in the US. In 1990s, Microsoft Word also became popular for the purpose of word-processing and is now more frequently used than Ichitaro.

In addition to the PC, many digital devices appeared in 1980s and 1990s. The second-generation cell phone appeared in the market in 1993 and the personal hand phone (PHS) appeared in 1994 that has overcome the use of the pager or the "Pocket Bell" that was popular in 1980s. Home appliances such as the washing machine and the electric oven were also digitized with installed micro-computer chips. In other words, the digital revolution occurred in 1990s and many more functions than ever were installed. Technology became more complex to operate and began to raise the issue of digital divide. Young people were challenged and easily adapted to the operation of such digital devices, but the middle aged and seniors could not easily learn the skills and adapt to the change. The 1990s was the time when the complaints about the difficulty of using of digital devices came to a head.

In response to this tendency as a social problem in Japan, usability engineers though not many at that time started their substantial activity. At first, the activity took the form of usability evaluation and the usability testing was held in usability labs that were newly built in offices and plants. But there was a problem on the side of managers who thought that the usability activity would not impact the sales compared to the functionality and performance. Many usability engineers claimed that usability is the fundamental right of the user and it is the obligation of the industry to provide products that are easy to use. But this kind of opinion was accepted only superficially and the situation did not change. The 1990s were, thus, the period of struggle for usability engineers.

Late in the1990s, key usability books were published in Japanese (Kurosu et al. 1999, Nielsen 1993). These books served for diffusing and improving the usability activities in industry. But the substantial change in the situation for usability activity was not realized until the advent of ISO13407.

11.2.3 Impact of ISO13407 (Around 2000)

ISO 13407 (ISO 1999) proposed by ISO TC159/SC4/WG6 was standardized in 1999 and translated into Japanese and standardized as JIS Z-8530: 2000. Its WD (Working Draft) was released in 1995, the CD (Committee Draft) in 1996, the DIS (Draft International Standard) in 1998 and FDIS (Final Draft International Standard) in 1999. Now, ISO13407 has been revised and is titled ISO 9241-210 (ISO 2010). The fundamental contents were not changed.

Information about the CD and the DIS was leaked to the Japanese industry before its final standardization in 1999. MITI (The Ministry of International Trade and Industry) held a meeting that introduced the content and its possible influences of ISO13407 for more than 100 industrial associations. It caused a kind of panic among them because they had a hard experience coping with ISO9001:1994 and anticipated that a similar burden might be placed on them. Furthermore, there was the uneasy thought that European countries might use this standard as a non-tariff barrier.

This confusing situation caused a positive effect on the usability activity. Managers began collecting information about the usability and human-centered design and started putting emphasis on the usability, or the quality of the user experience, as one of the important quality characteristics. More usability laboratories were built than before, new usability sections were organized, more usability personnel were hired than before. Managers, engineers and designers changed their attitude toward the usability problems and began to listen to indications and proposals of the usability people. The guidebook of ISO13407 in Japanese language (Kurosu et al. 2001) was published and many lecture classes were held introducing usability engineering around 2000.

Another positive aspect of ISO13407 was that it introduced the notion of the human-centered design, especially the concept of design processes. As is shown in Fig. 11.3, this standard claims four key design processes:

1. Understanding and specifying the context of use
2. Specifying the user and organizational requirements
3. Producing design solutions
4. Evaluating designs against requirements

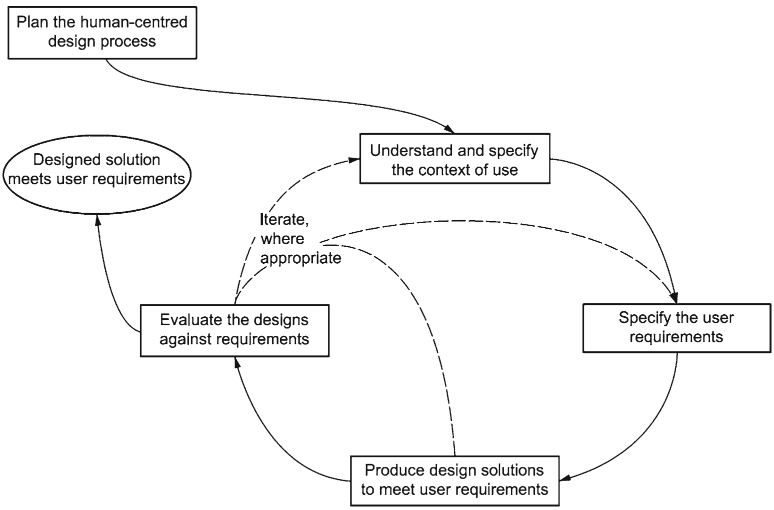

Fig. 11.3 Interdependence of human-centered design activities in ISO 9241-210 (ISO 2010)

This concept of the design process clarified what should be done sequentially in terms of usability. Usability professionals who were mainly engaged in the evaluation activity then realized the importance of the interdependence among human-centered activities and started to put more emphasis on the upper process of design.

Although ISO13407 did not clearly state what should be done or the design process, usability professionals in Japan started to adopt field work approaches, i.e. the observation and the interview, that have been used by anthropologists and other social scientists. They tried to collect more design-oriented information in terms of the user than the conventional marketing approach. Some applied GTA (Grounded Theory Approach) (Glaser and Strauss 1967) and QDA (Qualitative Data Analysis) software for analyzing the field work data. Furthermore, books on the scenario-based design (Carroll 1995) the contextual design (Beyer and Holtzblatt 1997) and the persona method (Cooper 2004) were published and served as good resources for clarifying what should be done in terms of the design requirements in the front-end of the design process. In this way, the usability activity in Japan has become more HCD-oriented compared to the previous evaluation-oriented one.

11.2.4 Web Usability and Universal Design (2000–Today)

In addition to ISO13407, there were two other factors that positively influenced usability activity: one was the rise of web usability and another was the popularization of universal design.

As is well known, the Internet became popular in 1990s and the construction of intra-structure became more and more prevalent in late 1990s. After 2000, the Internet started to be used for commercial purposes more than ever. A really important realization for content providers is that the usability of their web-site is directly linked to the sales. Users who accessed a commercial site may move to other sites if the web site is not well designed and requires more time to search for the information they need. It was quite natural that usability was regarded as an important aspect of web site design. More than ten books have been published in Japan on web usability since 2000. Thus, web designers have become keener and more sensitive to the issue of usability than designers working in other areas.

Web usability was also considered in conjunction with the accessibility, because the use of the web site by disabled and seniors had to be assured as a human right. Under the title of universal design, usability and accessibility are used conjunctively. It was fortunate for universal design that industry has been searching for a good keyword for publicizing their products and services. People in industry regarded universal design as a good keyword because the word sounded comfortable, telling the consumer that the company is taking a good care of all people. Many books were published and many organizations were founded related to universal design. As the definition of the word "universal design" differed much depending on the approach of stakeholders, some from the accessibility and others from the usability, the universal design movement has not been integrated and unified until today.

11.3 Organizing Usability Activities

11.3.1 Activities in Academia (Research and Education) and Industry

In Japan, usability is mainly conducted by people in industry. There are less than ten academicians who majored in usability engineering. This is in contrast to the fact that there are more than 200 academicians in Japan in the field of the human interface or the user interface in general. The reason is that the usability activity is an "activity" and is not necessarily a good domain for academic research. Many methods were imported mainly from the US and one of the major roles of academicians in Japan is to introduce such new overseas trends to industry. There are, of course, academicians who are involved in the development of new methods and tools. Unfortunately, they don't have an established community to validate them if they are not collaborating with industry. There are just students at the university who are often useful as the representative of young users. But whether the product or the system is usable or not depends on the generation and the cohort of the user. Thus, valid usability research should not be conducted if not requesting the participation of users of various traits.

One example of the usability project is a development of the cell phone by NTT docomo targeting senior people. Japan has become a super-aging society since 2007 with seniors making up over 21% of the total population. The ratio of seniors over 65 years old is expected to be more than 40% by 2055. The development of devices and systems that are easy to use by the senior people is now a must for industry. The fact that the industry started to consider senior users comes from the stance of social welfare as well as from the sales strategy toward the enlarging market. Although those seniors who have experienced the advent of micro-computers in 1980s have a certain level of ICT literacy, most of them are not well-acquainted with ICT devices and systems. Besides, degradation of physical and psychological traits such as physical strength, vision, hearing, memory, learning, motivation for the novelty, etc. will be experienced by all of them as their age progresses.

In the project activity for developing the cell phone aimed at senior use, the designers enlarged the characters on the LCD and the size of the button and installed such functions as the text read out, clear voice, and a slow read out. These functional features were of course welcomed by senior people, but other generations and those who are visually handicapped welcomed it too. In 2009, its cumulative sales volume exceeded 15 million.

There are many other examples that should be cited here other than the cell phone some of which are based on the collaboration with the academia. For example:

- Very light-weighed laptop PCs were developed by Panasonic considering the context of use of the business people who carry them everyday
- Effective hand-dryers were developed by Mitsubishi with the air blowing on both sides of the hand,

- Motor-driven bicycles were developed by Yamaha that charge the electricity during the pedaling on a flat road and increase the power at the ascent
- Document scanners with the combination of scanners and the PDF software developed by Fujitsu create PDF documents automatically from a set of documents that improves the efficiency of the job

In most cases, the role of the academician was to give a consultation from a specific technological area.

Now the concern of usability people in industry is moving to the upper process of the design, i.e. the user research. They are introducing such techniques as the contextual design, the persona, the scenario, the Grounded Theory Approach (GTA) and QDA software, the covariance structure analysis for validating the models generated by the GTA. They have now acquired their own position in industrial methodology in addition to the conventional marketing research techniques such as the focus group meetings. Recently, a new area, the business ethnography, has emerged to help industry people to conduct the field work research.

Because of the lack of professors in the universities, the education of usability engineering is not popular in Japan and is conducted only at several universities. This can be in either departments of informatics or in other cases in departments of design. More education is given in industry as OJT (On the Job Training) or OffJT (Off the Job Training).

Industry in Japan that realized the importance of usability as was described in Sects. 11.2.3 and 11.2.4 are in need of qualified people for their usability activity. It is amazing that there are only 5–15 usability professionals in companies with more than 20,000 employees. Inevitably, it is impossible for the all the products to be covered by usability professionals, but just 10–20% of the total products. One direction the industry is taking to educate engineers and designers to have the necessary competence for the usability activity.

Regarding the competence, JTCA issued a report on the instruction curriculum and the competence for usability professionals (JTCA 2007). Table 11.1 shows the list of competence for usability professionals. Indeed, it is almost impossible to find a "superman" who has all these competences, but this list opened the way to find and educate qualified usability personnel.

11.3.2 Human Centered Design Organization (HCD-Net) and ICHCD

As was stated in 11.1, HCD-Net (Human Centered Design Organization) was organized as a non-profit organization for the advocacy and promotion of the human centered design in 2004. It has six departments reflecting its wide range of activity, i.e. the research department, the education department, the diffusion department, the authentication department, the development department, and the international department. At present, HCD-Net is the only organization where

Table 11.1 Competence list for usability professionals by JTCA (Ver. 4) (JTCA 2007)

A. Interests and attitude
1. Interest in usability activity
2. Interest in design
3. Interest in artifacts
4. Flexibility for problem solving
5. Active attitude to newthings
6. Motivation for learning

B. Fundamental ability
7. Theoretical thinking
8. Insight
9. Quick-wittedness
10. Meta-cognition
11. Empathy
12. Imagination
13. Endurance
14. Responsibility
15. General motivation
16. Autonomy
17. Learning ability

C. Ability for business activity
18. Information gathering ability
19. Communication ability
20. Presentation ability
21. Documentation ability
22. Coordination and persuasion ability
23. Human network construction

D. Experience
24. Experience of development
25. Experience of usability activity

E. Knowledge
E1. Common knowledge
26. About user interface
27. About products and technology
28. About context of use
29. About development process
30. About universal design

E2. Process and principle
31. About HCD and UCD

E3. Related academic fields
32. About human factors engineering
33. About cognitive psychology
34. About general psychology
35. About research and evaluation method
36. About planning the research
37. About quantitative analysis methods
38. About qualitative analysis methods

F. Usability engineering ability
F1. Research and evaluation
39. Research design
40. Analysis and examination
41. Interview
42. Observation
43. Conducting the usability testing
44. Conducting the inspection evaluation
45. Requirement analysis

F2. Design
46. Document the requirement
47. Design and specification
48. Prototyping

G. Management ability
G1. Project management
49. Project design
50. Managing a team
51. Managing a project

G2. Organizational management ability
52. Managing an organization
53. Ability for education

Supplement
a1. Sociology
a2. Anthropology and ethnography
a3. Laws, acts and standards
a4. Product planning
a5. Administration
a6. English (language) skill

people involved in the usability activity belong. Currently the total number of members is just about 250. Although the number is rather small, HCD-Net is quite active and is collaborating with other organizations such as the Human Interface Society, Japan Ergonomics Society, UPA, Japanese Psychological Association, Japan Users Association of Information Systems, Research Institute of Human Engineering for Quality Life, and Japan Technical Designers Network Association.

HCD-Net is not just the organization for usability activity but also taking part in the universal design and the Kansei engineering. In other words, it concerns any kind of activities that should take the stance of human-centeredness. Besides, HCD-Net is holding the ICHCD (International Conference on Human Centered Design) as its academic activity in conjunction with HCI International (Human Computer Interaction International) biannually.

Information about this organization can be obtained from http://www.hcdnet.org/, although the English site is not yet well-organized.

11.3.3 Usability of Central and Local Government Web Site

One of the important application fields of web usability is the government site, because it has to be used by everybody except small children. In the last several years, local government web sites have improved levels of usability because of the complaints by citizens and the efforts of the government staff.

Local government is more familiar to the ordinary people than the central government. People will have to go there to register information or obtain documents or information for house moving, tax-payment, education, medical care, environmental issues, birth, marriage, death, and disaster prevention. Recently, it is popular for local government sites to use the goal-oriented menu with symbols as shown in Fig. 11.4.

Compared to the local government web sites, the central government sites were poor in usability. Since 2001, Japanese government promoted the e-Japan strategy and introduced the web-based government services. But when Prime Minister Fukuda learned about the low percentage of actual use of e-government sites, some of which showed 0% in 2008, he ordered an improvement to their usability. It was quite rare that people in the central government referred to the usability of something. In the autumn of that year, a working group was organized to improve the usability of central government web sites. In July 2009, usability guidelines for e-government web sites were fixed. In that document, the necessity to get the collaboration of usability professionals is frequently referred to. In other words, the client (government side) should write a good quality RFP (Request For Proposal) with the help of

Fig. 11.4 Example of goal-oriented menu in the local government web site (cited from the site of Narashino-shi in Chiba Prefecture). From *left* to *right*: house-moving, housing and environment, marriage, birth and child care, tax, pension and insurance, and health and welfare

usability professional and the vendor (software company side) should also get the support of usability professionals during the development of the web site. The next issue to be examined was "Who are the usability professionals?"

11.3.4 Certification of HCD Professionals

Based on the necessity for a certification system for usability professionals described above, HCD-Net started the first in the world in 2009. A similar idea was once proposed by the usability professional group (UPA) working group in 2001, but the board of UPA did not decide to progress it.

At first, there was a discussion on the differences among the usability manager (UM), the requirement engineer (RE), interface designer (ID) and the usability evaluator (UE) who should have different types of competences. But throughout the discussion, it was concluded that differentiating these four types will make the certification system quite complicated and will not be practical. Another discussion was about the variety of activity domains. IT systems, products and appliances, embedded software, web and other domains follow slightly different development process and require different types of competences. But this distinction was also discarded for the purpose of simplicity of the certification system. In other words, true usability professionals should be able to cover them all.

The certification system of HCD-Net has three layers where the first layer is for usability professionals who are conducting usability activities as their primary job. The second layer is for engineers and designers for who are expected to have a certain level of knowledge and skills of usability engineering. The third layer is for students learning usability engineering.

The competence model of Table 11.1 was used as the fundamental criteria for the selection. Competences described in Table 11.1 include those items that cannot easily be measured and are related to personal qualities, i.e. A. Interests and Attitude, B. Fundamental Ability, and D. Experience. By taking these items out of the table 36 competence items were adopted for the certification. In 2009, the certification of first layer professionals was conducted and 119 people were given the certification. Certification of second and third layers will be conducted after 2010.

11.4 Toward the Future

11.4.1 Interests in Upper Process and Fieldwork

As was described in Sect. 11.2.3, a recent concern of usability professionals is directed to the front-end of the design activity. It is true that ISO13407 was influential with respect to this tendency. But it was not the only reason why people tend to focus on the front-end process. Before 2000 when usability professionals were mainly engaged in the evaluation activity, engineers and designers did not cooperate much because the evaluation activity seemed to have a negative effect on their efforts to design something new. Besides, the evaluation at the final period of design will have to leave some problems unimproved due to the lack of time. Based on the consideration of these aspects, it was necessary for usability professionals to go back in the design process so that they could detect crucial usability problems earlier. In this way they collaborated with engineers and designers to minimize the unnecessary workload reworking designs after evaluation.

When they started the work of user research and requirement description, it was found that their approach was different from the marketing approach. Of course, the marketing is important for guiding the direction of development of products and services. But it did not give sufficient information for engineers and designers on what to design and how to design. A more user-oriented approach was needed for them. Hence usability professionals adopted the field work approach, especially the on-site interview that is substantially the same as contextual inquiry. It was found that the real environment gives them very rich information about the user and the context of use and that the direct interview with users gives them detailed and subtle information and sometimes new findings.

The method of interview is the semi-structured interview in most cases. This method sometimes brings new findings that were not anticipated. There is a big difference between the semi-structured interview and the structured interview where the latter has been frequently adopted by marketing research. However, non-structured interview is not suitable for the usability research because it takes much time and should be adopted by the pure anthropological approach.

Some advertising agencies that have formerly been adopting the marketing approach are now showing their interest to this kind of approach. They started to use a new term such as the “business ethnography”. Such qualitative approaches as described above is now the major concern of usability people.

Additionally, it should be mentioned that the total scope of the usability activity has now expanded to the whole lifecycle of products and services. In other words, the range of their activity does not end at the release of the product or the service, but should be continued to the lengthy period of actual usage by the user. In this respect, the longitudinal study or long-term usability is one of the main concerns of usability professionals.

11.4.2 User Experience and Kansei Engineering

Another trend in the usability activity today is to widen the scope from just the usability to the user experience (UX). This concept was originally proposed by Garrett, J.J. and Norman, D.A. around 2000 and was imported to Japan. There still is the confusion between usability and user experience. Some use both words as meaning the same. But, from the logical viewpoint, there is a clear distinction between them where the former is on the product side and the latter on the user side, i.e. the former is one of the causes for the latter. Another important point is that the satisfaction that is positioned as a sub-concept of usability is not a characteristic of the product but the impression of the user, hence it should be closely linked to the user experience. This issue is now under discussion among usability professionals in Japan.

One more trend in relation to the usability activity is the Kansei or the sensibility. Sensibility engineering that is called Kansei engineering in Japan deals with the combined aspect of the artifact of the cognitive process and the emotional process. Although JSKE (Japan Society of Kansei Engineering) does not give a clear definition of the concept, sensibility represents an important aspect of the user experience. Researchers have been involved in clarifying the relationship between the quality traits and sensibility, but have not yet reached a clear understanding. This subject is also under discussion now among HCI people in general including usability professionals.

11.5 Conclusion

As was described in this chapter, the usability engineering in Japan started from the ergonomic approach and then by taking the findings of cognitive psychology it has developed as an evaluation activity. At around 1999, ISO13407 had a substantially great influence over the usability activity in Japan and changed the scope of usability professionals from just the evaluation to the total design process. With the advent of web usability and universal design, the usability activity was accelerated. And now, the concern of usability professionals is directed to the upper process of design. Furthermore, the user experience and Kansei are now the focus of their attention.

The advanced position of usability engineering in Japan can be represented by the fact that the usability handbook (Kurosu et al. 2007) of 753 pages was published for the first time in the world in 2007. Despite the fact there is a rather small number of usability professionals and a large number of companies that have not yet embedded usability engineering in their design activity, usability activity in Japan will surely be spreading throughout the whole country in the near future.

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Chapter 12
Usability in Malaysia

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12.1 Overview of the Country

Malaysia is located in Southeast Asia and comprises 13 states and three federal territories. Malaysia has a population of about 28.3 million people (Department of Statistics Malaysia 2009). According to the Department of Statistics, Malaysia, for the year 2009, Malaysia's gross domestic product (GDP) and gross national income per capita are USD 42.9 billion and USD 7,400 respectively. The latest unemployment rate is 3.6% (Department of Statistics Malaysia 2009).

Malaysia is a multi-racial country. The Malays make up about 60% of the population followed by the Chinese 25%, Indians 10%, and other races 5%. There are many indigenous groups in Malaysia; for example, the state of Sarawak itself has more than 30 ethnic groups, each possessing their own language and culture.

Previously an agricultural-based economy, Malaysia has over the past few decades shifted to an economy, which is based on manufacturing and industry. To further advance Malaysia, the Government in 1991 outlined measures to achieve Vision 2020, the country is envisaged to achieve a developed nation status by the year 2020. Specifically, Malaysia aims to become a competitive world-class knowledge-based economy where Information and Communication Technologies (ICTs) has been identified as a key enabler in this transformation process. As part of the Vision, a 750 km^2. (290 square miles) area in Cyberjaya was designated as the Multimedia Super Corridor (MSC). In addition to attractive tax incentives, the MSC is equipped with the latest info-structure to attract both local and international ICT companies to set up offices in the Cyberjaya. Today, more than 2,000 companies have been granted the MSC status.

As demand for ICT increases, knowledge of Human Computer Interaction (HCI) has emerged as a necessary requirement for usability in an effort to develop quality software systems (Yeo 2007).

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In order to produce this chapter to provide a glimpse of the field of HCI and specifically usability in Malaysia, the authors conducted surveys, interviews, reviews of literature and web-sites of institutions of higher learning in Malaysia. For the historical background of this chapter, the authors interviewed a key human factors expert, Dr. Halimahtun Mohd. Khalid. Dr. Halimahtun had carried out much of the earliest usability research and development in Malaysia. The authors have also collected information through surveys with staff and students from public and private institutions of higher learning, research institutions and relevant ICT organisations (Chiu et al. 2008; Idyawati et al. 2010). As the issues of usability are applicable in many areas (for example household products, industry tools), we have chosen to specifically focus on usability in the area of ICTs (i.e. computer software and hardware) in this chapter.

At the start, when Malaysians were not aware of the importance of usability, it was an uphill task to introduce and prastice usability. The usability concept was introduced around 1990 mainly through the initiatives of academics such as Dr. Halimahtun Mohd. Khalid. Usability was introduced through educational technology initiatives at *Universiti Kebangsaan Malaysia* (Malaysian National University) by training academics in e-courseware development. Later, after she moved to Universiti Malaysia Sarawak (UNIMAS), usability was implemented in all multimedia trainings and courses by the Faculty of Cognitive Science and Human Development. In 1997, she founded the Institute of Design and Ergonomics Application (IDEA), which gave further impetus to usability applications in research, postgraduate and industry training. According to Dr. Halimahtun, usability was commonly tied up with those trained in Cognitive Ergonomics but later on, those in Computer Science gradually became implementers of usability. The Faculty of Information Technology at UNIMAS in 1998 was among the first to offer Human Computer Interaction (and usability) courses within the computer science programme.

Issues pertaining to usability were given more prominence with the formation of Southeast Asian Ergonomics Society (SEAES) now replaced by the International Ergonomics Association (IEA) network South East Asian Network of Ergonomics Society. Dr. Halimahtun, who led the formation of SEAES, was past president from 1994 to 1997, and was Chair of the Science Technology and Practice Standing Committee of the IEA from 2006 to 2009. Her strong affiliations with the IEA, and UPA, also benefitted Malaysia given the number international conferences on human factors, ergonomics, and HCI that was brought over and held in Malaysia.

12.2 Usability in Academia

An indication of the prevalence and awareness of usability issues can be gauged by the academic programmes offered, and research activities in the institutions of higher learning in the country.

12.2.1 Types of Course Offered

According to the information on the public and private universities' websites (Chiu et al. 2008), usability studies are not only limited to HCI and can be found in computer science, or other HCI related courses such as Man Machine Interaction, User Interface Design, Interaction Design, Graphical User Interface, and Website Usability.

Based on the survey conducted by Chiu et al. (2008), 42% (14 out of the 33) public and private universities in Malaysia offer HCI courses at various levels of the undergraduate study programmes. The majority of these courses are taught in the third-year of the Bachelor degree programmes.

An example of a typical undergraduate HCI course in an institution of higher learning in Malaysia is from UNIMAS. The HCI course was first introduced in the year 1998 in the Faculty of Information Technology (now known as the Faculty of Computer Science and Information Technology). The curriculum of the course includes user-centred design, usability requirement analysis, usability design and usability testing of computer systems. In the course, the students are required to apply a user-centred approach in their practical assignments, and work on projects which involve collaboration with the industry. For example, students were asked to design a usable 3D well-bore system that will be used by (oil) drilling engineers. The reviewer for the students' projects was the Chief Technology Officer (CTO) of Independent Data Services (Asia) Sdn. Bhd., the company that required the system.

Also, in addition to interaction with personal computers, students are also exposed to eye gaze systems, mobile and other devices that provide humans the flexibility to interact with the computer systems.

12.2.2 Research Activities

To gauge the current research conducted, we surveyed projects, which are currently funded by the Ministry of Science, Technology and Innovation's Science Fund, a major source of endowment for research in Malaysia. From the survey, we found that the usability projects conducted by Malaysian universities cover areas such as assistive technologies, augmented reality, design and usability evaluation of websites for multicultural users, customer centred design for e-commerce, online learning, translation groupware, emotional usability, user modeling, as well as, areas of particular relevance to Malaysia, such as culture, credibility and trust in websites.

A sample of projects includes:

- Intelligent Software Quality and Assessment Model Based on Software Behavioural and Human Factor Approach (*Universiti Utara Malaysia* (Northern University Malaysia) 2010)
- Development and Evaluation of Awareness Components for Translation Groupware (Multimedia University 2009)

- Voice Driven Facial Expressions Reconstruction For Virtual Reality Telecommunications (Multimedia University 2009)
- Imitation of Human Arm and Hand Natural Movement for Telecommunication Application (Multimedia University 2009)
- Gaze-based Interaction for Human-Computer Interaction (Multimedia University 2009; Universiti Malaysia Sarawak 2006)
- Multimodal Integration of Sketch and Speech (Universiti Malaysia Sarawak 2008)
- Knowledge-based Augmented Reality for Education, Training and Games. Augmented Toys Technology System for Secondary (High) School Biology Science learning purposes (Universiti Malaysia Sarawak 2008).

Research has also been conducted on the two emerging areas of HCI, which are adaptive and interface agents. Other research areas include those conducted at University Malaya (2009) for instance, visual exploration applications for students' life-time database and immersive online shopping interface for e-commerce sites using rich Multimedia and XML technology (Multimedia University 2009). In UNIMAS, there is the Sarawak Language Technology Research group, which focus on natural language processing (for example speech language dialog systems, and computer-mediated communication using indigenous languages), and augmented reality. At *Universiti Teknologi MARA* (UiTM), there exists a Special Interest Group for HCI which conducts research on emotion and culture in HCI, with specific focus on Kansei Engineering and website design. In *Universiti Malaysia Sabah*, research covers the perceptions of interaction design among ICT practitioners, and on usability evaluation of e-commerce websites in Malaysia. In Multimedia University, several special interest groups that focus on usability aspects of Intelligent Interactive Multimedia, Universal Usability and Interaction Design were formed.

Overseas universities operating sub-campuses in Malaysia also contribute to the development of HCI and usability in Malaysia. An example of this includes research in smart devices conducted in Monash University (Malaysia Campus), 2009).

With regards to facilities, there are three usability laboratories in Malaysia, one each in UNIMAS, *Universiti Sains Malaysia* (Malaysia Science University) (2005) and the third in MIMOS, a research institute.

12.2.3 Conferences Held

Conferences do not only provide an avenue for Malaysian researchers to showcase their work but also serve as a platform for discussion with researchers from other countries and as well as from industries. Many of the conferences organised by the universities in Malaysia contains usability-related tracks such as, the Fourth Malaysian Ergonomics Conference (SEAMEC) which was held back in the year 2003. Other related conferences that have been held in Malaysia include:

- The International Conference on IT in Asia (held biennially since 1999)
- The International Conference on Software Engineering and Computer Systems (ICSECS 2009)

- The Fifth International Cyberspace Conference on Ergonomics (CybErg'08)
- The Twenty-first International Symposium on Human Factors in Telecommunication (HFT2008)
- The Seventh Southeast Asian Ergonomics Society (SEAES)
- IEEE International Conference on Computing & Informatics (ICOCI'2006)
- The Fourth International Conference on Computer, Graphics and Interactive Techniques in Australasia and Southeast Asia (GRAPHITE 2006)
- The International Conference on Science and Mathematics Education 2005
- The Second International Conference on Information Technology 2005
- Work with Computing Systems (WWCS 2004)

To enable discussions on local usability issues at the global level, a virtual conference, the Fifth International Cyberspace Conference on Ergonomics 2008 (Cyberg'08), was hosted by UNIMAS. Furthermore, Malaysian efforts on research on usability and HCI are not only limited to urban areas. The rural communities are also given the opportunity to be part of the usability and HCI development. These underserved communities have different needs and expectations compared to organisations in urban setting. A usability related track was also organised at the Second eBario Knowledge Fair 2009 which was held in a remote and rural area. On the corporate side, a Mobile Learning and Edutainment Conference 2008 had been organised with user studies in mobile learning as one of the highlights (LTT Global Communications 2009).

12.2.4 Journals

The Electronic Journal of University Malaya (EJUM) is an online journal management system that provides scholarly journal management system for universities, higher learning institutions or research and development centres. Currently, EJUM is hosting 11 journals and three out of the 11 journals cover HCI and usability topics:

- *Malaysian Journal of Computer Science* Indexed by SCIE, Scopus, INSPEC
- *International Journal of Mechanical and Materials Engineering* (ISSN 1823-0334) Indexed by Scopus
- *Malaysian Journal of Library & Information Science* Indexed by SSCI, Scopus, Lib.Lit
- *The Journal of Universal Computer Science* (www.jucs.org) co-hosted by UNIMAS and Technical University of Graz is another avenue for usability publications; this Journal has an impact factor of 0.488.

12.3 Usability Awareness in Malaysia (Industry Versus Government Perspective)

To the authors' knowledge, a nationwide full scale usability survey has never been conducted. To provide a snapshot of the current level of awareness, the authors conducted a small survey among ICT companies to seek the industry's perspective on usability awareness in Malaysia. A total of 14 respondents from 12 different companies took part in the survey. Of these 12 companies, three are multinational companies (MNC) based in Malaysia, whilst the rest are Malaysian private companies. The majority of these companies are located in Kuala Lumpur, the capital of Malaysia, and their main business is software development.

Nine of the 14 respondents studied usability or usability-related courses during their undergraduate studies. The examples of the courses are Cognitive Ergonomics, HCI, Graphical User Interface Design and Introduction to Ergonomics. The impact of these courses on their understanding of the concepts and principles of usability are mostly neutral but these courses had made them aware of and helped them to design usable user interfaces. Additionally, nine respondents agreed that usability knowledge from their studies helped them in their jobs.

In the section of usability awareness, among those who took HCI courses, despite the fact that 64% of the respondents took usability or usability-related courses, only two of the respondents were aware of the existence of ISO 9241: Part 11 usability standard. This low awareness is also reflected in the governmental organisations (Idyawati et al. 2010). Out of the 12 companies, three of the respondents have stated that their companies followed usability guidelines. Only one respondent stated that usability standards such as the ten Heuristics as proposed by Nielsen and ISO 9241 are closely adhered to in their work.

Even though the awareness of usability standards is almost non-existent, 93% of the respondents acknowledged the importance of communication not only with the target users or clients but also with the stakeholders to understand users' project requirements and allowing them to contribute ideas to the project. Seventy-nine percent of the industry respondents ranked user satisfaction as the priority to produce usable products. Eighty-six percent of the respondents have had users actively involved in project development and 71% of them agreed they will continually re-design the product until the users and usability requirements are met. Interviews and observations are the most frequently utilised instruments to understand user requirements. This is followed by the use of questionnaire or surveys and recording (through software or video) methods. All of the participants agreed that it is important to validate the requirements or ideas with the users and this is done via usability testing.

A study reported in Idyawati et al. (2010) however revealed that for government sectors or government-linked companies, user studies and task analysis were not conducted in many system development projects. Despite the industry's emphasis on users, most of the requirements gathered were related to the task and user workflow rather than user interface requirements. When it comes to the design of the user interfaces, only 57% of the respondents agreed that they consider user preferences as their priority while 29% of them were neutral on this point. On the aspect of user interface design satisfaction, 43% of the respondents were unsure if their own user interface designs were adequate, furthermore stating that they were uncertain of their users' level of satisfaction on their designs.

Sixty-four percent of the respondents replied that the usable product they developed always assisted the users to work effectively and efficiently. This shows that from the industry perspective, usable products are important. Overall, this survey shows that the level of awareness of usability remains low among the users. However, the level of awareness in the industry is still higher compared to that of the government sectors and government linked companies (Idyawati et al. 2010).

When asked on their participation in talks, training or conferences related to usability, only one respondent has attended conferences. Also, 71% of the participants opined that there is a need to incorporate usability or HCI components into undergraduate computer science curriculum, justifying the existence of such courses in the university curriculum.

12.4 Usability Companies in Industry

Damai Sciences Sdn. Bhd. is a leading usability consulting company in Malaysia, headed by Dr. Halimahtun Mohd. Khalid. Damai Sciences conducts research and development in system development in various application domains from vehicle design to disaster risk information system. It conducts customised courses in human factors engineering in product and multimedia design where usability engineering is one of the core competencies. Lastly, Damai Sciences offers consulting services by performing usability tests of user interfaces from portal to product developments.

Among Damai Science's clients include Ministry of Trade and Industry (Singapore), Sarawak Shell Berhad (Malaysia), Honeywell Singapore Technology Ltd (Singapore), Proton Berhad Shah Alam (Malaysia), and MicroUsability Pte. Ltd. (Singapore).

One of the European Union research projects carried out at Damai Sciences is CATER (Computerised Automotive Technology for Reconfiguration), which is supported by the European Commission and collaborated with 13 other European and Asian organisations in the automotive industry. The main objective of CATER is to shift from global manufacturing to mass customisation in the automotive industry through efficient tools and processes. The CATER project produced several systems to support mass customisation. These products from the project were evaluated in terms of usability. The tests were conducted in two phases of product development where scenario-based usability tests were performed and measures taken of system effectiveness, task efficiency and users acceptability using rating scales.

12.5 Government

12.5.1 Malaysian Software Testing Board (MSTB)

Usability testing is also covered in the Advanced Level syllabus for International Software Testing Qualification Board (ISTQB). The sole body providing ISTQB certification in Malaysia is the Malaysian Software Testing Board (MSTB) under the Malaysia Development Corporation.

MSTB has been promoting the ISTQB certification since 2007 when testing was not considered seriously in developing software. Thus, MSTB has run various events to promote software testing, among them are the annual software testing conference (SOFTEC08, SOFTEC09 and SOFTEC2010), Test Talks, Industry Dialogues, Road shows, advertisements, interviews with the media, and many more in plan for the year 2010. This is in line with MSTB aspiration to make Malaysia a Testing Hub that is recognised internationally.

Besides that, MSTB has also been promoting the importance of software testing to the Government of Malaysia, hence the inception of the Q-Capability Development programme. This programme provides free training and MSTB hopes to get continuous support from those who have attended the Q-Capability Development programme to spur the software testing industry in Malaysia. MSTB has a software testing lab which includes a facility for usability testing.

12.5.2 SIRIM

SIRIM Berhad has been appointed by the Department of Standards Malaysia as the sole national standards developing agency under the provisions of Standards Malaysia Act (Act 549, 1996). One of the SIRIM Berhad activities under this area is developing Malaysian Standard in numerous areas. SIRIM has developed the Malaysian Standards related to HCI namely MS ISO 9241: 2009: Ergonomics of Human System Interaction – Part 410: Design Criteria for Physical Input Devices.

SIRIM Berhad, through the Malaysian ISO standards committee, has both participant and observer status in the ISO. For example, Malaysia was represented at the recent ISO meeting of the Ergonomics of Human-System Interaction, TC 159/SC 4, held in Beijing in conjunction with the IEA 2009 Congress, 9–14 August 2009.

12.5.3 MIMOS

MIMOS Berhad, a government-owned research and development entity under the purview of Malaysian Ministry of Science, Technology and Innovation, and is currently active in promoting collaboration in research areas with different universities in Malaysia (MIMOS Berhad 2009). MIMOS has built a usability lab with eye-tracking equipment to measure eye movements in website and product design. In addition, the lab is also equipped with the recording software tools such as Camtasia and Morae, to allow them to conduct usability studies.

In addition, software and mechanical engineers are also being trained on usability and are applying usability in their product development from computers to precision agriculture devices. This focus in usability is of vital importance as MIMOS' products need to be ergonomics-certified employing the Ergonomic Quality in Design (EQUID) process.

12.5.4 Malaysian Administrative Modernisation and Management Planning Unit (MAMPU)

The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) is a government agency that oversees the functions of administrative modernisation and human resource planning for the public sector. The public sector plays a leading role in ICT adoption as it is the largest group of computer users (over a million employees) and thus is able to exert considerable influence of the usability awareness throughout the country through its policies and regulations. With its current initiatives to transform the government sectors to adopt an ICT culture, MAMPU is responsible to encourage the citizens to accept and use e-government services. Being the government's agent of change and policy maker, MAMPU has enforced guidelines and standards to be implemented effectively which include ICT Security, ICT *Perolehan* (Requisition), Website/portal guidelines, SMS guidelines and ICT Management guidelines (predominantly to government computer systems). To better understand the current significance of usability in MAMPU, an interview session was conducted with senior ICT officials. These senior ICT officials represent the highest management level and their views reflect largely the current usability awareness of the public sector. The result showed that the term usability is not used among the in-house product designers and developers. The participants believed that usability aspects may be similar to what is known in MAMPU, as Proof of Concept (POC). POC consists of User Requirements Gathering, Functional Testing, User Acceptance Test (UAT) and Final Acceptance Test (FAT) which is carried out on a relatively informal basis with small numbers of users to compare the products with the standard operating procedures. The question is whether current POC is valid and reliable to enable meaningful conclusions to the overall user experience. From the numerous MAMPU guidelines published and practised by many companies, there exists similarities between usability measures such as ISO 9241 and the MAMPU guidelines. This situation requires further investigation and research into this organisation's policy making process, usability measures and guidelines.

12.6 Current Situation

There is greater awareness of usability now, compared to two decades ago in Malaysia. Practically, all industries in Malaysia, from consumer goods like ICT products (such as computers, mobile phones), furniture (such as chairs, workstation), vehicles (such as interior design) to commercial systems, such as checkout counters in department stores, assembly line in manufacturing, information displays in public places to passenger seats in transportation, that are involved with the design and development of products for human use would require usability services. Usability plays an important role even in the service industries especially in e-commerce websites that sell goods and services. The government and banking services also require much usability, from their online to counter services.

However, at present there is no usability policy yet adopted by the Malaysian Government. Unlike in developed countries, international organisation such as the Usability Professional Association (UPA) collaborates with the United States government in implementing usability policies.

On the academic side, not all courses currently offered in public and private universities contain usability topics. The curriculum could include content such as usability methods, coupled with real-world application of usability evaluations as per required by the industry. The university curriculum could emphasise industry/private sector partnerships with usability practitioners so that there is transfer of real-world expertise to students (Universiti Teknologi 2009). In research, usability should be an integral component of domains like information technology, industrial design, and engineering design.

The Malaysian industries have shown several promising capabilities to implement usability in research and product design. Besides projects such as CATER involving a local company, Damai Sciences and a university, UNIMAS, other national products such as Jen-ii, IDOLA, WiWi and precision agriculture products developed by MIMOS Berhad have also been implemented with a usability-focus throughout the product development life cycle. In addition, Motorola Penang Malaysia designs and develops communication products such as walkie-talkie devices with a usability-centred approach. In the authors' opinion, usability issues are being considered in the development process. For example, over the last five years, there is also a marked improvement in the usability of online banking websites such as those from Maybank, RHB, and HSBC bank.

12.7 Future Steps

For usability to advance in all spheres of development there ought to be greater government will. In Malaysia, for usability to make an impact a top-down directive maybe required. A stronger collaboration between local industry, academia and government would be able to create a sustainable force to vigorously promote and establish usability at the national level. For example, if MIMOS and SIRIM could play their roles actively in usability promotion, together with Human Factors and HCI researchers, non-governmental organisations (NGOs) such as PIKOM (Association of the Computer and Multimedia Industry), the general Malaysian public could expect greater awareness and stringent requirements for products and services to comply with usability standards. This is a challenge for both public and private sectors. Besides that, Malaysians can adopt some of the practices as carried by the United States. For example, the Government, via the US Department of Health and Human Services, created a usability website http://www.usability.gov. They published the usability standards for industry on this site and collaborate closely with the Usability Professionals Association (UPA) (see http://www.upassoc.org/).

Additionally, the European Union (EU) has enforced a law to apply International Standard (ISO) for usability (90/270/EWG concerning the minimum safety and health requirements for Visual Display Terminals (VDT) workers (EEC 1990)). The equivalent could be carried out through the Ministry of Science, Technology and Innovation with the cooperation of Multimedia Development Corporation. This is supported by the survey conducted (Idyawati et al. 2010), the study recommends the government to provide either resource-based (for example trainers, materials) or recognition-based incentives to individual, organisation and university that improve the usability in ICT projects. Besides that, the government should put in effort to increase job opportunities in the area of usability or HCI in the industry, perhaps through funding of such related projects in local ICT companies. Another suggestion from the participants is for the government to apply usability principles on their websites as these websites are frequented and it will reflect government efforts in promoting usability. As part of the effort to increase usability is to increase the accessibility of the government websites. The National Council of the Blind had organised a four day workshop to train government websites developers regarding accessibility for the visually impaired. Conference has also been organised locally on the issue of accessibility for the disabled.

A positive note in Malaysia is the initiative to form the Human Factors & Ergonomics Society Malaysia (HFEM) led by protem President, Dr. Halimahtun Mohd Khalid. One of the society's goal is to gauge, and raise awareness, as well as promote professional interests in human factors, HCI and usability nationally.

Other suggestions for promoting awareness of usability include:

- Introduce appropriate HCI courses with sound content on usability engineering, methods at the undergraduate and postgraduate levels. At the university level, emphasis should be towards practical aspects as opposed to only theories. The specialised programme could target industry and public sector professionals to raise further awareness of usability. This awareness may result in a usability-focus being adopted in development processes in both the private and public sectors. University can also play a wider role by conducting usability research and promoting such effort to the industry
- Organise usability talks by professionals and usability practitioners. This is supported by our survey as the majority of participants are interested to attend such talks
- Organise events that judge products on usability of applications
- Promote local success stories which had a usability focus in the development of products and services

The importance of implementing usability in most ICT products and services should be top priority. While the level of awareness of usability in Malaysia is low, there are promising signs that things are to improve. With efforts of usability experts, champions, and the private-public and academic sector working in tandem, the future of human factors/ergonomics and HCI in Malaysia is indeed promising and bright.

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Chapter 13
Usability in Mexico

Mario A. Moreno Rocha

13.1 Overview of the Country

The United Mexican States, widely referred to as Mexico, is an independent country located in North America, along with the United States of America and Canada. Mexico is the farthest northern country of Latin America, with a world celebrated culture and rich traditions. Mexico is a young, vibrant country in a state of constant change: from the darling of world travellers, it has transformed into a resourced emerging economy, looking for its own place in the concert of nations.

In 2010, Mexicans are celebrating 200 years of independence and 100 years of the commencement of our revolution. It is an appropriate occasion to briefly review and consider our basic statistics in order to have a clearer idea of our country.

Mexico is the 15th largest country in the world, with 1,964,375 km^2, comprising all kinds of weather, from the semi arid plains of the north to the lush tropic jungles of the south. Famous beaches, volcanoes, mountain ranges, jungles and deserts can be found in this wide and diverse country.

Mexico is a democratic federal republic, organised into 31 states and a Federal District. Its capital city, Mexico City, is one of the largest cities in the world, bursting with almost 21 million inhabitants in its metropolitan area. Other large cities in Mexico are Puebla, Guadalajara and Monterrey. In the year 2008, 77% of Mexicans lived in urban areas, with a population density of 54.9 Inhab/ km^2 (2006) (Figs. 13.1 and 13.2).

Mexico's population (as reported in July 2009), is 111,211,789 with an average annual population growth rate of 1%; and with a median age of 26.3 years. Ethnically, Mexicans are the historic result of a diverse mixture, becoming more and more diverse every day. Nowadays, Mexicans can be categorised as 60% Mestizo (mixture of Amerindian and Spanish heritage), 30% Amerindian, 9% White roughly 1% of the population is classified as "other".

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Fig. 13.1 Map of the Mexican United States

Fig. 13.2 Mexicans standing at Mexico's City Zócalo

Literacy in Mexico is estimated at 91%, with an even distribution among men and women. Primary basic education is compulsory in Mexico; besides, a large system of both public and private universities and technological institutes exists all over the country, educating more and more Mexicans each year. The National

Autonomous University of Mexico is the second highest Ibero American ranked university due to its original research and excellence in education.

Spanish is the official language of Mexico; however, several indigenous languages are also widely spoken. Mexicans speaking Spanish only account for 92.7% of the total population, whereas bilingual speakers (that is, Spanish and another indigenous language) represent 5.7%. Indigenous speakers represent only 0.8%. Indigenous languages or dialects include Mixtec, Mayan, Náhuatl, and other regional languages (2005) linguistically speaking. The richest and most diverse state in Mexico is the Southern State of Oaxaca, with more than 15 indigenous languages spoken today.

Mexico's economy is the 12th largest in the world. It has the highest per-capita income of Latin America (one third of the USA, approximately). Mexico's economy is characterised by a stable free market in the trillion-dollar class. Once an agricultural based financial system, Mexico's wealth is now firmly supported by industry and services, parting from the oil industry that characterised decades of sustained growth.

Main industries include manufacturing, tourism (services), energy, transportation and a sky rocketing communications industry. Mexican entrepreneur Carlos Slim is ranked number three on the list of the richest people in the world.

Mexico's culture is shaped by numerous traditions (both religious and secular). All artistic expressions are rooted in an indigenous past aggregated by a Spanish presence of 300 years. The Mexican culture, as a living entity, is constantly reshaping itself in the face of a steady social growth, spurred on by bold social movements, and the ever-prevalent war against crime.

But the most important single factor changing Mexico nowadays is the ever-growing reach of the Internet: access to information, social networks, instant messaging and mobile technology. In Mexico, 29.7% of the entire population has regular Internet access. The total number of households in Mexico with a computer is growing (3.5 computers per household), as well as mobile technologies (6% to access the net through mobile devices), and broadband is also becoming wide spread (93% and growing). Internet is reaching all sectors of society, giving them a voice and a representation never seen before.

Mexico is no longer simply the beach strewn, old world paradise that the world has know. Mexico is a vigorous country overcoming burdens and difficulties, redefining its identity for a new millennium.

13.2 Overview of Usability in the Country

Usability started in our country in a way that piggybacked on Software Engineering. Usability activities began hidden within the software development community as "new testing to be made on products of software". Even now, the word "usability" means many things to many people, thus complicating its development and formalisation in software development.

13.2.1 Early Days

During the latter years of the 1980s, several articles published in the now defunct Byte magazine covered the new developments on graphical user interfaces (GUI), lead by the then new Apple Macintosh computer. Thus, Mexican engineers got their first glance at the novel GUI, starting a debate on the new jargon of the "easy to use" computer and programmes. The necessity to create an easy-to-use application for the user was odd, as the development was based on the engineers' beliefs of the final user's needs. By then, the input of another area of knowledge into computing science was unheard of.

Although several attempts were made to take user's needs into consideration, usability was largely ignored, due to traditional education of the engineers that didn't consider the users as an important part of the software development, as the lack of versatile technologies that could adapt to the new paradigms too.

During several bonanza years experienced in Mexico in the early years of the 1990s, the government granted a record number of scholarships to Mexican students in order to pursue graduate degrees overseas; Mexican science students flooded American and British universities. Many of them were exposed to the studies of Human-Computer Interaction with world-class professors in the area.

The economic crisis of 1994 stalled the growing momentum of the country, delaying or stopping altogether government founded graduate studies of Mexicans abroad. However, this setback proved to be positive in the end, as the re-patriated scholars began to permeate universities and research institutes throughout the country, bringing back new perspectives on the software development cycle and the new theory of Human-Computer Interaction.

The new, younger professors started to "spread the word" on User Centered Design and the importance of the user's requirements. Since then, the most recognisable face of HCI is usability, as the functional, objective result of the study. Even now, the public mistakes usability as the whole Human-Computer Interaction; so, according to popular perception, you don't study "HCI" but "usability".

13.2.2 HCI in the New Millennium

Another milestone was the ACM SIGCHI Conference held in Seattle, Washington in the year 2001. The conference's Development Consortium was devoted to Latin America, hence reuniting the leading Mexicans researchers in the area. Besides the much-needed exposure to the HCI world community, that gathering started the Mexican chapter of SIGCHI, becoming, since then, the largest HCI interest group in the country.

With a new and coordinated direction for the development of the area, the next step was to incorporate HCI studies into the schools' curricula. At that point HCI studies were limited by some practices in software engineering courses, with several degrees of advancement. Initial efforts were made to create HCI courses in both undergraduate and graduate studies.

Proper facilities were also needed, so the quest for usability laboratories began. The first registered facility was the CCADET; but the first laboratory entirely devoted to usability testing was our own UsaLab at the Universidad Tecnológica de la Mixteca (UTM). More labs followed, as the number of Mexican students interested in studying HCI grew every year.

13.2.3 History of Today

Since then, the study of Human-Computer Interaction as the practice of usability has come of age. The practice of usability as an educational agenda turned into an industrial activity when our alumni became active in the work force and the Internet became widely available in the country. New software development companies started to grow and many multi national organisations eyed Mexico to expand their operations.

For that reason, localisation studies on web sites and services became one of the most popular services we offer at UsaLab. Foreign companies wanted to know if their services could be translated correctly and culturally adapted for the Mexican market. This trend incorporated more and more professionals from different areas into the usability workplace: translators, anthropologists, graphical designers, etc.

13.2.4 The UsaLab Experience

Even with all this taken into account, HCI and usability is still a hard sell. There are few local companies interested and even fewer willing to pay for our services. Also, we have been struggling to convert the local market into an industry demanding services. Of course, there has been progress with more and more companies requesting quotes, information and expressing a willingness to learn about the benefits of applied usability.

Our larger customer base has been foreign companies looking to launch international products into the Mexican market. Our decisive advantage has been the local knowledge of the culture, people and tech market. Along with our international partner Mercedes Sánchez Usabilidade from Brazil, we have been mainly developing business proposals for foreign clients. They are well versed in the benefits of a market research and usability studies on their products.

Another important issue is to seek partnerships with local research groups within Mexico. Generally, usability studies require testing in several locations around the country, so we should be better acquainted with more usability labs and professional personnel in Mexico. We are in talks to develop new labs in host universities and to establish connections with the few laboratories in the industry.

Our experience has taught us that our best promotion and advertisement is the academic results achieved by our students and faculty in the area. The second and first place in the CHI conferences allowed us to gain a lot of respect and credibility across the industry. Our best connections and contacts are being made, oddly, at scientific forums.

Then, the education and practice of usability in Mexico started in the academia, within the Computing Sciences research groups and faculty. Now, the Human-Computer Interaction study and usability practice is identified in Mexico as a computer science activity, thus largely a male practice.

13.3 Extent of Activities: Universities, Industry, Conferences and Organizations

The study and research of Human-Computer Interaction in Mexico is conducted in fine universities across the country. Lecturers and researchers work everyday in order to develop the theory and practice of usability, along with brilliant students.

13.3.1 Undergraduate Studies

The study of Human-Computer Interaction at undergraduate levels is widely available now, mostly as a single course within a bachelors' degree in computing science, but a growing number of courses, found in design degrees, are often offered in conjunction with accessibility and interaction design.

A sampling of courses related to usability and their respective degrees and universities are presented in Table 13.1.

Table 13.1 Mexicans universities offering undergraduate HCI related studies

University	Degree	Course	Content
Universidad Autónoma de Yucatán (UDAY)	BA in Software Engineering	Human-Computer Interaction	Theory, interface design, UCD
Universidad de Sonora (USon)	Several degrees	GUI Programming	Fundamentals, interface design
Universidad de las Américas, Puebla (UDLAP)	Several degrees	Human Computer-Interaction	Theory, interface design, UCD
Universidad Tecnológica de la Mixteca (UTM)	BA in Computing Science and BA in Informatics	Human Computer-Interaction	Theory, UCD, usability testing

Table 13.2 Mexicans universities offering graduate HCI related studies

University	Degree	Name
Universidad Tecnológica de la Mixteca (UTM)	MSc	Master in Interactive Media
Universidad de Colima (UCol)	MSc	Master in Information Technologies
Universidad Popular Autónoma de Puebla (UPAEP)	PhD	Doctorate in Software Engineering
Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE)	PhD	Doctorate in Computer Science
Universidad de las Américas Puebla (UDLAP)	PhD	Doctorate in Computing Science

13.3.2 Graduate Studies

Although there is not a graduate study programme fully devoted to Human-Computer Interaction or usability for that matter yet, a growing number of graduate studies programmes in Mexico offer a specialisation in HCI and usability. A few examples are presented in Table 13.2.

13.3.3 Groups and Organisations

The largest groups of interest in HCI and usability is the CHI México group, an ACM SIGCHI looking to promote and increase knowledge and greater interest in the science, technology, design, development, and application of methods/tools/techniques for HCI in Mexico. Also, it is the means of international communication for people having interest in HCI in Mexico.

Founded in 1999, CHI México has more than 15 registered members. Among their interests are the organisation of conferences, events and lectures on HCI, promoting and raising awareness on all things HCI and usability. Other chapters, like the UPA's, are still missing in Mexico.

13.3.4 Conferences, Meetings and Organisations

The participation of Mexican HCI scholars and practitioners at international conferences and events as CHI, HCI International, IWIPS, British HCI, Interfaces, Interacción, Interact and the World Usability Day is granted. By now, the academic community has reached an interesting maturity, which has allowed it to create regular events with local and international scope. Two of them, CLIHC and MexHIC are held regularly, as shown in Table 13.3.

Table 13.3 HCI conferences celebrated regularly in Mexico

Conference	Scope	Frequency	Next event
Congreso Latinoamericano de Interacción Humano Computadora (CLIHC)	Latin American conference, in conjunction of LA Web	Every 2 years	Brazil, 2011
Taller Mexicano de Interacción Humano Computadora (MexHIC)	Mexico and foreign researchers	Every 2 years, alternating with CLIHC	Monterrey, Mexico, September 2010

Table 13.4 University laboratories offering services to the industry

Laboratory	University	City	Services
CCADET, Desarrollo de Prototipos	Universidad Nacional Autónoma de Mexico (UNAM)	Mexico city	Prototype design, usability testing, education
UsaLab, Laboratorio de Usabilidad	Universidad Tecnológica de la Mixteca (UTM)	Huajuapan de León, Oaxaca	Usability testing, localisation, education
CIIDIT, IT & Software	Universidad Autónoma de Nuevo León (UANL)	Monterrey, Nuevo León	Usability of mobile devices, education

Table 13.6 Enterprises offering usability studies

Company	City	Services
Axitia, Inteligencia en Internet	Puebla, Puebla	Portal re-design, research, usability benchmarking
in/situm	Mexico, USA and Brazil	Innovation and interaction
Web usability	Mexico city and Monterrey	Consulting, web re-design, usability testing, education
Gelattina	Monterrey based	Web 2.0 strategies, usability testing, marketing, design
ADWEB solutions	Guadalajara, Jalisco	Web design, solutions

13.3.5 Industrial Laboratories

There are an increasing number of laboratories offering usability testing in Mexico. Years ago, the number of results yielded from a web search accounted for just a few, but nowadays the number is in the teens. Labs are located in Mexico's main cities (México City, Monterrey, Guadalajara, Puebla) as well as inland cities (e.g. Huajuapan de León, Oaxaca) covering a wide range of projects. Their reach and scope differs from lab to lab, but all of them offer usability testing of web pages and services, as well as interface design and more. Tables 13.4 and 13.6 lists some examples.

The Manifiesto Nuevo León on Usability and Accessibility of Government Websites of 2008 created a new area of opportunity, this being the first initiative adopted by the government related to HCI and promoted and created by the HCI community in Mexico. Since then, the federal government has implemented new related plans to include elderly persons, disabled persons and indigenous into its

Table 13.5 Non-profit organisations

Organisation	City	Services
UA Web	San Pedro Garza García, Nuevo León	Promotion of usability and accessibility
Centro de Estudios de Usabilidad, AC	Mexico city	Usability consulting, interface design, education

e-Mexico programme, created in order to improve the people's digital abilities in our country (Table 13.5).

13.4 A Sample of Mexican Usability Projects

During the last 20 years of usability development in Mexico, several important achievements have been reached by a committed community of academics and usability practitioners. However, it is clear that this is just the beginning, and that there is still much to accomplish.

13.4.1 Academic Results

According to the paper presented at CHI 2009 "Scientometric analysis of the CHI proceedings" by Bartneck et al. (2009), Mexico is the most highly rated Ibero American country, (that is no. 22) in the rankings on the sum of main proceeding credits and extended abstracts credits presented at CHI conferences.

22. México
24. Brasil
25. Portugal
27. España
35. Chile
39. Puerto Rico
40. Argentina
48. Paraguay

Mexican HCI research groups are relatively few; yet, they have produced papers of world-class quality that have positioned the country's universities in the rankings of universities participating in CHI conferences. The top ranked HCI Mexican universities are as follows:

285. Universidad de las Américas, Puebla (UDLAP)
320. Universidad Tecnológica de la Mixteca (UTM)
226. Centro de Investigación Científica y Educación Superior de Ensenada (CICESE)
422. Universidad Nacional Autónoma de México (UNAM)

423. Universidad Veracruzana (UV)
729. Universidad Autónoma de Baja California (UABC)

Our students have also peaked in international competitions. Three Mexican teams have won first places at the ACM's Student Design Competition, celebrated during the CHI Conferences. The competition has grown each year with increased international representation, and always draws a large audience at CHI; it has become a major recruiting opportunity for identifying talented students (Fig. 13.3 and Table 13.7).

13.4.2 Industrial Projects

Industrial usability projects in Mexico have been, up until this point, scarce. There are few companies interested and willing to invest, despite the advantages and accolades a usability project could bring. Besides, clients prefer to remain anonymous

Fig. 13.3 Our University team during CHI 2007 in San José CA

Table 13.7 Mexicans results in the ACM SIGCHI Student design competition's finals

Year	Place	University	Project
2005	Joint second place	Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE) and University of California (Irvine)	Calafia, supporting emotional ties among Mexican elders and their families living abroad
2007	Second place	Universidad Tecnológica de la Mixteca (UTM)	EMI: a system to improve and promote the use of public transportation
2008	First place	Universidad Tecnológica de la Mixteca (UTM)	Ñuu Xaa: a system to support homeless people's self-subsistence

and they are not willing to share with others their projects and developments, although labs and usability professionals are inclined to do so. A sampling of recent industrial projects are provided below:

Project: Re-design of the Guerrero and Guanajuato local government websites
Company: Axitia Inteligencia en Internet (axitia.com)
Description: Axitia is the company leader in governmental website re-design. These are two cases: the websites of the Mexican States of Guerrero and Guanajuato. Both sites have been re-designed in a lengthy process, which included a diagnostic of existent websites, strategic planning, executive design and development. Each site contains particular innovations that have made them unique within the country. Axitia uses and developed a very successful bench-marking system for governmental websites, which is the standard in the country for such endeavours (Fig. 13.4).

Project: Design of Gett-In/E-blast
Company: Gelattina (gelattina.com)
Description: Gett In asked Gelattina to design an e-card (Fig. 13.5) to promote their new software for Intranet. They designed an e-card in tune with the company's personality, highlighting the advantages and benefits of using this software. Usability testing assured ease of use.

Fig. 13.4 Websites of the State of Guerrero (*left*) and Guanajuato, Mexico

Fig. 13.5 e-card of gett-in for advertisement

Project: Volkswagen global website localisation
Company: UsaLab Laboratorio de Usabilidad (www.usalab.com.mx)
Description: Volkswagen decided to update their global websites (Fig. 13.6), considering several versions of it for their most important markets all over the world. Nine selected countries identified enough cultural characteristics in order to foresight the study, and because of the large number of possible buyers and economic throughput of each market, a localisation study and usability testing were conducted for the first phase of the project.

13.5 Conclusions

The development of usability and Human-Computer Interaction in Mexico is a comprising labour in which everyone has a place. It started in the academia, with the interest and keen work of researchers coming from abroad and turning it into a practice. Academic labs were filled with students eager to learn and academic programmes started to appear. The triumph in international competition caught the attention of the industry and companies were created when the businesses started demanding easy-to-use applications. Researchers, along with usability practitioners

Fig. 13.6 Volkswagen global website localisation and usability testing

created momentum and the response of the government to a society of knowledge is based in the fundamentals of HCI and of a required usability.

The last 20 years created the foundation of HCI and usability in Mexico. The next 20 years will see the consolidation of academic programmes and a usability industry. A new expansion into unexplored and fertile markets, (combined with the creation of more and better labs and services), is in the very near future.

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Chapter 14
Usability in Aotearoa/New Zealand

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14.1 Country Overview

Aotearoa/New Zealand is located in the Pacific Ocean, south-east of Australia. It was originally settled by Māori in around the thirteenth century (King 2003), and subsequently by Europeans in the nineteenth and twentieth centuries. Aotearoa is the Māori language name for New Zealand, the latter being a name given by Dutch cartographers following the first European sighting of the country by Abel Tasman in 1642. Of the present population (4.3 M), the majority (68%) is descended from the European settlers or are new European immigrants, 15% are Māori, 7% are from other Pacific nations, and 9% are of Asian origin. English and Māori are the official languages; Māori is spoken by 4.1% of the population, and fewer than 20% of the people are multi-lingual (Statistics New Zealand).

Aotearoa/New Zealand is a parliamentary monarchy, and a member of the British Commonwealth. Parliament is multi-party, with a mixed member proportional representation voting system. The economic base of the country is largely agricultural, with tourism of increasing significance. The GDP per capita of US$23,200 (2003) is close to the average of the countries of the Organisation for Economic Cooperation and Development (OECD) (Statistics New Zealand 2005).

New Zealand's largest trading partners are Australia, China, United States of America, and Japan (Treasury 2010). The increasing importance of connections to Asia is reflected in New Zealand's membership of APEC (Asia-Pacific Economic Cooperation) and the negotiation of a free trade agreement with China in 2008. New Zealand's strongest relationship, both economically and culturally, is with Australia; since 1984 a Closer Economic Relations Trade Agreement has aided the integration and harmonisation of economic policies and regulations.

More detailed information on the country's history, culture and economy can be found elsewhere (King 2003; New Internationalist 2003; Statistics New Zealand).

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14.2 Usability in New Zealand

As for most countries, the history and development of usability in Aotearoa/New Zealand is closely tied to the history, development and promulgation of the academic discipline of human-computer interaction (HCI). For many years the practice of usability was mainly confined to the Universities, and it is relatively recently, since 2000, that it has emerged as a significant commercial/professional activity.

The earliest usability activity in Aoteroa/New Zealand dates back to the 1980s, with user studies carried out at the University of Waikato to compare the effectiveness of different menu forms (Apperley and Field 1985). At that stage the study of human-computer interaction, user interface design, and usability, and the commercial application of these endeavours, were very much in their infancy.

Although some aspects of HCI and usability had been included in graduate level teaching at several universities by the late 1980s, it wasn't until 1991 that the first undergraduate course in HCI was developed, at Massey University. In 1996, the Australian OZCHI conference was held in Aotearoa/New Zealand for the first time, and was attended by over 100 people, showing a growing interest and awareness in the subject. Several of the published papers from the conference address specific usability themes (Grundy and Apperley 1996).

In 2000 the CHINZ conference was launched as a local conference focussed on HCI and usability, providing a forum for the growing community of researchers and professionals working in this area. CHINZ is now an annual event, and typically is attended by 40–60 people. In 2004, CHINZ hosted the Asia-Pacific CHI conference, APCHI.

The University of Waikato established the first usability laboratory in the country in 2000 (Thomson and Apperley 2001), with state-of-the-art facilities to support comprehensive usability studies. Although motivated by academic research needs, the laboratory undertook a number of commercial contracts, and saw part of its role as promoting usability as a discipline, and providing education and resources for commercial organisations. At this stage a number of small informal usability communities were beginning to emerge across the country, which eventually led to the Usability Professionals Association of New Zealand (UPANZ) being established in 2004. UPANZ currently has almost 400 people on its mailing list. Earlier, in 2003, the first commercial organisation wholly focused on usability was established in Wellington, Optimal Usability.

Figure 14.1 shows a time-line indicating the key events in this brief history. An earlier paper (Apperley et al. 2003) provides an historical perspective on HCI activity within the universities.

The first significant user study involving Māori language (te reo) participants was published in 2006. This examined patterns of usage of a digital historic newspaper collection over a period of time, where users were able to choose between English and Māori interfaces. The content being accessed was predominantly in te reo (Keegan et al. 2006).

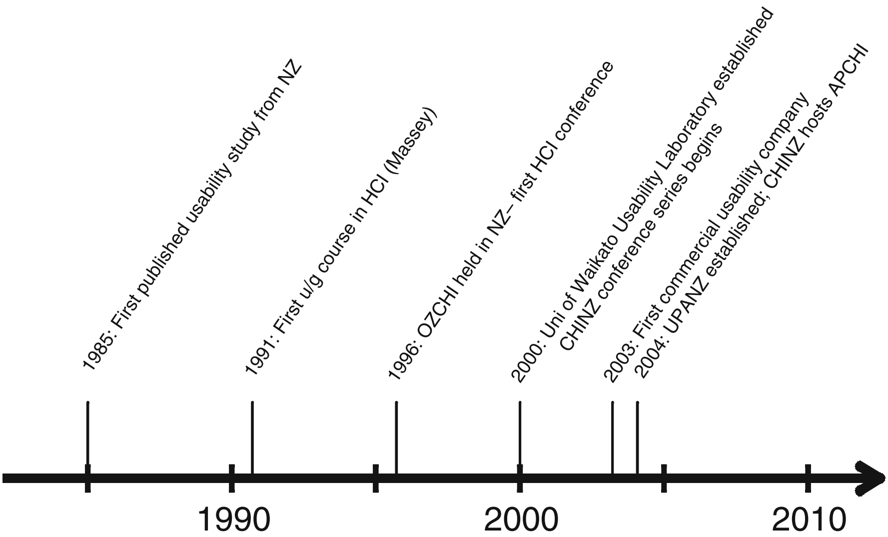

Fig. 14.1 A timeline of the history and development of usability and related activities in Aotearoa/New Zealand

The Ergonomics Society of Australia and New Zealand (ESANZ) had been established in 1966, and by 1986 there was sufficient interest to form an independent local organisation, the New Zealand Ergonomics Society (NZES). A Board for Certification of New Zealand Ergonomists provides a certification system for qualified professional practitioners of ergonomics. No similar specific certification process is presently available for HCI/usability practitioners. In Australia, the HCI special interest group of the Human Factors and Ergonomics Society of Australia (HFESA) run the annual OZCHI conference. In contrast, the annual New Zealand CHINZ conference is organised by the local ACM SIGCHI Chapter, and has little interaction with the ergonomics community.

14.3 University Programmes

All of the eight Universities in New Zealand include some coverage of usability within their teaching of a computer science, information science, or software engineering degree. This coverage is quite limited in some cases, and quite extensive in others. At almost all of the universities, usability is just one component of a course which is likely focused on human-computer interaction or a closely related topic such as interface design or information visualization. Those teaching in the subject area are generally engaged in, and publish, related research. A brief summary of the current activity in each university, in teaching and research, is included in the following paragraphs. Where appropriate, examples of relevant published research are given.

14.3.1 University of Auckland

The Computer Science department offers a specific 3rd-year undergraduate paper in human-computer interaction which includes some usability content, and provides a further advanced paper at the graduate level. A number of staff are actively engaged in usability research including work on pen-based interfaces (Plimmer 2008), web usability (Conte et al. 2007), and automated usability testing (Au et al. 2008).

14.3.2 Auckland University of Technology

Within the Bachelor of Computer and Information Sciences degree, a 3rd-year paper in applied HCI is offered, which includes some usability content. Similar material is available in the Bachelor of Business degree within the eBusiness option. Usability material is also taught in graduate level papers in both computer and information sciences and in business. The Usability Research group has focussed on opening up usability procedures in order to provide access to a wider range of people involved in software development (Carter 2007).

14.3.3 University of Canterbury

A 2nd-year undergraduate paper in human-computer interaction addresses some usability issues; further material is included in graduate papers on HCI and visualization. The HCI and Multimedia laboratory is very active in research concerning usability, and has an extensive record of highly relevant user studies (Alexander et al. 2009). The Human Interface Technology (HIT) lab is also extensively involved with user related studies (Sodnik et al. 2008).

14.3.4 Lincoln University

Although the teaching programme in Computing includes material on interface design spread across a number of papers, there is no specific usability content in the degree. The computing group do engage in some research on usability related matters (Rutherford et al. 2004).

14.3.5 Massey University

A paper in user interface design, with some usability material, is offered in computer science and software engineering degrees at both 4th year undergraduate and at graduate level. A number of staff in the computer science group are actively engaged in usability research (Johnston et al. 2009). Within the business school, Massey offers a variety of graduate and post-graduate qualifications in ergonomics, from its Centre for Ergonomics, Occuppational Safety and Health (CErgOSH).

14.3.6 University of Otago

Usability material is included in the degree programmes in Information Science and in Software Engineering. There is an active HCI research group in the Information Sciences department, with a strong focus on virtual and augmented reality in teleconferencing; usability is a part of their activity (Scowen and Regenbrecht 2009).

14.3.7 Victoria University of Wellington

Papers in user interface design, and in human-computer interaction, are offered at both 3rd and 4th year levels as a part of the software engineering degree. There is a very active software engineering research group, and some of their activity extends into the domain of usability (Wright et al. 2005; Barr et al. 2007).

14.3.8 University of Waikato

Usability material is covered within a 3rd-year undergraduate HCI paper, and there is a specific usability engineering paper, along with other related topics (user interfaces, HCI, information visualization) at the graduate level. Usability research activity is spread across a number of research groups, including HCI and digital libraries (Nichols and Twidale 2006; Cunningham and Nichols 2008). The department maintains a dedicated usability laboratory.

14.4 Usability in Industry

Aotearoa/New Zealand is a relatively small country, yet one with a healthy economy, an educated and sophisticated population, and an increasing focus and awareness on the importance of technology, particularly its role in future economic growth. Its size has some interesting consequences. For example, in 1967, a consortium of all of the major banks established a clearing house (Databank) which provided what was possibly the most comprehensive unified banking system of its time. The country has continued to be at the forefront of banking technology, chiefly because its small size enables comprehensive national systems to be put in place relatively easily. On the other hand, few multinationals have major research or development activities in the country, and the business sector (particularly the IT sector) is dominated by small to medium sized enterprises (SMEs); SMEs (100 or fewer employees) make up more than 99% of all businesses and account for about 60% of all employment (Centre for SME Research). In light of the small scale of most private organisations involved in IT development, the state sector becomes a major player with regard to issues such as usability.

Awareness of the importance of usability and user experience has been growing throughout the past decade. In 2003 Norris and Van Der Kaay (2003) describe the process of introducing usability into the design of the intranet for Telecom New Zealand, the predominant telecommunications company in New Zealand. As awareness has grown the largest dedicated usability company, Optimal Usability, has grown alongside. A characteristic of Optimal Usability's strategy has been to reach out beyond the small New Zealand market by developing online tools through their product development company, Optimal Workshop. Two notable results are:

- OptimalSort: a web-based tool that can be customised to create, perform and analyse card sorting studies;
- Chalkmark: a web-based tool for collecting click data on screen mockups, producing a 'heatmap' of user click locations.

As with usability in the rest of the world, concerns that start in the use of computers and technology have broadened to issues of user experience and service design throughout the economy. This broad perspective of the role of usability methods is illustrated by the involvement of Optimal Usability in the development of new models of airline seating for Air New Zealand.

14.4.1 Case Study: Air New Zealand's New Long Haul Experience Design

Air New Zealand wanted to develop a new long haul passenger experience strategy and initially worked with IDEO during 2007. This work laid a foundation for the next stage of conceptual seat design in which New Zealand design companies helped create 19 separate concepts. In February 2008, Air New Zealand brought the five most promising concepts to Optimal Usability to help test which one or two to actually build and place on its new long haul aircraft.

Optimal Usability worked with Air New Zealand to establish personas that communicated how key market demographics behaved when travelling and what was important to them. This helped focus a diverse group of designers to a single view of the key customer groups.

14.4.1.1 Creating Realistic Test Flights

Utilising a mock Boeing 787 cabin that Air New Zealand had built in a secret location in Auckland (the first outside of Boeing's facility in Seattle), Optimal Usability worked on creating a realistic shortened flight experience. The realism factor was critical in drawing out true customer behaviours throughout a flight experience. Some key contributors to the realism were:

- Actual aircraft sound
- Lighting that mimicked a real flight
- Real cabin crew to provide safety instructions and service
- Adequate lengths of time for sleep to understand real behaviours
- Adequate number of passengers in a test flight to encourage real social behaviours
- Actors were used and not only brought a level of realism to their own flight experience but they also helped other passengers get into a role-playing frame of mind.

14.4.1.2 Flight Experience (FX) Testing

Optimal Usability co-ordinated groups of passengers from each target demographic through flight sessions and observed the interactions of passengers with all aspects of the design concepts i.e. seats, tray table, in-flight entertainment, access in and out of rows, service options, etc.

Observations and photographs focused on parts of the experience that worked well and aspects that caused issues. Following the FX test session, Optimal Usability facilitated focus groups with the passengers and designers to better understand what was observed and to discuss any possible design changes.

Working closely with the designers, quick design iterations were made and then re-tested with the next group of passengers. This style of iterative design helped converge the design efficiently, based on real passenger feedback.

14.4.1.3 Using Actors and Real Customers

Initial seat concepts in the mock aircraft environment were made of polystyrene and the overall environment required some imagination to provide useful feedback. Optimal Usability recruited method actors who were able to take on the role of the personas. The ability for the actors to play the persona characters and then articulate the experience was a very successful technique for the early prototypes. As the fidelity and realism of the seat concepts were developed, real customers were recruited to participate in the FX test sessions.

14.4.1.4 Summary

With most of the design team being part of FX testing sessions, there was a shared understanding of the issues to be solved and hence focused solutions. Building on the work done with the seat concepts and FX testing, Optimal Usability also got the opportunity to user test the new in-flight entertainment system and test the conceptual design for the updated online booking experience.

This work represents a landmark for usability in New Zealand, highlighting the capacity of the usability sector to support such a high-profile locally designed product.

14.5 Conclusion

The development of usability activity in Aotearoa/New Zealand dates from the 1980s. The earliest endeavours were strongly associated with the study and concern of human-computer interaction, and the development has been closely tied with that focus. However, in more recent times the focus has broadened, and usability has been seen to be highly relevant to industry, given rise to the emergence of commercial organisations concerned solely with usability issues. The case study described above, demonstrates how one such organisation, originating with a human-computer interaction focus, is now involved in leading-edge internationally relevant ergonomics activity.

It is likely that this increasing relevance in industry will continue, together with the expansion of usability from its HCI roots, to embrace the usability of whole systems. It is to be hoped that this trend may lead to the building stronger links between the ergonomics and HCI communities.

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Chapter 15
Usability in Philippines

Aura Castillo-Matias and Rosemary R. Seva

15.1 Overview of the Country

The Philippines is an archipelago consisting of 7,107 islands of which only about 2,000 are inhabited. It is divided into three main geographical areas called Luzon, Visayas and Mindanao. The total area of the Philippines is 299,404 km^2 stretching 1,850 km from north to south and 1,100 km from east to west.

Currently, its total population is estimated at about 92 million people of multiple ethnicities and cultures: Chinese, Spanish, American, Japanese and European. There are also about 60 cultural minority groups in the Philippines which collectively constitute about 12% of the total population.

The climate in the Philippines is hot and humid year round with an average temperature around 25°C. However it can be roughly divided into the dry season (January to June) and the wet season (July to December). The tropical climate of the country sustains one of the richest areas of biodiversity in the world. It is estimated to support two million species of plants and animals endemic to the islands.

Literacy in the Philippines is estimated at 93.4% and a functional literacy of 84.1%, about equal for males and females. Children attend elementary, secondary and higher education institutions. Classes are taught in both the national language Pilipino and English. Three government agencies are involved in education. The Department of Education is responsible for elementary, secondary and non-formal education. The Technical Education and Skills Development Authority administers post-secondary middle-level education training and development. The Commission on Higher Education regulates program standards in undergraduate and graduate academic programs offered in both public and private colleges and universities.

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While Filipino and English are the official languages, there are several indigenous languages also widely spoken. Indigenous languages or dialects number around 171 including regional languages such as Bicolano, Cebuano, Ilocano, Kapampangan, Ilonggo among others.

The Philippine economy once driven by agriculture is transitioning into a newly industrialized country engaging more in manufacturing and services. Primary exports include semiconductor and electronics, transportation equipment, garments, coconut oil and fruits. Service industries such as tourism, telecommunication and business process outsourcing are the most promising opportunities helping boost the economic growth of the Philippines.

Major trading partners include China, Japan, the United States, Thailand and Malaysia. The unit of currency is the Philippine Peso.

15.2 Usability Applications in the Philippines

The limited opportunity to learn usability in Philippine educational institutions is driven by the need of the industry. Product design in the Philippines is limited to furniture, jewelry, and garments industries. These are small and medium scale enterprises that do not have formal programs in product research and development and employs less than a hundred workers. Aside from the furniture industry, the costume and jewelry industries will not benefit much from the application of usability principles. The low awareness in human centered design is also evident in the poor design of many other areas like public transportation, public payphones, ATM machines and road/street signs, among others. However, much promise can be seen in its application in the telecommunications and software industry.

Telecommunications industry in the Philippines is dominated by a few companies that offer a variety of services including call, short messaging, downloading, and internet services. These companies employ several programmers to develop new products for their intended market. However, most application developers focus on the functionality of programs and do not follow established usability guidelines. One of the big telecommunications companies became aware of this and established a usability group to ensure that usability is integrated as early as the product conceptualization stage. Before launching a product or service, the usability group conducts expert review or usability testing to identify problems that users might encounter.

The software industry in the Philippines is well known all over the world and had been around for more than two decades. It earned more than USD 350 million in 2004 and at present, there are more than 400 companies engaged in the business employing more than 10,000 workers (Toral 2010). The main focus of the industry is on systems application development and maintenance of legacy application (Singh 2003). It is a significant industry that contributes to the growth of the Philippine economy and can be made more competitive through the integration of usability methods in the development process. At the moment, only a few developers are formally testing the usability of their products before actual release in the market.

The interest in usability in the Philippines is driven by a few people who have either worked with developers or have done some software development in the past. Some of them have undergone formal usability training (certified usability analyst) but most have studied usability on their own. They are either employed by a company or freelance application developers that have no access to a usability laboratory where they can conduct the test. There is one network of usability advocates that have been involved with the World Usability Day movement.

15.3 Extent of Usability Activities

15.3.1 Undergraduate and Graduate Studies

Not many universities in the Philippines have included usability in their undergraduate and/or graduate curricula. In the engineering field, it is only in the industrial engineering program that usability is included as one of the topics in the product design and ergonomics courses. De La Salle University, one of the private universities in the Philippines, offers a full course on usability testing and evaluation as an elective course in its Industrial Engineering undergraduate program. In the University of the Philippines, the national university, usability and human centered design is discussed as one of the topics in the Human Factors Engineering course in the master's program under the human factors and ergonomics track.

In the computer science program, usability concepts are included in the human-computer interaction course. Some master's program in information technology have also included one or two lectures on the topic.

15.3.2 Instructional and Testing Laboratories

De La Salle University, a private university, has a usability-testing laboratory in its Human Factors and Ergonomics Center (HFEC). One room with one-way mirror is designated as the testing room and another one as the observation room. All computers in the room are equipped with screen capture software such as Camtasia and Morae to record and annotate web usability test results and a number of cameras are available to record testing of mobile applications. Figure 15.1 shows how testing of mobile applications are recorded.

In case the project sponsor is interested to know actual points of interest in the website, the Center has an eye-tracker to determine the gaze pattern of users as seen in Fig. 15.2.

The eye tracker is used to trace eye movements of subjects during the test and quantify the fixation duration at areas of interest specified before the test. For example, a web designer might be interested to know if a certain promotional item

Fig. 15.1 Screen capture camera

Fig. 15.2 Website gaze analysis using eye tracker

in the website catches the attention of the user. Through the use of this eye tracking equipment, the number of fixations and the duration of fixation at this item will be recorded. In case the results show that users do not focus on this item, the designer can consider changing its position or design characteristics such as size and color. The eye tracker is a useful tool in usability studies as it records unconscious behaviour of subjects while using the website. Such information cannot be obtained from post-usability testing interviews because they are not aware of their actions.

The HFEC has done a number of usability studies for the industry. Projects done by the Center do not only involve usability testing but also development of operational usability measures in a specific context. Some projects done in the past include testing of e-commerce websites, mobile applications, SMS, SIM-OTA, and mobile sites. The Center also assisted web developers in improving website architecture through the use of multivariate analysis.

Student researchers of the Center conducted several studies on improving the usability of e-commerce websites and development of usability guidelines for visually impaired users. A number of studies were also conducted to investigate phone design usability. The outcomes of these studies are further discussed in the next section.

Within the next 2 years, the Usability Testing Laboratory of the Department of Industrial Engineering and Operations Research at the University of the Philippines Diliman will be established. Through the Engineering Research & Development for Technology (ERDT) project of the Department of Science and Technology (DOST), funding for capital outlay and equipment purchase has been allocated to help build new research laboratories for emerging technologies. This laboratory will be equipped with usability testing software such as Morae, eye tracking systems, electronic goniometer and EMG data loggers, digital video cameras, computer desktops/laptops and statistical analysis software. The laboratory will have a usability testing room, a video-conferencing/focus group area and an observation room in between (as shown in Fig. 15.3). This layout was recommended by Dr. Ian Douglas of Florida State University during his 2-month visiting professor visit to the University of the Philippines last August 2009.

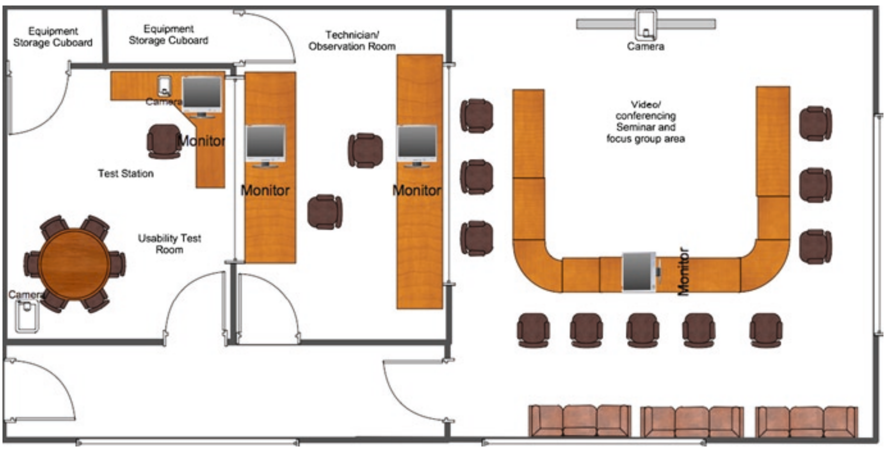

Fig. 15.3 Proposed usability testing laboratory layout

15.4 Two Sample Industrial Studies

15.4.1 Usability for Visually Impaired Users

Menu structure is significant in developing usable websites for visually impaired users. Web sites with broad menu structure resulted in lower task times, less number of keystrokes, low cognitive load, and high satisfaction compared to designs with deep menu structure. The result obtained was consistent with Commarford et al. (2008) where the use of broad menu structure was preferred over the use of deep menu structure. Deep menu structure entailed higher cognitive compared to broad menu structure, which was reflected by the high NASA-TLX score obtained from the participants. Participants who experienced high cognitive load performed worse in terms of task time, number of keystrokes, and PSSUQ score than participants who experienced low cognitive load.

Visually impaired participants have a tendency to rely more on hyperlink searching to facilitate navigation. As such, number of links became a significant factor to Web site usability for the visually impaired. It was discovered, in most cases, that use of less number of links prove beneficial to the usability of the Web site in terms of task time, number of keystrokes, and NASA-TLX score compared to the use of more number of links. This is mainly because less number of links generated better performance because of the cognitive load experienced by the participants were not overtaxing on the memory than as compared to the use of more number of links. With regards to PSSUQ not becoming significant, it was revealed that even though participants desired having less number of links on the Web site. Participants are willing to be exposed to more number of links depending on the type of Web site being navigated. Since an e-commerce Web site was chosen, presence of more number of links was tolerated by the participants.

Length of link also became significant in affecting the usability of the Web site in terms of NASA-TLX and PSSUQ. Generally, the performance of participants on short links was better than long links. The use of short link entailed lower cognitive load because less information was needed to be processed. With regards to task time and number of keystrokes not becoming significant, it was observed that participants when exposed to long links tended not to wait for the entire phrase of words to be dictated by the screen reader. As a result, they miss out on vital information and may have to repeat the entire searching process. This then translated into participants becoming dissatisfied with the Web site, which was also reflected on the obtained PSSUQ score.

It was also discovered that although participants performed better with Web sites having less number of links, unfamiliarity of the Web site played a significant effect on their performance. This occurrence can be explained by the navigational behavior of some participants when exposed to unfamiliar Web sites. Participants exposed to unfamiliar Web sites tend to make use of line-by-line scanning. Line-by-line scanning involves browsing through majority of the Web site's texts and graphics regardless of it being a link or not using up and down arrow keys (Takagi et al. 2007).

The interaction between the number of links and length of link was investigated and it was found out that in certain instances the use of short length of link and long length of link on a Web site having 50 links almost produced similar performance. This can be attributed to participants still not experiencing information saturation, which was reflected on the obtained NASA-TLX scores. However, with regards to increasing the number of links to 150, a clear decision of choosing short length of link over long length of link was observed. In this case, information saturation was already experienced by the participants, which was also reflected on the obtained NASA-TLX scores. Based on the observed result, it can also be said that the number of links have a bigger impact on cognitive load than as compared to length of link.

15.4.2 Phone Design Enhancement Using Apparent Usability

The prevalence of mobile phone usage in the Philippines prompted the study of Seva et al. (2009) to enhancing its design by identifying physical attributes that influence apparent usability. Apparent usability is identified to be an indicator for how easy people think something will be used based on assessment through the visual domain. Kurosu and Kashimura (1995) presented principal determinants of apparent usability including measurement methods to be adopted in its assessment. What they presented were primarily divided into two categories namely the cognitive efficiency strategies and the operational efficiency strategies.

Based on the findings of this study, apparent usability is a significant predictor of phone desirability. Apparent usability is significantly related to the emotions felt by consumers while using the product and this strong feeling might have contributed to their desire for the product. Mobile phone attributes body shape and number button arrangement were observed to be substantial in predicting apparent usability and should therefore be the main concerns of phone designers.

The main factor that affects apparent usability is the perceived ease of use of the product and not just attractiveness. As such, it is crucial to study further how users can determine ease of use without actually using a particular product. This is especially useful in the design of mobile phones because customers are not allowed to use the mobile phone prior to purchase in the Philippines. As such, buyers rely on their perception of the phone’s ease of use or prior experience.

The results of the study also showed that consumers prefer wider screen area and smaller mobile phone size. A wider screen area may be preferred as it allows consumers to appreciate the advanced integrated features of mobile phones such as photos, video, games, web browsing and 3 G networking resulting from the enhanced visualization. On the contrary, a smaller length and width ratio is favored as this portrays a feeling of sleekness and modernity. The miniaturization trend is apparent as mobile phones are continuously getting smaller and thinner.

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Chapter 16
Usability in Poland

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16.1 Overview of the Country

Poland is located in the central part of Europe – it covers an area of 312,685 km^2 and is the ninth biggest country in Europe. It borders the Baltic Sea (528 km) and seven countries, namely Belarus (416 km), Czech Republic (790 km), Germany (467 km), Lithuania (103 km), the Russian exclave of Kaliningrad (210 km), Slovakia (539 km) and Ukraine (529 km).

Poland became the first of the central European countries to overthrow communist rule in 1989. It is the most populous state in central Europe. In 1989 it was on the verge of economic collapse, weighed down by massive foreign debt. Today, it is one of the fastest growing economies in Europe. On 13 December 2002 Poland completed negotiations to join the European Union. It signed an Accession Treaty in April 2003 and, following the public support shown in the referendum held on 8 June 2003, became a full member of the European Union on 1 May 2004. Poland is also a member of NATO since 12 March 1999 (UK Foreign and Commonwealth Office 2010).

Country Data

- Area: 312,685 km^2 (120,728 square miles)
- Population: 38.1m
- Capital city: Warsaw (population: 1,711, 466)
- Other big cities: Kraków 756,267, Łódź 755,251, Wrocław 634,630, Poznań 564,951, Gdańsk 456,658, Katowice 314,500

Poland emerged into the global market place almost 20 years ago, transforming itself from a command economy into a free market economy. The private sector (75% of GDP) is now the main driver of economic activity. Poland has enjoyed uninterrupted growth since 1992. In 2004 – the year of accession to the EU – growth

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amounted to 5.4% and, after a slow down in 2005, picked up again in 2006 to 6.2% and reached 6.6% in 2007. In 2008 it is expected to stay above 5.5%. In August 2008 it stood at 4.8%, and while other countries suffered from the recent recession, Poland has been reporting 1,4% growth for the fiscal year 2008.

For instance Poland attracted 12.8 billion Euros of Foreign Direct Investment (FDI) in 2007, where 85.7% of FDI came from EU countries (mainly from France, Germany, Austria, Italy and Sweden) and 14.7% from the rest of the world (mainly from USA, South Korea and Japan). Foreign investments are still a big part of Polish manufacturing and service industries.

Unemployment has fallen significantly in recent years, but the labour market remains one of the key challenges for the Government (e.g. low participation rate). Unemployment stood at average of about 9% in 2008 and 2009, compared to 19.1% in 2004, but there are still huge regional disparities.

Basic Economic Facts (UK Foreign and Commonwealth Office 2010):

- GDP: US$438.6bn (€373.9bn)
- GDP per head: US$11,483 (€9,790)
- Annual growth: 6.6% (2007), 2.2% (2008), 1.2% (2009)
- Inflation: 4.8% (August 2008)
- Unemployment: 9.3% (August 2008)
- Major industries: Machine building, iron and steel, coal mining, chemicals, shipbuilding, food processing, glass, beverages, textiles
- Major trading partners: Germany, Italy, Russia, Netherlands, France, Ukraine, UK

The Polish IT market is supposed to maintain its status of the one of the fastest growing markets in Central & Eastern Europe for the next few years. The size of the IT market is estimated to increase to around US$9.2bn in 2014 (Business Monitor 2010); however, IT spending per capita is on a considerably lower level than in other EU countries and disparities in IT penetration between towns and rural areas are still broad. Nevertheless, more than 50% of the Polish population is using the Internet (Digital Poland 2009) and some on-line services like shopping are even more popular than in Western Europe.

The main source of new developments and projects are European funding on ICT and national information society-related initiatives.

The Polish software market is projected to be worth US$1.6bn in 2010 [9]. Basic software packages such as enterprise resource planning (ERP) still account for about half of enterprise software spending, however, demand on more specialized applications, such as customer relationship management (CRM) and business intelligence is growing faster.

Asseco, Comarch, Sygnity are the top Polish software vendors. Asseco, ranked fifth in the 2009 Europe Truffle survey (Truffle 100 2009) with 432 million EUR revenues and over 5,000 employees specializes in IT systems and software for the banking sector, power and telecommunication, health services, local administration, agriculture, uniformed services and international organizations and institutions such as NATO or the EU. Comarch is offering ERP, CRM and business intelligence solutions. Sygnity offers a full range of services from consulting through realization, to outsourcing of IT projects for large and medium-sized enterprises in the most important sectors of the economy as well as in public administration. All the companies mentioned are also active abroad, building capital groups in the EU and outside.

The culture of Poland is closely connected with its intricate 1,000 year history. Its unique character developed as a result of its geography at the confluence of Western and Eastern Europe (wikipedia.org). The people of Poland have traditionally been seen as hospitable to artists from abroad and eager to follow cultural and artistic trends popular in other countries. In the nineteenth and twentieth centuries the Polish focus on cultural advancement often took precedence over political and economic activity. These factors have contributed to the versatile nature of Polish art, with all its complex nuances (Student HCI Scientific Group 2010).

Polish art has always reflected European trends while maintaining its unique character. Its original achievements in architecture, posters, painting, theatre, literature, film and jazz make Poland an intriguing place for tourists, who come from all over the world. Apart from Warsaw, towns like Krakow, Wroclaw and Gdansk have been traditionally main places of interests for tourists interested in enjoying various forms of Polish intensive cultural life.

Among the most outstanding twentieth century Polish artists, poets, novelists and playwrights are: Witold Gombrowicz, Sławomir Mrożek, Zbigniew Herbert, Tadeusz Różewicz, Czesław Miłosz, Wisława Szymborska as a well as Ryszard Kapuściński (reporter) and Stanisław Lem (science fiction). Other famous names recognized worldwide are for example Andrzej Wajda (film director), Krzysztof Penederecki (composer) and jazz musicians Krzysztof Komeda, Tomasz Stanko and Michal Urbaniak.

16.2 Overview of Usability in the Country

16.2.1 History

IT developments in the 1990s in Poland brought personal computers (PCs) to everyday business life, while mainframe computers were still in use. Liberalization of the Polish economy in the 1990s – in addition to state-owned IT firms – brought to the market many independent IT developers, whose activity much contributed to delivering new software applications for business management support.

At that time typical problems appeared with quality and usability of IT systems – as a result, a growing interest was shown in usability and in applying human-computer interaction design (HCI) for interactive systems development.

First HCI workshops in Poland took place in 1998 sponsored by Xerox Corporation. A group of famous HCI specialists (Jonathan Grudin, Clayton Lewis, Peter Polson, Lucy Suchman) met in several towns with members of Polish university staff, who were interested in new, human-centred design methodologies for IT systems development.

At that time the sets of HCI tutorial notes gifted by Association for Computing Machinery (ACM) to some members of Polish academia served as the main source for stimulating educational activities in this newly emerging area. The first universities, who then started regular educational and research activities in HCI and usability areas, were:

- Gdansk University of Technology (Prof. Marcin Sikorski)
- Wroclaw University of Technology (Prof. Jerzy Grobelny).

The effect of the first HCI seminars and tutorials offered at these two institutions, was a spreading of the interest in the new, fascinating research, resulting in establishing HCI courses in almost two dozen Polish universities (more in Sect. 16.3).

The importance of HCI was noticed by the Ministry of Education so that HCI was added as an obligatory topic to the curricula of computer science at Polish universities.

16.2.2 An Outline of Usability in Poland

The outline of current usability-related activities in Poland is split between three areas: application, education and research. Therefore following target groups for HCI and usability are: IT practitioners, graduates and research-academic staff.

Following main application areas for HCI and usability can be pointed out:

- *Software usability*: prototyping and rapid prototyping, user interface ergonomics, human factors, user centered design methodology, user experience, usability testing, user and context modeling and monitoring, accessibility evaluation and guidelines;
- *Multimodal interfaces*: interaction design, use of speech, gesture, haptic for the HCI, dialog systems, affective computing and emotional design, emotion recognition, biometrics, augmented reality;
- *Web usability*: web usability testing, e-marketing, e-services, e-inclusion;
- *Ubiquitous computing*: on-line services for business and private life, e-services and e-government, mobile solutions.

Currently three main streams of activity in HCI and usability can be identified in Poland:

1. Universities:
   Polish academic institutions perform educational activities in areas related to HCI, at both undergraduate and graduate levels

   - Technical universities: future graduates usually study computer science, electronics, electrical engineering, management,
   - Non-technical universities: future graduates usually study psychology, economic informatics, informatics;

In the area of HCI universities also perform diverse research activities: scientific projects, seminars, international cooperation.
2. Industry:
The Polish IT industry is represented mostly by large software companies, who run application-oriented projects for specific product development; a big part of these projects as well as their outcomes remain confidential so research reports are seldom published;
3. Consulting companies:
Polish usability consulting sector is represented usually by relatively small, private usability consulting companies, serving diverse clients in analytical, research and also utility-oriented studies. Sales volume in this sector remains unknown partly because these specific data sets have not been gathered so far, and if so, many usability consulting companies take up other usability-relevant activities, like web design, web advertisement development or e-marketing, where usability works may be "hidden" under another label.

16.2.3 Outlook for the Future

Future developments of HCI and usability in Poland are stimulated by the balance of promising perspectives and existing problems as current limitations.

Unique perspectives of the Polish usability market are as follows:

- Generally good education level of young generations, internet usage has been a natural part of their everyday life;
- Demand for quality of e-services is growing in public and in business life;
- Major business activities are dependent on the quality of IT systems and infrastructure;
- Accessibility of e-services is in the scope of the European Commission, what forces new solutions, new regulations and new projects to deliver them;
- Relatively moderate risk level in implementing IT solutions, because Polish industry usually applies solutions already tested in countries and markets with higher IT-saturation;
- Many small-scale software developers in the Polish market, interested in improving quality and usability of their products in a competitive market.

The following problems make current developments in the usability of interactive systems more difficult:

- Generally poor quality and usability of e-services for citizens, accompanied by poor saturation with internet access in rural areas;
- Accessibility regulations for WWW sites and e-services are not effective;
- Insufficient funding for public universities and, generally, for research programs;
- Few Polish research projects are focused on HCI and usability, low funding, few PhDs on HCI;

- There is no HCI-related journal in Poland, HCI papers are scarce and dispersed among various publications;
- The Polish IT industry still needs “usability evangelization” and familiarization with tools available for IT projects quality management;
- Many Polish IT companies believe that usability is costly, time-consuming and not feasible in actual projects.

It is difficult to point out now any general pattern for usability developments in the Polish IT industry and services: it is an ongoing interplay between specific market perspectives and existing limitations, that shapes actual behavior of commercial and administrative institutions towards implementing usability-related projects.

16.3 Extent of Activities

16.3.1 Universities with Educational Programs

Currently HCI courses are offered in Poland at more than two dozen universities,[1] including:

- Gdansk University of Technology
  - Faculty of Management and Economics, Department of Ergonomics and Maintenance
- Faculty of Electronics, Telecommunication and Computer Science, Software Engineering Department
- Jagiellonian University in Cracow
  - Institute of Scientific Information and Library Science
- Military University of Technology in Warsaw
  - Department of Cybernetics;
- Lodz University of Technology
  - Institute of Computer Science;
- Polish-Japanese Institute of Information Technology in Warsaw
  - Multimedia Department;
- Poznan University of Technology
  - Faculty of Computer Science and Management;

[1] Alphabetically listed, with HCI-relevant relevant organizational units, full list is available at the web site for the student HCI Scientific Group at the Polish-Japanese Institute of Information Technology: http://hci.pjwstk.edu.pl/index.php?page=edukacja

- Wroclaw University of Technology
  - Faculty of Computer Science and Management, Laboratory of Ergonomics;
- Warsaw School of Social Sciences and Humanities
  - Institute of Social Psychology, Information Science and Communication.

Universities and teachers to some degree are flexible in specifying the contents of the course, as far it covers minimal requirements for the curricula officially approved by the Polish Ministry of Science and Higher Education for the undergraduate (bachelor and engineering) studies in computer science. This curricula demands at least the following student skills to be acquired from the course:

- Ability to prepare and execute usability testing
- Ability to prepare a graphical user interface for a computer application.

As shown above, the list of skills is very short and rather generally stated, and moreover these skills are specified under the common name "Computer graphics and human-computer interaction", which may often lead to domination of graphics over HCI in practical tuition.

16.3.2 Universities with Research Activities

There are several universities[2] with regular usability-relevant projects, among them:

- Academy of Fine Arts in Katowice: their research on interaction design covers among others gaze tracking and gesture semantics and recognition;
- Gdansk University of Technology, Faculty of Management and Economics: experience in developing methodologies for usability testing and user-based studies, especially in the areas of usability and consumer behaviour in on-line services;
- Polish-Japanese Institute of Information Technology in Warsaw: many projects in developing multimodal interfaces, spoken dialog systems, augmented reality, emotion recognition, multi-touch applications,
- Warsaw School of Social Sciences and Humanities: research focused mostly on psychological and social aspects of IT, information society;
- Wroclaw University of Technology, Ergonomics Laboratory: numerous studies covering eye tracking methodology and developing methodologies for the user-centred design of interactive systems.

At the time of writing, in different academic institutions several usability-relevant projects have been in different phases of development. On average these projects can be characterized usually as smaller-scale projects, with moderate funding.[3]

[2] Alphabetically listed and with their main research areas.

[3] Funded by the specific University or by the Polish Ministry of Education and Scientific Research.

They are often interdisciplinary, touching both technical issues and social or psychological aspects of HCI, and they are usually located somewhere close to multimedia and graphics areas; as such they often cover user interface design, UI development and various aspects of HCI – but they are not listed directly as projects relevant to the HCI domain.

16.3.3 Industrial Activity

There are several institutions running regular projects relevant to HCI and usability areas:

Central Institute of Labour Protection in Warsaw (www.ciop.pl)
This is a national institute conducting various projects on ergonomic requirements for work systems, standardization, occupational risk and protection of personnel health. One of its units, Department of Work Psychology and Sociology is focused on research about the health protection of computer staff, including application of software ergonomic requirements and developing regulatory framework regarding quality conditions of computer-supported work in contemporary offices.

Telekomunikacja Polska S.A. TP SA (www.tpsa.pl)
This is the biggest Polish Telecom, operating cable and cell phone networks, however its domestic market has dramatically shrunk in recent years. TP SA is subsidiary of France Telecom, thus there is a strong liaison between R&D departments of both institutions; they have common R&D projects on HCI, user-based studies, consumer research, user interface research and customer experience assessment. TP SA owns a usability lab, and has projects on improving quality and usability of interactive services offered by Telekomunikacja Polska S.A. for business and individual clients. Usability reports are intended for internal use, so they are generally not published in professional bulletins. More and more usability projects performed by TP SA in Poland are in regard to services or websites for other markets in Central-Eastern Europe.

KPMG Poland (www.kpmg.pl)
KPMG is a large international consulting company, with its Polish branch regularly publishing – among other areas – reports on current trends in IT application in the Polish economy and business. Some reports deal directly with issues of quality of IT services for business, like usability and usage patterns of Intranet portals in Polish companies, and they also form practice-oriented guidelines for decision-makers in business.

Symetria Company in Poznan (www.symetria.pl)
Symetria is a private service company based in Poznan, specialized in eye tracking research and usability consulting. Symetria regularly publishes its own research papers and reports (“white papers”), not only on eye tracking technology but also on usability studies and analytic reports.

Janmedia (www.janmedia.pl)
Janmedia an international company with a Polish branch based in Wroclaw; it has been a pioneer company promoting usability in Poland as a part of their own strategy, and, consequently, promising to deliver high usability to all their own products and services.

There are several other usability consulting companies, like ThinkLab (www.thinklab. pl), Uselab (www.uselab.com.pl) or Webaudit (www.webaudit.pl). Apart from offering various usability services, owners of these companies often publish blogs, white papers and research reports. Very often they also act as animators of local usability communities and usability evangelists on the domestic scene.

16.3.4 Conferences, Meetings, Professional Activities

Main HCI events organized in Poland in recent years include:

Kansei seminar "User Interface – Kansei in practice"
This seminar has been organized annually since 2006 by the Polish-Japanese Institute of Information Technology in Warsaw. Every year this event gathers ca. 100 participants from academia (students and teachers) and from industry across Poland.

The Kansei seminar is devoted to main topics such as interaction design, Kansei engineering, user experience, usability testing and HCI in general. There are always two regular sessions of up to 15 presentations:

1. Foundations of Kansei/HCI, incl. theoretical issues of affective design;
2. User interface design in practice, where presenters discuss practice-oriented solutions related to interaction design, their usability and innovative user interface solutions. Kasei seminar is the only regular event in Poland dedicated exclusively to HCI and usability – while other IT events only sometimes offer a HCI or usability track.

World Usability Day
This is a world-wide event organized every year by different institutions from industry and academia. It is organized in the main Polish cities by different institutions, by companies and academic institutions together, like world usability day (http://www.worldusabilitydaytour.pl/). Its program varies every year, as well as the list of cooperating institutions.

Tutorials and Training
Summer schools on software usability and HCI have been organized by the Gdansk University of Technology, Faculty of Management and Economics, Ergonomics Department; in 1999–2005 it was attended by about 120 participants who expanded their skills in teaching HCI and in running usability research. Subsequently there was a more advanced HCI tutorial offered within the TAMODIA conference in 2005 in Gdansk. Regular post-graduate courses in HCI within the Software Engineering Postgraduate Programme are offered at the Gdansk University of

Technology, Faculty of Electronics, Telecommunication and Computer Science; in 2000–2009 thus the post-graduate program was attended by about 150 participants who gained basic skills in using usability tools in IT projects.

Post-graduate studies “Advanced Multimedia” are also held at the Polish-Japanese Institute of Information Technology in Warsaw who offer an extensive course on HCI and user interface design.

Other Usability Events

Other usability–related events are organized occasionally by companies or other organizations, often in the frame of specific projects aimed at popularization of e-government, accessibility, e-inclusion or similar topics. There are also events organized occasionally at trade shows or by companies demonstrating their measuring equipment (eyetracking, biometrics etc).

16.3.5 Professional Organizations

Student HCI Scientific Group at the Polish-Japanese Institute of Information Technology (PJIIT) in Warsaw seems to be the most active professional group related to HCI in Poland. Its aim is to popularize methods of HCI (Human-Computer Interaction) and to promote usability engineering – in theory and in practice; regular meetings are held with HCI professionals who give students an insight into current projects and problems of user interface design. The HCI group at PJIIT aims to promote the best student’s projects and to present them at IT business exhibitions. Meetings of the HCI scientific group are open, so they are usually visited by students of other Warsaw universities or other faculties.

The HCI group it runs an elaborated Web portal (Fig. 16.1) which is maintained by the group members (http://hci.pjwstk.edu.pl); its most important sections are:

- Introduction to HCI and usability,
- Usability methods and practices,
- Usability application areas: software, WWW, intranets, documentation, presentations, etc.,
- HCI books and usability reports,
- HCI events in Poland and in the world,
- HCI in Polish research and academia.

The Web page is a first knowledge source for computer science students, Ph.D. students, but also practitioners in the domain of HCI and usability. It contains not only basic information, but also advanced topics, including articles describing particular methods or procedures, as well as reports from meetings or conferences, studies abroad, etc.

A growing educational impact can be observed from the HCI group on PJIIT students: the number of Master Theses related to usability/HCI is growing, and more and more students choose HCI regular courses, also number of participants of events relevant to HCI is substantially growing; social impact of this HCI group is also important; although the HCI professional community in Poland is relatively small,

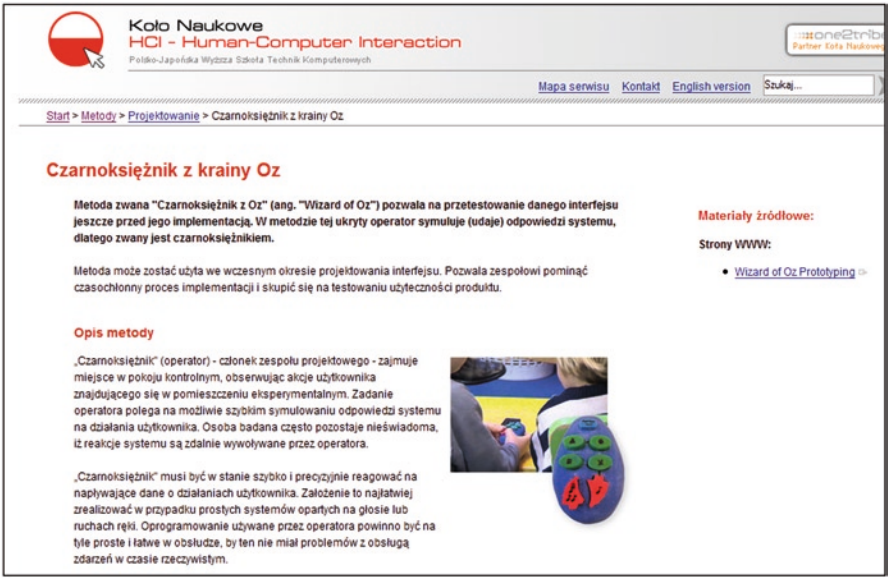

Fig. 16.1 A screenshot from the website of Student HCI Scientific Group at the Polish-Japanese Institute of Information Technology (PJIIT) in Warsaw http://hci.pjwstk.edu.pl

initiatives like students' HCI group introduce more interest on the topic; more and more authors would like to publish their articles on the Web portal. Recently a kind of blog on HCI studies in Netherlands has been introduced; owing to the HCI group the students are getting more active, e.g. they take part in HCI-related conferences.

Association for Quality of Information Systems SJSI (http://www.sjsi.org) is an organization of Polish IT professionals, interested in the quality of IT systems. It also groups some professionals interested in HCI and usability, although most of the SIJI members are interested in "technical" systems testing. SIJI organizes regular seminars as well, some on usability and other HCI-relevant topics.

16.4 Selected Projects

16.4.1 A Sample of Industrial and Institutional Projects

16.4.1.1 Warsaw Transport Authority

Warsaw Transport Authority (Zarzaçd Transportu Miejskiego m.st. Warszawy – ZTM) is the biggest city public transportation institution in Poland. It manages a call center that is accessible around the clock serving 19, 484 and employs 10–20 operators working in different shifts. The call center provides information about departure times of city public transportation (buses, trams, metro and local railway), giving advice in choosing the best transport to reach a certain destination and other information pertaining to public transportation in Warsaw. The call center receives almost 30.000 calls per month. After dialing in, the user connects with the automated voice portal. It uses modern speech recognition and synthesis technologies and the dialog system was prepared using UCD methodology. It is possible to connect with the human operator at any moment by pressing any key on the phone keypad. If all operators are busy, the user is put into a queue and he/she is informed about his/her place therein. The user can always decide to leave the queue and to use the automatic features of the voice portal instead. These include: departure times, complaints, ticket prices, fare reductions and news. Around 30% of hotline clients use the voice portal and don't connect to human operators at all. The most demanded feature is information on departure times (45% of all automated calls).

It was observed that with time more and more people have started to use fully automatic features and as observed from surveys most of the hotline clients are satisfied with automatic service. The main advantage of such a system is that they never have to wait to get information. It takes around 45 s for the human operator to provide proper information regarding this topic. Automatic dialog takes twice as much time. However, considering that people have to wait in the queue for several minutes for the available operator, the advantage of using the voice portal is straight forward.

16.4.1.2 Internet Obywatelski – Usability for Citizens

Beside usability and accessibility audits provided on a commercial basis by dedicated companies and specialists some civic and NGO initiatives are present (i.e. Internet Society Poland).

In the years 2002–2004 three consecutive surveys of Websites of Polish public administration were done by Internet Obywatelski (Citizens' Internet) civic initiative. The methodology used was based on the Website Attribute Evaluation System (WAES) as published by Cyberspace Policy Research Group, modified in order to be useful in the analysis of Polish public administration. The main aim of the survey was the analysis of the fulfillment of the Public Information Access Act introduced in 2001, but the surveys contained some analysis of accessibility and usability of public Web pages, incl. evaluating transparency (measuring the effort an agency makes to make information available through its website) and interactivity (measuring the ease with which visitors can use information provided on the website).

Within interactivity two criteria were analyzed: audio access for providing audio services, and disability access score as defined by Priority 1 Accessibility and User Checks by Bobby Tests used in the survey. In the survey of 2002 (published 2003) the websites of 15 ministries, The Chancellery of the Prime Minister, 16 province offices and the 14 biggest cities were analyzed. In 2003 survey the 16 offices of province marshals were added and the number of city Websites was raised to 18. In the last survey (for 2004, published in February 2005) only 15 ministries, Chancellery of the Prime Minister, 16 province offices and 16 offices of province marshals were surveyed as the introduction of the obligatory Public Information Bulletin (PIB) has moved the official city information from informal websites of cities to the formal PIB services.

During 3 years of consecutive surveys substantial improvement has been observed but unfortunately enough not in the field of accessibility: even in the last survey conducted at the end of 2004 only two websites from 48 analyzed provided audio access.

The modified WAES methodology of Citizen's Internet was used by its members in some analysis of websites of governmental agencies (i.e. in the audit of the state Agency for Restructuring and Modernization of Agriculture in 2007).

As the surveys of Citizens' Internet lacked financial support they could not be continued after 2005. The results of the three surveys are available at www.egov.pl (in Polish only).

16.4.1.3 Widzialni.eu (The Visibles Project)

Since 2007 main audits of web services are conveyed by www.widzialni.eu ("The Visibles") project being the result of corporate social responsibility of IArt commercial agency. The main partners of IArt in the project are the Silesian District of Polish Association of the Blind and Polish Association of the Deaf. The audits done within the framework of widzialni.eu in the years 2008 and 2009 included the websites of political parties (10 websites analyzed), of internet banking (13 websites) of main state persons (president, speakers of the parliament, prime minister, etc. – six websites), universities (ten websites), cities (nine websites) and some public institutions (eight websites). The results are available at www.widzialni.eu.

In March 2009 widzialni.eu together with Agora media conglomerate organized the first edition of national competition for "Websites with no Barriers" in two categories: public institution and commercial entity. The competition is planned to be a yearly contest.

It is worth mentioning that according to Polish law the Public Information Bulletin has to comply with HTML 4.01, XHTML 1.0 or HTML 3.2 standards, but there is no formal obligation to fulfill WCAG 1.0 criteria. The Ministry of Interior and Administration works on the new regulation on PIB planning to introduce the accessibility obligations. Usability and accessibility obligations are to be introduced in the planned bill on re-use too, which will implement Directive 2003/98/EC.

In 2007 the Republic of Poland formally signed the 61/06 Convention on the Rights of Persons with Disabilities. The convention has not been ratified yet despite numerous appeals of NGOs and public institutions.

16.4.2 Sample of Academic Research

Below are listed several HCI-related research projects recently funded by the Polish Ministry of Education and Scientific Research:

- NN516 405137: “User interface based on natural gestures for exploring virtual 3D spaces” led by dr inż. Przemysław Głomb from Institute of Theoretical and Applied Informatics of Polish Academy of Sciences; 2009
- NN104 010337: “Verbal and nonverbal interaction in task-oriented dialogues” led by dr hab. Maciej Karpiński from Adam Mickiewicz University in Poznan, Faculty of Neofilology; 2008
- 34/N-COST-2007/0: Research grant “Consumer behaviour and usability of on-line services” (2008–2009) funded by the Polish Ministry of Education and Scientific Research and hosted by the Gdansk University of Technology, Faculty of Management and Economics, Ergonomics Department; extensive user-based studies resulted in developing usability guidelines for on-line services and in producing services development models, which include non-technical factors shaping on-line customer behavior and perceived quality of the service website.

Polish academic institutions keep participating in various international projects relevant to HCI and usability areas. Examples of several projects from recent years are listed below:

UsabilityNet (www.UsabilityNet.org)
UsabilityNet was a project funded by the European Union to provide resources and networking for usability practitioners, managers and EU projects. UsabilityNet was funded by the EU Framework V IST Programme as IST 1999-29067: a preparatory, accompanying and support measure. The project started in February 2001 and finished in July 2003.

Gdansk University of Technology, Ergonomics Department, took part in this project as a Polish partner.

EU COST-294 MAUSE (www.cost294.org)
MAUSE (COST-294 Action funded by the COST Office of European Union, 2005–2009) was the project aimed at enhancing scientific approach to usability evaluation methods development, evaluation, and comparison, aiming for results that can be transferred to industry and educators, thus leading to increased competitiveness of European industry and benefit to the public.

Gdansk University of Technology, Faculty of Management and Economics, Ergonomics Department, took part in this project as a Polish partner.

LUNA (www.ist-luna.eu)
LUNA was a 3-year (2006–2009) project focused on the problem of real-time understanding of spontaneous speech in the context of advanced telecom services. The main objective of LUNA was the creation of a robust natural spoken language understanding toolkit for multilingual dialogue services, able to carry out human-computer communication with a good degree of user satisfaction.

The vision of LUNA is to improve current automated telephone systems allowing easy human-machine interactions through spontaneous and unconstrained speech, replacing menu-driven voice recognition. The project aims to enhance the users’ experience, helping callers in using vocal services quickly and accurately.

Polish-Japanese Institute of Information Technology in Warsaw, Multimedia Department and Institute of Computer Science PAS took part in this project as Polish partners.

LIREC (http://lirec.eu)
LIREC project (2008–2012) aims to establish a multi-faceted (memory, emotions, cognition, communication, learning, etc.) theory of artificial long-term companions, embody it in robust and innovative technology, verify the theory and experiment with the technology in real social environments, and provide resulting guidelines for designing such companions.

As successful technology can only be delivered on the basis of strong scientific foundations, and with partners in psychology, ethnology, human-computer interaction, human-robot interaction, robotics and graphical characters, LIREC will advance understanding of the concepts of embodiment, autobiographic memory and social interactions in the context of companions where the "mind" might migrate to differently embodied "bodies".

Experimental human-human and human-animal studies and longitudinal evaluation of the developed technology in social settings will support the development and delivery of mechanisms for verbal and non-verbal social interaction and communication; an autobiographic emotionally-tagged memory; mechanisms for detecting and responding sensitively to the user's affective state, motives and intentions; an autonomous cognitive-affective architecture and support for migrating companions. These will be combined in case study long-life companions that will take social technology to a new state-of-the-art.

Wrocław University of Technology (Robotics) is a partner in this project.

IC0904
IC0904 Action (funded by the COST Office of European Union, 2009–2011) is the project aiming to standardize usability evaluation methods and to produce reliable, interdisciplinary design methodology for interactive systems.

Gdansk University of Technology, Faculty of Management and Economics, Ergonomics Department, takes part in this project as a Polish partner.

16.5 Books, Journals, Blogs and Periodicals

Polish publishing houses are generally aware of HCI, especially Helion SA, publishes books on IT, regularly issues translations of foreign titles, and in 2008 a book of Polish authors (Kasperski and Boguska-Torbicz 2008) on usability of Web pages was published.

Extended versions of papers presented during "User Interface – Kansei in practice" series of seminars are published by the PJIIT (Marasek et al. 2006–2009).

Usability and HCI are widely represented in Polish Websites. Besides the page maintained by the Scientific Group at the PJIIT in Warsaw (http://hci.pjwstk.edu.pl), which summarizes current trends and knowledge, several blogs exist.

- http://www.webaudit.pl/blog/
- http://www.webusability.pl/
- http://www.usability-onair.com/
- http://offline.pl/

These are the most popular ones.

16.6 Summary/Conclusions

HCI activities in Poland presently seems to suffer from a narrow and isolated focus of works conducted by small research groups, located mainly at universities and in software companies or consulting groups (as it was also observed in Germany, Gorny and Oberquelle 1999). Quite a strong background in ergonomics and psychology is not enough to provide research on the use of computers, which are a primary object of interest in the contemporary user environment. Moreover, usability of Web portals and interfaces is regarded mostly as a marketing problem, focusing analyses on issues of selling to launch products or services through the Web rather than on user satisfaction.

Marcin Wichary (2004) posed some suggestions on how the visibility of HCI can be increased:

- Creating a (formal or informal) organization of all the academic people working in the field of HCI in Poland,
- Lobbying to l more HCI-related classes in all the universities in Poland, starting with technical universities and specializations of programmers, (web) designers and software engineers,
- Publishing articles about usability in popular or academic press,
- Creating websites promoting HCI and usability.

Most of these have been already implemented, however knowledge on HCI/usability is in Poland rather limited, but steadily growing.

Recent actions, like implementation of EC-guidelines on accessibility, social events focused on usability (WUD, UX Book Club), obligatory elements of user interface and its testing in computer science curricula, and new books on usability, introduce more and more recognition of HCI to the younger generation. This hopefully will benefit in the near future in awakening interest of prospective students to the field of Human-Computer Interaction and its applications.

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Chapter 17
Usability in Russia

Alexandr Belyshkin

17.1 Country Profile

Even though Russia is the largest country in the world (16,377,742 km^2 of land), its 142 million population is sparsely distributed across the vast land and concentrated in the European part. 73% of the population lives in urban areas while 27% are in rural areas. The country's population is predominately ethnic Russian (79%), and for 92% of it Russian is the first language. Russia's GDP in 2008 was 1,418 billion USD, and average salary in 2009 was 642 USD, although it is greatly varied depending on the region. In Moscow, for example, the average salary was 1,090 USD. Educational level is high: 157 out of 1,000 adults have higher education (Russian Federal State Statistics Service 2009a). Only 20 years ago the country underwent rapid and profound transformations, in which its entire political and economic systems were revamped. State-investment in the knowledge intensive sectors of the economy dwindled, while the new and privatized industries of information, communication and technology developed. This resulted in emergence of the IT market, and consequently, the structure and organization of usability research. Most of it is conducted today in the private sector.

17.2 IT Market

High-tech business development in Russia is hindered by the emphasis on natural resources and their extraction. The latter is Russia's basis for the GDP. According to the estimates by the Ministry of Economic Development, IT market volume was 17 billion USD in 2009, which implies that the entire IT market in Russia

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(excluding communications) composed less than 1.5% of its GDP. The situation in the service sector for the high-tech economy, usability for instance, was even worse.

IT services (which include usability) compose only 28.6% of the total IT market. The rest is shared between the Hardware market – 51.4% and the Software market – 20% (Ministry for Economic Development of Russian Federation 2009). In our own opinion, usability services compose no more than 1% of the sector.

There is a certain paradox about usability testing in Russia. Russia has recently become one of the leading IT outsourcing countries. Service export volume, including the presence of development centers for foreign IT companies, rose to 1.7 billion USD. This is bigger than IT export for India. Russian companies alternate between the 7th and the 8th position among 100 leading IT service providers in the world. They are the leaders among suppliers in Central and Eastern Europe (Makarov 2009). Despite these facts, specifically usability testing is outsourced to Russia very rarely. This trend is difficult to understand against the 5.5 billion USD profit that all Russian software companies shared in 2008, and 2.65 billion USD gained from IT services and products export (RUSSOFT 2009).

17.3 Web and Mobile Communication

The explosive growth of the Internet in Russia stimulated the field of usability. In comparison to the year 2000, internet usage rates have grown by 1359,7% (Miniwatts Marketing Group 2009). In summer 2009, 35% of the total population (39.9 million people) used the internet at least once in 6 months (the Fund "Obshestvennoe mnenie" 2009). Such growth attracted many investors to the area of web development. As a result, competition level in most popular fields, e.g. social networks, geo-information services, news portals etc. grew as well. Services such as graphic design and usability became the main competition fields. This created conditions for the development of a market for IT services, namely, usability.

The fast growing mobile services market served as another push for advancing usability. The development of mobile communications was even faster than that of the Web. By the end of 2009, about 85% of people used at least one mobile operator (AC&M 2010). Many unprepared and uneducated clients have joined the mobile service usage, pushing operators to lower the entry step and simplify their service interfaces. As a result, most mobile operators formed their own usability departments and established partnerships with international and Russian usability agencies. Thus, the expanding Internet, and computer and mobile communication markets increased the demand for usability services in Russia.

17.4 HCI/Usability History in Russia

17.4.1 Soviet Era

The changes did not arrive on virgin soil. The development in the field of engineering psychology and ergonomics in the late Soviet period was defined by two trends. On the one hand, there were the heavy industry and military sectors which demanded development of disciplines focused on human factors in technology. On the other hand, production overall was not oriented toward the market. It was heavily tilted toward the means of production and away from consumer goods. As a result, the quality of Soviet consumer goods and services was extremely poor. The design of goods reflected interests and technological limitations of manufacturers and service providers, rather than needs and preferences of consumers. Arguably, by the time the Soviet Union collapsed in 1991, Russian industries and business had no experience in using design development and no design culture.[1] This mentality had a profound impact on the areas of knowledge related to interface development.

The situation in the industry servicing sectors was somewhat better in comparison to the production of consumer goods and services. Several segments secured governmental funding to support research in the fields of human factor and ergonomics for weapons development, space research, aviation, shipping and railway, atomic energy industry and continuous process industries. Those applications became the focus of few research groups in the Soviet Union. Departments of engineering psychology and ergonomics were established in Moscow and Leningrad (today St. Petersburg) State Universities in 1970 and 1966 respectively, and in several other technical research institutions. In 1973 a Laboratory of engineering psychology was created in the Institute of Psychology, at the Soviet Academy of Sciences. The "Ergocenter" opened in 1978 in Tver and was one of the largest research and development centers. It initially serviced the Industry of Defense. In 1990, after the reorganization, the Centre received a civilian status. Among the most interesting in the Soviet period was the work of A.L. Yarbus who invented the world's first eye-tracker and wrote on eye movement research. His book was published in 1965 in the USSR and translated into English 2 years later (Yarbus 1967). There were also a number of interesting practical achievements of the Soviet period, which influenced HCI/Usability development in the post-Soviet years. A complete review of the fields of engineering psychology and ergonomics during the Soviet period is presented in English by G. Bedny and D. Meister (Bedny and Meister 1997).

These unique world-class achievements took place in the context of the Soviet scientific community lagging behind in development due to its isolation from the international scientific society. In accordance with the planning by the Soviet

[1] It is symptomatically that although there are two big industrial design schools in Russia until recently there were fewer practicing industrial designers than practicing usability specialists.

government, development in the computer industry was centered on mainframes and, partly, on midi- and mini-computers. Personal computers were not seriously taken into account. Nevertheless, often illegally, PCs invaded Soviet technical and scientific organizations. This resulted in a PC software development boom carried on primarily by enthusiasts: professional programmers as well as various amateurs. At first this work was mostly done free of charge. However, the increased introduction of PCs for solving daily tasks of developing businesses created a commercial demand for Russian, locally-developed software. As a result, a large number of software development companies and software development departments in hardware building companies were formed, their programmers starting to earn a reasonably high income.

A competitive software market emerged in the early 1990s represented by a high variety of software applications of the same functionality, that is, dozens of accounting programs designed by different developers. The phrase "user friendliness" adopted from Western European and North American contexts became one of the more popular slogans. Behind it, however, there was no specific user quality concept that could offer quantitative product estimation and comparison. Developers often declared their product as"user friendly" based only on graphical, but not character-based user-interface realization. Whilst in Western Europe and North America this problem was solved by the development of the concept of usability, in post-Soviet Russia it remained marginal, if at all known among scientists as well as commercial software developers.

17.4.2 East-West Human Computer Interaction International Conferences (1991–1996): An Attempt to Import HCI/Usability to Russia

This was the context in which in August 1991 the First International Workshop on Human-Computer Interaction was held in Moscow. Seventy-five Soviet and 15 foreign specialists attended this meeting. This was the last year of the USSR (Bass and Gornostaev 1991). Following the success of this workshop, several annual East-West conferences on Human-Computer Interaction (EWHCI) took place in Moscow and St.-Petersburg between 1992 and 1996. Russia and other former republics of the Soviet Union represented the "East", while North America, Western Europe, Australia and New Zealand represented the "West". EWHCI conferences were attended by many brilliant researchers and the overall quality of work presented was very high. Selected papers from EWHCI '93, '94 and '95 were published by Springer-Verlag in their Lecture Notes in Computer Science series (Bass et al. 1993; Blumenthal et al. 1994; Blumenthal et al. 1995). Very positive conference reports for EWHCI '91–'94 were published in SIGCHI Bulletin (Cypher et al. 1991; Grudin et al. 1993; Instone et al. 1994; Price et al. 1995). No doubt, in 1992–1995, EWHCI was a world-level forum in the HCI field. Conferences were sponsored by Apple Computer, Association for Computing Machinery Special

Interest Group on Computer-Human Interaction (ACM SIGCHI), Human Factors Society and a number of local companies.

The interest of westerners in these events was not only in the desire to meet a completely new research community and interchange ideas leading to broadened perspectives and new creativity. They were also interested in the Activity Theory developed in Russia as the HCI community started searching for new theoretical frameworks to overcome difficulties in applying a cognitive approach to both research and practical design. Activity Theory was considered capable of dealing with the HCI problems.

Activity Theory, considered as the most important accomplishment of Russian psychological science, has an extensive history dating back to the works of Vygotsky and his followers, Leontev, Rubinstein and Galperin. However, except for a couple of books published in the West and few publications in the western journals, the theory remained practically unknown outside the Soviet Union until the mid-1980s. At that time it was picked up, reformulated and promoted by a number of western researchers, mostly from Nordic countries. As a result, Activity Theory today is associated not only with Russian psychological tradition, but has become rather a theoretical ground for the larger international community and involved researchers from Europe, North America and Australia.

By the mid-1990s, the economic situation in Russia worsened. Destructive economic reforms, drastic reduction in manufacturing, large-scale deindustrialization, and a severe crisis in higher education and science development forced many Russian researches and practitioners to abandon their HCI-related careers for new sales- and business-related jobs that offered higher salaries. The "brain drain" among the Russian HCI community was considerable. For example, the leading theorists of the Applied Activity Theory approach to HCI, V. Kaptelinin and I. Verenikina, are now working in Sweden and Australia, respectively.

As a result, participation of non-Western researchers and the quality of presentations at the EWHCI were decreasing every year. The conference had transformed into "meetings for Westerners on Russian territory". The year 1996 was the last when EWHCI met. One of the reasons for the withdrawal of western specialists from these meetings was the fact that not many Russian delegates were prepared to accept the HCI/Usability concepts as the only paradigm for their future work. Quite often, participating Russian specialists did not have a direct relationship to HCI – their software was just interactive, albeit advanced. It was evident from their annual presentations that their main research interests were in the spheres peripheral to the HCI/Usability mainstream, such as artificial intelligence, hypertext, computer-assisted learning, information visualization, digital libraries, multimedia etc.

The first attempt to import an accomplished western HCI/Usability paradigm to Russia was unsuccessful, as it had been rejected conceptually by the Russian academic community, which at the time went into a decline. The emerging commercial software industry was not ready to accept usability as a key market differentiation parameter for their products.

Still the current situation with usability in Russia is rather positive, and the EWHCI era played its important role in forming this situation. Today, the veterans of the movement and young enthusiastic newcomers work successfully in this field. The results of their work and its impact on the field of usability will be discussed in the following sections.

17.4.3 Modern Era of Usability in Russia

The current situation in Russia, including organizational aspects, the growth of the commercial sector, as well as education, differs greatly from the Soviet period, and bears signs of great improvement.

17.4.3.1 Commercial Companies

At present there are at least seven companies specializing in usability services: Usethics (founded in 2001), UIdesign Group (2003), UsabilityLab (2006), HumanoIT Group (2007), HCI.ru (2008), UI Modeling Company (2008) and interUX Usability Engineering Studio (2009). Moreover many web-agencies offer expert UI evaluation or testing. Altogether there are about 30 freelance specialists consulting in the field.

Overall in Russia the UI is viewed through the lens of design. Only four companies from the above list offer usability testing and have usability labs (Usethics, UIDesign Group, UsabilityLab and interUX). Most companies don't even mention usability testing on their web sites, focusing purely on UI design. Nevertheless, research culture and technology in companies specializing in usability testing and big interface departments meet the standards of world-wide practice.

17.4.3.2 Interface Departments

The first usability department was created in 1997 in the company RTS Stock Exchange. Since then, more businesses added usability testing to their operation. At present, several companies have testing and UI design departments with over 10 employees. These companies are Beeline (Vimpelkom, department founded in 2006), 1C, Yandex, ABBY, Parallels, Acronis (2007), Kaspersky Lab (2008). Besides these companies, by the end of 2009 at least 20 others established smaller departments or hired individual full-time specialists.

1C is a good example of the growing importance of UI departments in contemporary software development in Russia. The company has a substantial UI department consisting of 15 specialists, who only last year (2009) performed over 100 tests of different 1C products. The impact of this company's usability department is considerable, since many other firms adopt the 1C's technological platform. These partner-firms, for instance, are influenced to invest in their own departments of UI and usability testing.

17.4.3.3 Offshore Usability

Usability testing and expert evaluation are the main projects conducted for international clients in Russia. There is a demand for exhaustive usability testing, in the course of which Russian specialists adapt stimuli material and report the problems found. Testing-support services, by which Russian companies mainly provide the logistics (participants recruitment, hotel booking, translation etc.) are also common.

Based on their experience, local specialists aim at adapting the tests to local cultural and social specificities in order to avoid possible problems related to cultural differences. Problems of such kind include seemingly grammatically correct, but in fact wrong questionnaire translations, interface localization errors, etc., which tend to distort the collected data and result in inaccurate test findings. Fluency in Russian is often not enough. There is also a need for the adequate understanding of Russian reality.

Nowadays remote test monitoring, during which the customer observes the tests with simultaneous translation via the Web, is becoming popular. This scheme allows customers to save on traveling without losing on the detailed, real time control of the testing process. As a rule, a local moderator or assistant can identify problems arising during the test more precisely and finely than a non Russian-speaker or someone unfamiliar with local reality. Even if the project budget doesn’t include a report preparation, it still pays to organize a short briefing after each testing day in order to discuss problems found by local specialists. A more detailed review of offshore usability in Russia is presented in the paper by I. Burmistrov (Burmistrov 2006).

17.4.3.4 Usability Organizations and Conferences

The Russian usability community has a rather peculiar history. The Russian local branch of the ACM SIGCHI (a shortened MosCHI) was launched in 1992, and Juri Gornostaev became its first Chair. Unfortunately, by the late 1990s, under the chairmanship of MosCHI’s next Chair, Vladislav Valkovsky, the organized usability movement in Russia turned to complete dormancy suffering the same fate as EWHCI conferences.

The rebirth of the usability community took place in 1999, when Yaroslav Perevalov and Ivan Burmistrov of RTS Stock Exchange created a web site called “Usability in Russia” (www.usability.ru) with an internet discussion board as a part of this site. Very quickly the Usability Forum broke the “wall of silence” that reigned in Russian HCI since the last EWHCI conference. The forum turned out to be a very popular and demanded resource. After a period of virtual communication, Russian usability specialists met each other at a real workshop in 2001. The workshop became regular, and between 2001 and 2004 there were 14 meetings of this type. Usually between 25 and 40 people from the European part of Russia participated in these workshops with a constant core of about 15 participants.

Inevitably, at some point leaders of the movement started thinking about the formal standing of their community. After visiting CHI’04 in Vienna and discussing the possibilities with ACM SIGCHI officials, Ivan Burmistrov and Alexey Kopylov (cofounder of the UIDesign Group) presented at one such meeting a report of the conference with a special emphasis on the Russian community's prospects as a branch of SIGCHI. A meeting held in June 2004 became the constituent assembly of the Russian Special Interest Group. A new short name for the Russian SIG, RusCHI, was also introduced in order to accentuate that this was a new community, and not a sequel of the former unsuccessful MosCHI.

RusCHI was chartered as an official local chapter of ACM SIGCHI on September 30, 2004. Ivan Burmistrov was elected as the first Chair of RusCHI. Currently, this is the largest usability community in Russia. Amongst its main activities are organization of regular workshops (from two to seven meetings per year) and large-scale events such as World Usability Day conferences, which began in 2006 and attract about 200 participants each year. The website of RusCHI is www.sigchi.ru. There is also a local UPA branch (UPA:Russia), founded by UsabilityLab and closely affiliated to this company. Besides that, a youth community named ErgoPro was set up in 2008. This community consolidates young specialists and students who decide to connect their future career with usability.

There also is the Inter-Regional Ergonomics Association, which emerged in 1995 as a result of the Soviet Ergonomics Association reorganization. It is a not totally field specific Association, but nevertheless it is functioning. The main goal of IREA is to facilitate communication and collaboration between all specialists on ergonomics working in different regions of Russia. Specialists from the same region constitute a Regional Branch of IREA. IREA is a Federated Society of the International Ergonomics Association (IEA) and Federation of European Ergonomics Societies (FEES). The IREA activity is coordinated and agrees with the policy and Strategic Plan of these organizations.

Publications on the subject of usability and ergonomics are small in volume but high in quality. In addition to translations of Western literature to Russian, there have also been some original Russian-language publications such as the book by Vlad V. Golovach "UI Design: skills to wash an elephant." Available as a free download online, it was read by over 15,000 people in 1 year.

17.4.3.5 Scientific Organizations

The current situation in research and education is the opposite to that in the commercial sector. The collapse of the USSR led to fast degradation in the sphere of research and education. Engineering psychology and ergonomics suffered from two main causes. The first was the absence of a minimally necessary governmental financial support, and the second was that high-technology industries practically ceased to exist. As a result, there were no venues to work at and to apply the knowledge to. "Ergocenter" is an example of this disorganization. "Ergocenter" was one of the biggest Russian organizations providing scientific support to weapons manufacturing. Soon after the collapse of the USSR it lost most of its personnel. The few of the remaining employees today are occupied writing scientifically outdated academic textbooks.

However, there are some positive points in the overall pessimistic picture. For example, there are courses in HCI and usability taught at a number of universities, and these include “Human-Computer Interaction” at Moscow, St.-Petersburg, Novosibirsk and Novgorod State Universities, and Mari State Technical University; “Software and Hardware Ergonomics” at Moscow Institute of Radio-Engineering, Electronics and Automation (MIREA). The first and still the only Russian textbook on HCI was published in 2005 under the guidance of “Ergocenter” (Magazannik and Lvov 2005). Its second reprint appeared 2 years ago.

A positive example of a research group that has fully integrated and productively works within the HCI paradigm is the Laboratory of Work Psychology (LWP) at the Moscow State University (the head of the laboratory is Prof. Anna Leonova). Since 1993, the laboratory pioneers research on interruptions in human-computer interaction, a theme which has become widely-accepted in international research and development activities since the 2000s. The laboratory’s great emphasis is on combining an ecologically valid experimental setting with a rigorous experimental design. LWP studies investigate the influence of factors such as the interrupted operation complexity and the complexity of interrupting tasks on various indices of interruption handling effectiveness like switching and resumption time and number of errors. The analysis of conventional performance indices is backed up by the analysis of subjects’ behavior as well as eye movement registration and recordings of physiological reactions. Interruptions are the main but not the only theme in the laboratory’s research program. The laboratory had been involved in many joint collaborative research projects with a number of universities in Germany, The Netherlands, and Belgium. Key results of the LWP works are available in publications (see, for example, Zijlstra et al. 1999; De Keyser and Leonova 2001; Burmistrov and Leonova 2003; Leonova et al. 2009). The laboratory maintains state-of-the-art research facilities including TechSmith Morae, Noldus Observer and advanced eye-tracking equipment. An important feature of LWP is its close relationship with the software industry. Many LWP staff members have commercial assignments in addition to the research tasks within the university. No doubt, they are the best candidates for scientific co-operation and joint research in Russia in HCI and related fields.

17.5 Usability Testing in Russia: Distinctive Features

Even though Russia geographically is the largest country in the world, linguistically its population is rather homogenous. Russian language is native for 92% of the country’s residents. In spite of this homogeneity, there are differences in income levels, consumer preferences and life attitudes. Those differences are the most significant among the following groups of cities:

- Moscow
- Cities of capital type consumption (Saint. Petersburg, Novosibirsk, Yekaterinburg, Nizhny Novgorod, Samara, Kazan, Omsk, Chelyabinsk, Rostov-on-Don, Ufa)

- Other large cities
- Small provincial towns and villages.

This geographic particularity determines the first distinctive feature of usability testing in Russia: its resource-intensity. Due to the fact that the geographic distances between the second group of cities and Moscow are rather vast and transport networks are far from developed, is it is quite difficult to conduct large usability studies in Russia.

The second feature is a difficulty securing participation. An average fee for participating in a usability test in Moscow and the second type cities is about 1,000 rubles (about 35 USD). In cases of need in respondents with rare skills or high-income level, the incentive can rise up to 150–200 USD. The time which participants need to get to the lab can be a serious demotivating factor. Even within Moscow it might take potential participants up to1.5 h to get to the lab. On average 10–20% of respondents don't attend at all or appear more than an hour late to a study. It is recommended to use a double recruiting scheme to exclude the possibility of a participant's non-attendance. In this case two participants are being recruited for the same time and if they both attend, the more suitable candidate is chosen. The rejected one receives half of the agreed fee.

Another common problem is that in Russia tests commonly encounter exceeding loyalty of the participant to the tested product. Participants, especially those who are not professional users, often blame themselves for difficulties occurring when they try a product. Participants are often ready to spend more time doing the test rather than report a difficulty in use. As a result, they do not voice their difficulties and they do not complain about the product itself.

Video and audio recording tend not to be problems, if participants are notified about them in advance.

When coming to a study, participants should be asked to bring an ID (normally a civil passport) for signing the NDA considering test contents. If recruiting is done through the web, participants should be notified about the recruitment procedure. They should know that it is necessary to give answers to several questions before being invited for the test. Those who give answers corresponding to screener requirements will be invited. They are not paid to answer those questions. Not many agencies specialize in participants' recruitment for tests and focus groups. In most cases, the partner agency fulfils this function.

The chance of getting participants with fluent English is rather small. If English fluency is required, it should be included in the screener. It will be necessary to make a quick test in English usage before the testing. Participants should be informed upfront that they won't be paid if the test is failed. These requirements stimulate participants to evaluate their skills and suitability for a particular test more adequately. Average price for professional simultaneous translation from Russian into one of the European languages varies between 100 and 200 USD per hour.

Due to a number of state holidays and school vacations, January and May are not the best months for conducting research in Russia.

It is quite easy and cheap to get Internet access from a laptop or a mobile phone in Moscow and other big cities. On the other hand, quality and prices for hotel accommodations often leave much to be desired.

There is one important factor that needs to be taken into account when making payments to Russian companies: foreign currency accounts in Russian banks consist of 20 digits, whereas European banks have 16 digits. The IBAN system is not used in Russia. This factor makes transfers to Russia rather difficult. For example one of our clients had to send the money three times before our bank could credit it to our account.

17.6 Usability in Russia: The Future

Although slowed down in the past by economical and political factors, commercially driven usability activities are more or less flourishing. Since this paper left its draft stage, at least two new interface design companies appeared in the market, and a new professional community (Polezny Club / "Useful club") emerged. It can be safely projected that in the next few years usability, and especially UI design activities, in Russia will double. At the same time, there is still a noticeable lack of governmental funding and scientific research activities. There is little to no hope of any major improvement in these areas in the future.

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Chapter 18
Usability in Singapore

Kee Yong Lim

18.1 The Singapore Context

Singapore is a densely populated island city-state with a land area of only 710 km^2 (2008 data with further land reclamation from the sea ongoing) and a population of 4.99 million that continues to grow due to liberal immigration policies (Government of Singapore publication 2010).

The population of Singapore is multi-racial and is thus culturally and religiously diverse and rich. Ethnically, the racial composition is made up of Chinese (predominantly), Malay, Indian and a mixture of other races. This diverse racial mix arises from the historical emigration to Singapore from countries in the region and its colonization by the British. Vestiges of this historical heritage can still be discerned from the road names and city enclaves attributed to specific groups, such as Chinatown, Arab Street and Little India. More recent immigration due to international business and trade has introduced people from all over the world, making Singapore a vibrant metropolitan city.

Four main languages (written and spoken) are used in Singapore, namely English, Malay, Mandarin and Tamil, together with a myriad of spoken dialects, the use of which is on the wane. Although Malay is the national language due to historical reasons, English is the predominant language of commerce and civil administration. For the general population, a colloquial form of English termed 'Singlish' is the representative 'standard' used; with traceable linguistic contributions from the multi-racial melting pot. The younger generation in Singapore is generally bi-lingual with English being the common denominator and a second language selected from the remaining three languages. In contrast, older Singaporeans are generally mono-lingual with Chinese, Tamil or Malay being the language spoken.

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It was not so long ago that Singapore was first noticed and referred to as one of the ‘rising economic dragons of the East’. From its initial economic base in petrochemicals, shipbuilding and repair, tourism and manufacturing, Singapore’s economy has now diversified into pharmaceuticals to capitalise on developments in the life sciences (such as the sequencing of the human genome), biomedical and precision/nano engineering, aerospace and more recently water and green technologies.

Despite being a small island city state, Singapore has now achieved a remarkable record in terms of its notable international investments via its sovereign funds, and its global commerce via its home grown multi-national corporations such as Keppel Corporation (world’s largest oil rig builder), SembCorp Marine, Singapore Airlines, Creative Technology, Hyflux, Singapore Technologies Engineering, Singapore Telecommunications, etc. Its economy has now attained the status of a developed economy. With her economic successes, the people of Singapore have enjoyed a standard of living unsurpassed in the region, culminating in its recognition in more recent years as a first world nation.

Against this backdrop, real case examples of various factors that have driven usability design contributions in the direction of specific applications development shall now be presented.

18.2 Case Examples of Socio-Linguistic and Socio-Cultural Factors in Usability Design

In the context of multi-lingual, multi-racial and cosmopolitan Singapore, it may be anticipated that linguistic factors may present usability problems especially for the older group of residents and tourists.

Generally, such usability problems arise from inappropriate or inconsistent carry through in the design of language considerations, for example:

18.2.1 Auto-Teller Machines (ATM)

- ATM or cash point machines with bankcards that have a default interaction language hard coded into the smart chip. On insertion of this card, the ATM is supposed to present the user all its information in the selected default language. Unfortunately, this is not always the case. For a local bank, the initial screen displays are shown in the pre-selected language, but during the course of the interaction, the screen displays revert inexplicably to only English, e.g. displays for the application of share warrants and rights. This inconsistent design essentially disables the older mono-lingual user, and defeats the purpose of providing the user the choice of an interaction language. To date, this inappropriate design has remained unrectified by the bank.

18.2.2 GPS Taxi Booking System

This system was implemented initially by a large taxi company, but variants of the system have since been adopted by most of the other smaller taxi companies. For the initial system, subscription is made compulsory with the rental of the vehicle. At this time, a significant proportion of the taxi drivers comprise older workers. Since the contents in the message display terminal (MDT) of the system are only presented in English (aggravated further by abbreviations), usability problems may be anticipated, as many of the older drivers are not proficient in this language. This user requirement remained unaddressed despite the designers being seemingly aware of the problem. This awareness of the designers is surmised by the user manual being printed in three languages. As a result, the drivers have to read the user manual instructions in one language and cross-reference them to the MDT displays in English. The drivers would also have to learn by heart the vocabulary of the function labels and the display contents to pass a device operation test. This requirement is clearly user unfriendly. Worse, it represents an incomplete solution because the function buttons are soft coded and can be scrolled in a carousel fashion using one of the buttons. The software function-to-physical button location can therefore change. This feature is built in presumably to enable expansion of the list of software functions without the need to increase the number of physical buttons. Although versatile in this way, the design presents a greater memory problem to a language challenged user. As a result of this onerous design and the obligatory response required to a displayed booking requests, many of the taxi drivers switched off the system initially despite paying for the rental of the equipment.

Other inadequate design features of the booking system include its communication support being limited to only asynchronous and visual communication in contrast with the preceding radio based system. As a result of such a design, the driver is presented with a less efficient communication system that does not facilitate message clarification when needed (bearing in mind also that the situation is aggravated further due to language proficiency problems). To rectify this loss of synchronous communication capability, many drivers are observed to resort to using mobile phones and walkie talkies.

Finally, a bigger problem that arises with the design is the introduction of potential selective attention and resource competition situations vis-à-vis the visual requirements of the driving task (see Sulistyawati et al. 2005c; The Straits Times Interactive 2000). This raises a concern of safety as the device is used while driving. In particular, it begs the question of why handphone use during driving is disallowed in Singapore, while the use of this device is permitted. Thus, the design and official approval of this device make the legislation in Singapore appears to be somewhat inconsistent in this respect.

18.2.3 Chinese Signage with Phonetic 'Translations'

This problem arose during a period when the Singapore Government was encouraging a wider use of Mandarin. In the fervour of supporting this campaign, a short-sighted switch to signage showing chinese characters with romanised phonetic 'translations' was implemented (see Fig. 18.1). The outcome of emphasizing accurate enunciation in the display over the need for semantics was a communication disaster. Although such an emphasis has since been discontinued, vestiges of the folly of such display designs remain in hawker centers or local food courts distributed across the island.

The geographical location of Singapore at the tip of a straits that separates the West from the Far East, together with its colonial history, multi-racial mix, western style education system and vibrant cosmopolitan outlook, enable Singapore to serve as a socio-cultural and socio-economic bridge where east–west fusions could be developed to a flourish. In particular, this bridge may be expressed commercially in the form of trade, tourism and conventions, and R&D in all sectors including the development and testing of cross-cultural products and services. The environment is ideal for realizing in full the vast potential of the 'Think Global (Market) and Act Local (Customization)' exhortation for successful global competition. In this respect, the importance of appropriate socio-cultural customization has long been appreciated - as an illustration see HSBC's (a multi-national bank) understanding of the underlying semantics of icons as shown in Fig. 18.2.

Other examples of projects shaped by the preceding socio-cultural factors include various industry wide programmes in the iN2015 digital masterplan targeting

Fig. 18.1 Usability requirements concerning language use in displays. (**a**) Good use of four languages to convey a safety warning. (**b**) Would non-Chinese customers know what food is being sold?

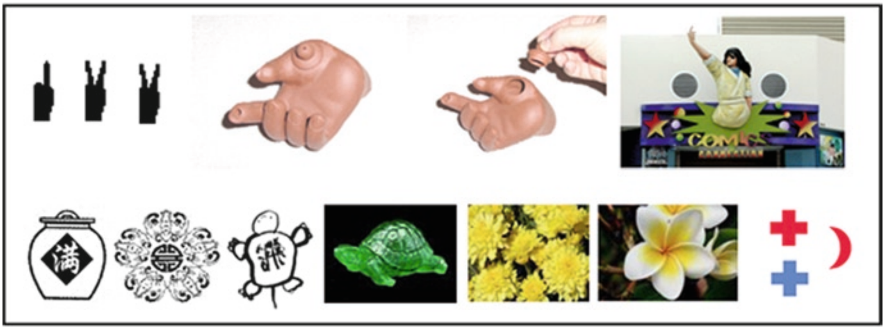

Fig. 18.2 Understanding socio-cultural semantics in icon design

supply chain management, tourism and MICE (meetings and conventions), etc. (see later account and the iN2015 report (iN2015 2006a)) and R&D projects on cross-cultural and emotive aspects of product and service design (Lim 2003c, d). An example of the applications developed is a tourist application named the Digital Concierge. This application is intended to enhance the experience of tourists visiting Singapore (see iN2015 2006b). A further example of such R&D may be found in Lim and Xu (2000).

18.3 Case Examples of Usability Design Related to Socio-Economic and Geographical Imperatives

Singapore as a country is well run with a democratic system that is remarkably stable for the last 30–40 years. Political stability has served Singapore well in maintaining racial harmony and facilitating wealth creation. In this respect, Singapore's impressive economic development since its independence has been regarded by many as nothing short of a miracle, since Singapore has not been fortunate enough to be endowed with abundant natural resources with the sole exception of an excellent harbour located at a strategic tip along one of the busiest shipping channels in the world.

To exploit its strategic geographical location, Singapore has developed state-of-the-art maritime traffic tracking and management systems, container freight scheduling systems, and the world's first remote crane control system for handling containers in the yard (see Fig. 18.3).

Such hi-tech initiatives are typical of Singapore as it emphasizes heavily automation and advanced technology to gain a competitive advantage and overcome its shortage of human resources. Inevitably, such an aggressive techno-centric stance coupled with trailing human factors knowledge, would lead to usability problems

Fig. 18.3 Singapore's remote crane control system for freight/container handling in the yard

arising from inadequate consideration during system development of the human operator in the loop. In the case of the remotely operated crane, the display of the crane control system and the task design implied by the semi-automated system respectively failed to consider the depth perception requirements and the increased workload (intensity of the operator's container handling task) as compared to the old onsite crane control system (see Lim and Quek 2002; Quek and Lim 2003). Although the system is presently working, the end result is an incomplete realization of the potential capability of such an advanced system. In particular, the designed throughput of the remote crane control system could not be realized in full following implementation.

Singapore's economic success is not only driven by a stable Government but is also propelled forward inexorably by her enviable reputation for efficiency. The latter reputation is amply reflected in its world class education system tasked with the development of human capital (i.e. a competent workforce that enables a swift and pervasive uptake of hi-tech automation and the computerization required for rapid industrialization), and in its highly developed physical infrastructure required to ensure responsive competitiveness in its import/export trade, port/shipping/ship building/oil platform business and tourism industry. Specifically, Singapore's land, sea and air infrastructural systems have consistently won international accolades, with titles and awards such as the busiest sea port in the world, best airport in the world, best airline in the world, innovative land transportation systems such as its mass rapid transit and traffic management systems (see Land Transport Authority's Electronic Road Pricing System, Left Turn on Red (LTOR) system at traffic light junctions, and Expressway Monitoring and Advisory System (EMAS)) more information is available at the web sites included in the reference section.

Although these systems are largely designed well, residual usability problems exist. Examples are presented in the following sections:

18.3.1 EMAS Displays

The EMAS displays are not specified optimally to support the driver's task such as the use of abstract icons and obscure abbreviations, the provision of unnecessarily specific message content, the inappropriate formulation of messages, and the inappropriate use of scrolling of message displays (see Fig. 18.4). Further, its travel time information display is too vague to adequately convey the traffic situation along a route to the desired destination (see Fig. 18.5).

18.3.2 Electronic Road Pricing (ERP)

ERP or congestion charges are cumbersome to remember as they vary across locations and time of day and year. Although drivers could check the applicable rates online (that is if they are computer literate and have internet access), few would

Fig. 18.4 Sub-optimal usability of EMAS displays arising from a design that is neither user nor task centric

Fig. 18.5 How could one infer from a time-based message display the traffic situation along a route?

Fig. 18.6 ERP Information (Congestion Charge Rates) displayed at the point of entry is too late to be useful

bother to do so since this would be an additional chore before a trip. In addition, the fuel consumption associated with alternative routes to avoid the congestion charges might render such an effort futile. To address the problem of remembering the charges, electronic displays of the charge rates have been recently installed at considerable cost above the gantries at the point of entry (see Fig. 18.6). As it would be too late then to consider alternative routes except to exit and avoid entering the zone of congestion charge, the displays are largely superfluous.

Finally, the mandatory use of a generic electronic cash card in the in-vehicle unit (IU) to pay for the congestion charge is inappropriate since it would invite theft (see Fig. 18.7). Despite feedback from the author to the designers at the time of development, the potential for an escalation in such crimes was brushed aside. Indeed, after the implementation of the system, vehicle break-ins to steal such cash cards has become common place. Such a problem could have been averted had a cash card that is unique to a specific car registration been used instead. In addition to this problem, motorists are required to remember to top up the cash card when the balance falls below a sum close to the charge rate. Since a motorist may pass through a number of gantries with various charge rates (and also pay for parking), the usual practice is to maintain a bigger margin of cash balance in the card (the consequence for insufficient cash balance to pay for the congestion charge is a fine). As such, it has become even more lucrative and tempting to steal the cash cards. Thus, many motorists have resorted initially to removing the cash card for safe keeping each time they leave the car. Alternatively, they might need to remove it for a cash top

Fig. 18.7 Scenario analysis should be used to define user requirements to support the development of a more appropriate IU system

up at an ATM. In both cases, if the motorist forgets to reinsert the cash card back into the IU device again before entering the congestion zone, they would be penalised with a fine. To avoid the risk of a fine, most motorists have now abandoned the practice of removing the cash card for safe keeping, unless they are also concerned about a broken car window linked to the cash card theft.

To address the problem, a new IU device with automatic cash top up has recently been introduced for sale (see news article entitled "New In-Vehicle Unit for the Electronic Road Pricing System" at The Straits Times Website 2009). Since such a technology has long been available, the launch of this device appears to be an after thought. As few motorists would now pay to have their existing IU device replaced, the insufficient cash balance problem would persist for quite some years yet, until all cars with the older model of IU are scrapped. Even so, the new device does not address the theft concern and the problem of remembering to re-insert the card after its removal for safe keeping. For these reasons, the development of the IU system can not be considered to be user centric. Scenario analysis should have been undertaken by the designers at the start of system development. In this way, a more appropriate design could have been developed based on a thorough understanding of user requirements.

18.3.3 Left Turn on Red (LTOR)

The Left Turn on Red (LTOR) system is used at traffic light junctions (see Fig. 18.8). The implementation of this system failed to consider the traffic context in Singapore in terms of the interactions between the right of way at pedestrian crossings and different systems of traffic light control. Worse, the LTOR system has latent safety hazards that are inherent in its design. Specifically, drivers at LTOR junctions are subjected to problems associated with the field of view, response conflict, negative transfer of learning, and too many interacting decision and response rules.

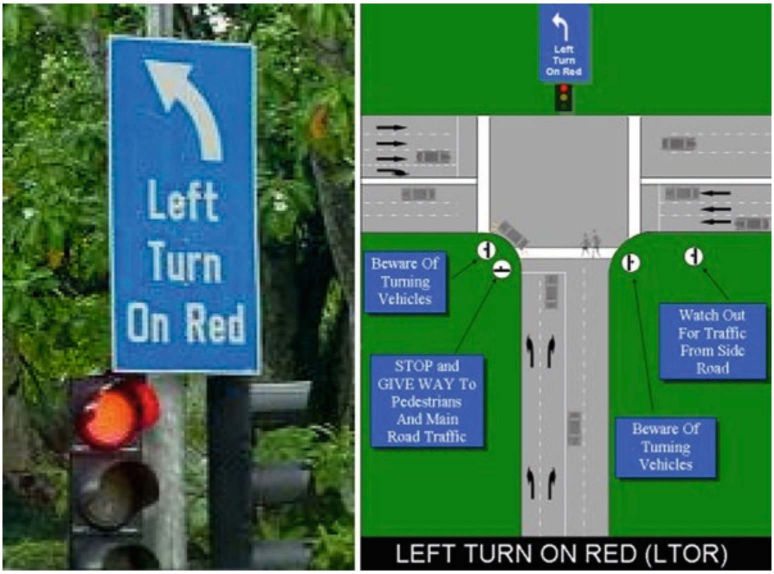

Fig. 18.8 Confusion reigns at "LTOR" junctions: do I stop or go when the traffic light is red?

The traffic engineers seem to be aware of the latent safety hazards and responded by specifying rules to restrict the installation of the LTOR system only at selected traffic junctions, e.g. the LTOR system should not be used in areas with high density vehicle and pedestrian traffic, at traffic junctions with u-turns, etc. As is generally known in Human Factors Engineering, installation rules constitute a poor solution to control an inherently unsafe design. Indeed, the installation rules are forgotten over time, and the LTOR system proliferated and were installed at unsuitable traffic junctions. At about the same time, more and more warning signs were introduced along the road leading up to the LTOR junction to remind drivers to adhere to further rules.

Rules are again expected to compensate for an inherently unsafe design. After personal experiences of near misses and a number of incident reports from drivers published in the newspapers shortly after its implementation, the author was prompted to write in to present a usability assessment of the LTOR system to highlight the latent safety hazards, and to recommend their removal in favour of the older system of filter lanes/islands or affirmative (green arrow) left turn traffic lights. These recommendations have not been implemented since enforcement of the rules has surprisingly been considered the 'best' way forward. Although the LTOR system has persisted to this day, the author's letter must have prompted a review of existing LTOR installations since some of them were removed shortly afterwards from unsuitable traffic junctions.

18.4 Case Examples of Usability Design Relating to the Emergence of the Digital and Global Economy

In recent decades, Singapore has also initiated a series of aggressive national masterplans to develop a 'final' infra-structure, namely a national digital infrastructure (see Table 18.1). The latter is intended to support pervasive and high speed

Table 18.1 Singapore's series of master plans for the development of a national digital infrastructure

National plans	Strategic objectives	Outcome
The National IT Plan (1986–1991)	Extend government systems to private sector through electronic data interchange networks	Deployment of TradeNet, MediNet, LawNet
IT2000 (1992–1999)	Transform Singapore into an "Intelligent Island" by developing: a National Information Infrastructure strategic industry wide inter-organizational applications	Nationwide deployment of a nation-wide broadband infrastructure (SingaporeOne) Establishment of a policy framework for e-commerce (Electronic Transaction Act) Development and implementation of 200 applications for education, shopping, banking, e-government (e.g. CORENET for the construction industry), video- and music-on-demand, digital public library catalogue
Infocomm 21 (2000–2003)	Establishment of infocomm as a key factor for growth by boosting business competitiveness and enhancing the quality of life	Liberalisation of the telecommunications market Enhanced domestic and international infocomm connectivity
Connected Singapore (2003–2006)	Creation and realization of new possibilities for individuals, organisations and businesses achieved through the integration of computing, communications and content.	Development of end-to-end infrastructure that integrates the processes of digital production, management, localization, archival, distribution and secure provision of digital content to support key sectors such as logistics, manufacturing, retail and education Pervasive infocomm usage by companies (iN2015 2006a)
Intelligent Nation 2015 (2006–2015)	Application of infocomm to meet three strategic challenges: Economic growth: sustaining competitiveness and developing pillars of growth National security: countering human (including cyber vectors), natural and epidemiological threats. Demographic changes, e.g. greying population	Harnessing infocomm to add value to the economy and society Achievement of a two-fold increase in infocomm industry to S$26 billion Achievement of a three-fold increase in infocomm export revenue to S$60 billion Creation of 80,000 jobs Achievement of 90% of home broadband usage Achievement of 100% computer ownership in homes with school going children

broadband info-communication that is required to position Singapore effectively for the much anticipated intense competition in the global economy (see InfoComm Development Authority's iN2015 report 2006).

As a result of these masterplans, Singapore's e-Government services are now well developed and effective. Some examples of the e-Government services supported may be seen in the following web portals: Inland Revenue Authority of Singapore, Accounting and Corporate Regulatory Authority of Singapore, Land Transport Authority, Government e-business system (2010), One. Motoring, Immigration and Checkpoint Authority of Singapore, Singapore Tourism Board (web links to all these organisations are provided in the reference section), etc.

With its fast paced economic development, Singapore is presently confronted with a number of urgent social costs such as negative population growth which has to be offset by immigration (with attendant social cohesion issues to address), an increasing diaspora of its citizens across the globe, and a rapidly ageing population.

To address these issues, Singapore needs to advance certain digital initiatives to mitigate the effects of specific trends and their constraints, e.g. to bridge the geographical constraints faced by its greying population and to keep its globally dispersed citizens connected to their home country. Thus, the development of a 'silver industry' is highlighted explicitly in its digital masterplan. It is the aim of the Singapore Government to transform a potential weakness into a competitive strength, in the same way that it has done successfully with the water industry. In particular, Hyflux, a home grown water technology company set up to address the shortage of water in Singapore, has now become a multi-national corporation with its market spanning China to the Middle East.

Similarly, the present need to address a rapidly ageing population is now seen as an opportunity to develop the 'silver industry' since similar trends have been observed worldwide. Thus, the Singapore Government is now advancing initiatives to support the design and development of hardware and software products and services targeted at the elderly. User requirements and usability concerns relating to this user group will therefore command greater attention in Singapore in the near future. Other broader trends for HCI, HF and Ergonomics have been reported in Lim (1997a, b, 1999a, b, 2003a, 2003b).

18.5 Case Examples of Usability Design Relating to Geo-Political and Homeland Security Concerns

Government led initiatives may also be determined by Singapore's geo-political location and history, which has continued to shape Singapore's defence and security expenditure, R&D and international policy.

The development of defence and homeland security technologies and systems such as biometrics, image processing, autonomous systems, network centric systems, multi-modal systems, etc. will involve user interface design, situation awareness, sense making, team work, etc. concerns that would require HCI, HF and Ergonomics

Fig. 18.9 Singapore's Hi-Tech Digitally Wired 'Soldier of the Future'

design contributions. An example of the hi-tech applications developed in recent years is the Advanced Combatman System. The latter system is Singapore's version of the US Land Warriors or 'Soldier of the Future' programme (see Fig. 18.9; Lim and Tan 2007; Tan and Lim 2006). This system requires a myriad of HF, HCI and Ergonomics issues to be addressed such as the helmet mounted display, mobile computing interactions, visual requirements, physical loading, thermo-regulation, situation awareness, data fusion, teamwork, CSCW, etc. Further examples of such R&D may be found in Wu et al. (2006); Lim and Wu (2007); Sulistyawati et al. (2005a, b); Tey et al. (2002) and Lim, Koh et al. (2005). Due to the security classification associated with such projects, a more detailed account cannot be presented.

18.6 Human Factors, HCI and Ergonomics (Usability Design): Education, Research, Practice and Professional Societies

As an indirect result of the initiatives and developments described earlier, a number of higher education courses, research centers and usability consultancy companies have been established in the discipline.

Degree level training specializing in HF/HCI/Ergonomics is presently offered in two of out the four universities in Singapore, namely an undergraduate programme at SIM University (Human Factors and Systems) and a comprehensive Masters degree programme at Nanyang Technological University (Human Factors Engineering). Further details of these programmes are available on the web site link provided in the reference section.

Other than degree level courses in the discipline, standalone exposure level subjects and/or electives on user interface design, web design, user interaction, interaction design, Human Factors Engineering and Ergonomics, are offered at polytechnics. Further details of these programmes may be found in the curriculum listings of Ngee Ann Polytechnic, Republic Polytechnic, Temasek Polytechnic, Singapore Polytechnic and Nanyang Polytechnic available on web site links provided in the reference section.

Similarly, exposure level courses are offered at specific university departments such as the Department of Industrial and Systems Engineering at National University of Singapore and the School of Communication and Information at Nanyang Technological University. Further details of these programmes may be found in their curriculum listings available on web site links provided in the reference section.

As for research centres, there are two Centers of Excellence in the discipline in Singapore, namely: the Centre for Human Factors and Ergonomics at Nanyang Technological University and the Defence Medical and Environmental Research Institute (2010). Further details of their work may be found in their web portal links provided in the reference section.

Unfortunately, the leading research centre (Centre for Human Factors and Ergonomics founded by the author more than a dozen years ago which he directed until 2008) and the postgraduate course at the Nanyang Technological University have both suffered a major setback, as practically all of its experienced Professors in the discipline resigned in 2008.

Concerning usability consultancy companies in Singapore, there are only a few as the market in the island city state is small. Further, most of the consultancy companies are working predominantly on usability testing, user experience testing and web portal design. Examples of such companies comprise Microusability, Fhios and Human Factors International Asia. Further information on these companies may be found in their web portals links provided in the reference section.

It should be noted, however, that not all the companies have staff who are formally trained and qualified in the discipline. To provide a higher level and more comprehensive consultancy support in Human Factors Engineering, Human Computer Interaction and Ergonomics design, the author has set up his own company (Human Centered Analysis and Design Pte Ltd) after leaving academia. With 25 years of research and consultancy experience in the disciplines, the author as the Chief Consultant of the company, has to date contributed in a broad range of capacities (covering design and evaluation to training, investigations and expert witnessing) across different industry sectors and for various applications (covering consumer products to industrial and military systems).

As for professional societies, it is clear that they play a crucial role in raising public awareness of usability in general, and in championing the development and application of the discipline. These functions have been served by the Ergonomics Society of Singapore (ESS) or its more recent incarnation as ERGOSS, see web portal (see reference) and the more recently established Singapore Chapter of the Usability Professionals Association. However, to date, these associations remain generally low key due to inadequate support.

Another effort to raise awareness specifically of HCI in Singapore and the region was initiated in 1995 by a special interest group comprising the author and a number of professionals in Australasia. The main objective is to establish a conference series named "Asia Pacific Computer Human Interaction (APCHI) Conference" (2010). This initiative led to the inaugural conference organized by the author in Singapore in 1996 (hosted by the Information Technology Institute which is now unfortunately defunct). The conference series has been very successful and is now in its ninth conference (see reference). From its inception, the conference series has been hosted by Singapore (two times), Australia, Japan, China, New Zealand, Taiwan, Korea and now Indonesia. Future conferences are planned for Japan, Malaysia, India and the Philippines. HCI interest has thus grown in the region facilitated in part by the APCHI conference series. In particular, the APCHI series has succeeded in raising awareness and interest in HCI in Indonesia. This led to their inaugural national conference in 2005 in Bandung (Java), and their hosting of the ninth APCHI conference in Bali in August 2010. To date, the author has served as one of two permanent/founding steering committee members of the APCHI conferences series.

18.7 Uptake of Human Factors, HCI and Ergonomics (Usability) Design Contributions: Challenges and Amenability Factors

Taking a broad view of the scope of usability, general socio-economic and geopolitical factors that might determine the uptake or otherwise of the contributions of the discipline (see Lim 2003a) may now be considered with respect to the Singapore context:

18.7.1 Whether HF/HCI/Ergonomics has been Designated a Mandatory Part of the Training of Design Engineers, Software Engineers and Computer Scientists

In many developed countries where the discipline is well established, accreditation boards of computer science and design schools would require explicit inclusion of HF/HCI/Ergonomics in the curricula. This factor is important as it influences the attitude of engineers and designers towards the requirements of the discipline at an early stage in their career development. An exposure to fundamental HF/HCI/Ergonomics knowledge and design perspectives at this time, would not only empower them to address these design concerns later, but would also inculcate in them a more balanced view of user requirements and the trade-offs between technical and human centered requirements. Although HF/HCI/Ergonomics curricula are now offered at various polytechnics and universities in Singapore, they remain largely exposure level courses. As a result, design engineers, software designers and computer engineers are likely to graduate and enter industry with inadequate knowledge of HF/HCI/Ergonomics. This situation explains the persistence in interactive systems development of many misconceptions about HF/HCI design requirements, for instance:

- User friendliness is all about making screen displays and icons attractive and pretty.
- User interface design is all about graphical displays and screen layout design.
- A graphical user interface (GUI) is the panacea for ensuring usability and the provision of a GUI is all that is needed to guarantee a user friendly design.
- I follow Microsoft style guides closely, so there shouldn't be any usability problems. That's all I need to do for user interface design.
- User interface design is something I need to do only at the end of system development.
- User interface and interaction designers must have a computer science/software engineering background. Other disciplines are peripheral to interactive systems development.
- User interface design is really not my job. Graphic artists should do that.
- HCI design is something I do if I have time. It is really a luxury and not a necessity for system effectiveness.
- I can use this user interface so users should not have any problems.
- The design has been evaluated comprehensively by my team members and cleared without problems. That is enough.
- Acceptance testing has been done and there are no bugs. Why do we need users? Acceptance testing is the same as user testing. User testing involves testing with the clients who have commissioned or paid for the project. They represent end users, and their acceptance is therefore equivalent to acceptance by end users. End users need not be involved in the acceptance process.
- The system software is very effective. It gives you the result in less than a second to 99% accuracy and 100% reliability. With such technical performance, what else do you want?
- To use this system, users must undergo intensive training. It's an inevitable requirement since this is a piece of hi-tech software. There is no way for users to use it otherwise.
- The users are not well trained and shouldn't have done that. There is little we can do about these user errors since the system design is fine. There are always users who would just make errors.
- I have checked the look and feel of the user interface design. It's fine.
- The tasks performed by the users previously are irrelevant to this system. They need to forget the old way as it is redundant and just learn how to do it the new way as it is more effective.
- Usability and/or HF/HCI/Ergonomics design requirements are not specified in my contract, so why should I address them? Anyway it's common sense.
- HF/HCI/Ergonomics is about aesthetics and subjective preferences. There's nothing concrete about it. An industrial or graphics designer should handle it.

18.7.2 Whether There Is a Significant Product/System Design and Development Industry and/or Demand for Customized Design Development

If off-the-shelf procurement is the main stay of an economy, then HF/HCI/Ergonomics design contributions may be confined only to evaluation for procurement. This is largely the case previously in Singapore. HF/HCI/Ergonomics contribution to design is limited then to multi-national corporations such as Dell, HP and Creative Technologies. Even so, most of these corporations in the early days performed the bulk of their R&D and creative design activities overseas. In the last decade, the situation has changed dramatically. Specifically, the creative design and development industry (including interactive digital media) in Singapore received a major boost from the Government in terms of funding and other incentives to support training and R&D. These initiatives are supervised by various ministries and statutory boards such as the Ministry of Information (2010), Communications and the Arts, Economic Development Board (2010), InfoComm Development Authority of Singapore and National Research Foundation (2010). For further information, the reader is referred to their web portals listed in the references.

18.7.3 Whether the Pace of Technological Implementation and Renewal Is Rapid

If this is so, then product/system failures due to poor design are quickly supplanted and forgotten, especially if the project scale and costs are small. Similarly, if competition is intense and the product life cycle is short, then poorly designed systems may be made obsolete more quickly and fade from the scene. The fast turnover of such products may be perceived as an unavoidable outcome of intense competition and the propagation of a 'use and throw society', rather than the 'premature death' of a product or system due to inadequate design attention. Such cases have emerged in Singapore, where the rate of product and system turnover can be high. For instance, several post-implementation design revisions had to be made within a year or so to the message display terminal of the GPS taxi booking system.

18.7.4 Whether Systems Are Initiated by the Government or Commercial Organizations

In the former case, development costs would not be borne directly by end users. As such, they might be more tolerant of less optimal designs or may choose to avoid using them if they could. In cases where system use is obligatory, users might be forced to learn to use the system and put up with poor designs. Lost productivity and hidden inefficiencies may remain undiscovered as a result. Alternatively, potential benefits of a hi-tech system may not be realized in full due to limited or partial use of the system. For instance, the reality of e- and m-commerce has generally fallen short of their anticipated promise of a major economic revolution. Similarly, to realize the economic returns expected from a nationwide implementation of a digital information infrastructure, user requirements and stake-holder participation in the development of user-centered applications, can not be neglected if end user buy-in is to be ensured.

In the case of commercial products, users/customers can express their displeasure by voting with their feet. When confronted with such problems, companies in Singapore tend to opt for stop gap solutions such as offering incentives (such as free gifts and lucky draws) to entice customers to buy or use their systems/products. Such situations continue to be pervasive and can be seen in ATM and electronic banking services, web portals, etc. Nevertheless, it is clear that these fixes are sub-optimal and do not usually solve the problems directly and so cannot be applicable as a solution over the longer term.

Table 18.2 provides a comparison of the general characteristics (namely motivation, constraints, and strengths and weaknesses) and associated implications of commercial and Government led initiatives that one needs to consider when formulating strategic initiatives to facilitate uptake of design contributions of HF/HCI/Ergonomics. In the context of Singapore, her Government has evolved its role from serving as a key driver and implementer of strategic initiatives to become a facilitator and catalyzer of industry involvement and collaboration. Thus, to achieve greater success in Singapore, HF/HCI/Ergonomics needs a champion in the Government to catalyze the uptake of its design contributions.

The above transformation in the role of the Singapore Government is clearly evident in the case of the development of a national digital infrastructure. Specifically,

Table 18.2 General characteristics and implications of commercial and government led initiatives

Projects initiated by	
Commercial organizations	Government organizations
Profit objectives	Electoral/national imperatives
Success yardstick: sales revenue	Success yardstick: public presence/access
Shareholders' money	Taxpayers' money
Survival of the most viable	Survival of the populist
Failures not always public	Failures largely public
Failure may be accepted	Failure may be disastrous
Shorter product lifespan	Longer time span
Specific market segment	Inclusive civic design and ethics, nationwide or wide user base
Customers' control/choice	Users usually accept or do without
Customers may be demanding	Users may be more tolerant
Sensitive to product type	Sensitive to societal norms
Initiated by the enterprising	Top down initiative
Competence of company	Socio-economic maturity
Service quality culture vital	Service quality a bonus
Intense competitive pressure	Monolithic service

the government has shifted from driving infocomm development and usage in the last 25 years, to industry wide involvement in the current iN2015 digital masterplan. In particular, the masterplan now emphasizes the involvement of stakeholders from various economic clusters, namely: digital media and entertainment; education and learning; financial services; government; healthcare and biomedical sciences; manufacturing and logistics; and tourism, hospitality and retail.

These stakeholders participated in the formulation of unique infocomm scenarios to establish user requirements. Specifically, their conceptions detail specific goals, programmes, applications and expected outcomes (see iN2015 2006b). These conceptions can then be elaborated and developed into applications.

18.7.4.1 The Level of Income and Education of the Population

In this respect, it may be anticipated that a population with a higher per capita income and education may be more resilient to less usable designs. However, user resilience does not equate with tolerance or an accommodating attitude. A reason for this is that users who are more educated also tend to be more sophisticated in their demands. They are also likely to be more self confident, vocal, aware and defensive of their rights as citizens and consumers. Consequently, they are less likely to accept blame for errors and difficulties encountered in the use of products and systems. Nevertheless, these user responses may also be moderated by cultural factors. In the case of Singapore, the population tends to be more accepting and tolerant and less prone to speaking up. Thus, although poor designs may be noticed, they can simmer below the surface and remain unaddressed.

18.7.4.2 The National Perspective on Automation and Advanced Technology

The Singapore Government has traditionally been very aggressive in exploiting automation and advanced technology as a means of enhancing productivity and addressing its traditionally tight human resources. Although such an emphasis is understandable from the perspective of national imperatives, there have been instances in which the emphasis on automation has been disproportionate. In particular, an imbalanced techno-centric perspective can lead to a predisposition to consider human operators as inevitably "error prone", and so an emphasis to replace them as a first resort. This situation tends to divert attention and efforts away from the appropriate design and application of technology to complement human abilities.

18.7.4.3 The Prevailing and Predicted Demographic Trend

As with many countries worldwide, Singapore is experiencing a fast ageing population. To aggravate matters, housing in land scarce Singapore comprises predominantly high rise flats. Such accommodation when designed and managed poorly can create silos and ghettoes. Cognizant of these problems, the Singapore

Government has invested design and management efforts to avoid them. However, with a rapidly ageing population, the silo problem might re-surface in the form of mobility constraints that lead to social isolation. Thus, the iN2015 digital infrastructure initiative includes the development of Internet applications to reduce the social implications of such physical and geographical barriers. A second concern relates to the falling birth rate, which requires the retirement age to be extended from 62 to 65 years old. Thus, systems and devices have to be designed to be more elderly friendly to support the required extension in working life. Further, with the increasing intensity of global competition, life-long learning is now also a requirement. To reduce the need for intensive training, greater design attention and effort should be invested to reduce undue system complexity and enhance usability through user-centered design. It cannot be over-emphasized that the extent to which senior citizens can continue to contribute effectively to the socio-economic development of the nation, will depend on how well the design of the work systems and home applications are tailored to meet the needs of an ageing population. Consequently, it is envisaged that in the near future, HF/HCI/Ergonomics will have a key role to play in supporting these national interests.

To conclude, the uptake of HF/HCI/Ergonomics design contributions is determined significantly by the socio-economic and geo-political factors that prevail in a country. Design uptake can be facilitated by efforts to raise public awareness of the importance of usability and to influence government policies by convincing them of the key role HF/HCI/Ergonomics play in ensuring the effectiveness and safety of systems and overall productivity. With greater awareness of the criticality of the design contributions from the discipline, consumers may also be prompted to pressure commercial companies into paying greater attention on ensuring usability in the design of their products and services.

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Chapter 19
Usability in Korea – From GUI to User Experience Design

Kun-Pyo Lee and Ji-Hyun Lee

19.1 Introduction

South Korea is a country in East Asia. Its territory covers a total area of 100,032 km^2 and has a population of over 50 million. As Asia's fourth largest economy and the world's 12th largest economy by purchasing power parity, South Korea is a high-income developed country and a member of the OECD. The country's economy is export-driven, with production focusing on electronics, automobiles, ships, machinery, petrochemicals and robotics. In 1990, South Korean manufacturers planned a significant shift in future production plans toward high-technology industries. In June 1989, panels of government officials, scholars, and business leaders held planning sessions on the production of such goods as new materials, mechatronics including industrial robotics, bioengineering, microelectronics, fine chemistry, and aerospace.

19.2 The Development of Usability Research in Korea

At the end of last year, Samsung Electronics announced that its profits exceeded the summated profit of Japan's Top ten electronic companies including Sony, Panasonic, and Toshiba. As data shows, Korean industries, particularly IT-related industries, have made a quantum leap to head worldwide IT industries. Some statistics show that Korean distribution rates of mobile phones among people of the age of 12~18, are the highest in the world standing at 87.7% (Shin 2009). Also, Korea globally ranks top in the Internet distribution at a rate of 95% (Lee 2009a, b). Nowadays, IT in Korea is deeply interwoven into everyday life. As shown in Fig. 19.1, Korean

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Fig. 19.1 Automatic immigration check machine at Inchon airport, Korea

travelers do not have to wait in long queues in front of the immigration check at Inchon Airport. Instead it only takes 20 s to scan their electronic passports and mobile phones (Staff reporter 2008). The Korean government has also been consistently pursuing 'e-government' services through which people can issue almost all the official documents and certificates from their home PC.

Such a significant development of IT industries in Korea inevitably initiated intensive investment in the development of research and technology related to usability and design, as seen in the comment of the previous chairman of Samsung, Lee Kun-hee: "I strongly believe that soft creativity like design will be the most important asset of a corporation in the coming twenty-first century."

There are three key players for the development of usability research in Korea: industry, school, and the government. The model of the triad collaboration between the three for supporting usability is described in Fig. 19.2. Schools generate knowledge through 'research', which is applied in the industry to generate 'practical competitiveness', which informs the new 'policy' of the government, which is then applied to enhance the quality of education. This mutual and cyclical collaboration is very critical, (Lee 2000). The subsequent sections will follow the structure of the triad model for showing each party's sample cases in detail.

As mentioned above the main role of schools lies in generating knowledge through research and education. With the rich IT infrastructure in Korea, universities have diverse activities linked to usability studies. There are two main activities, one focused on professional academic societies and conferences, the other on research projects supported by industry and government.

There are many usability related professional academic research societies in Korea, which are formed mainly around the disciplines of computer science, design, psychology, and human factors. One of them is the Korean HCI conference (http://www.hcikorea.org). Originally established in 1990 as a SIG rooted in the Korea Institute of Information Scientists and Engineers (KIISE, http://www.kiise.or.kr),

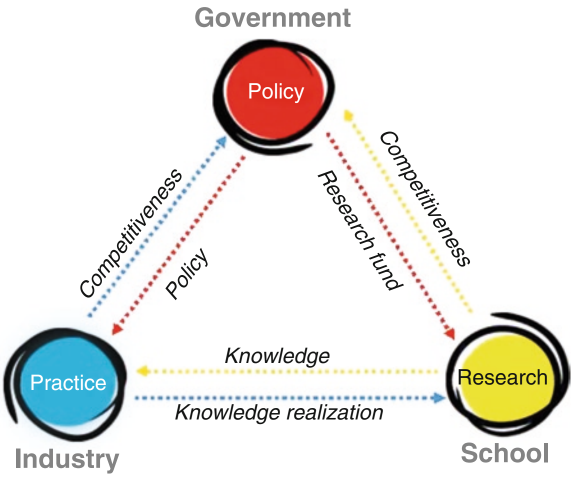

Fig. 19.2 Model of triad collaboration between industry, school, and government

it was part of the research group at KAIST's Artificial Research Center. Founding members include researchers from Computer Science, Cognitive Psychology, Design, Linguistics, Industrial Engineering, and Philosophy who were interested in GUI (Graphic User Interface) and multimedia. Ever since the first HCI conference was held in 1991, now the Korean HCI conference is one of the biggest conferences in the HCI field with 1,200 participants from schools, industries, and other HCI related organizations. Major topics covered by the conference have been changed along with the development of IT technologies.

According to the chronological analysis of major keywords from research proceedings since the 1990s, studies of interfaces were centered on hardware. This mirrors the initial stages of Korean IT development, which started from the 1980s. Along with the continuous growth in the computer industry at the end of the 1990s, the scope of research had been extended to include the graphic user interface (GUI). Other less noticeable, but interesting research keywords include so-called emotional engineering and smarter search tools. Multimedia technologies including Computer Supported Collaborative Work, and face and voice recognitions were also gaining interest within the academic field.

This pattern of research was continued in the early 2000s, but focus shifted from GUI to Internet-based software. As more people were accustomed to the Internet and as Web-based services thrived, researchers were compelled to think about online usability testing or new types of interaction methods. Technological development also spurred studies on web and mobile services, Internet TV and virtual reality. As time passed, such research about the Web was specified according to the purpose of services provided for users. Consequently, specific subjects such as e-learning systems, Internet games and shopping malls became more common for research titles.

Major papers were published since then, until the Human Computer Interaction Korea 2010 conference showed that researchers' demand and interest in user

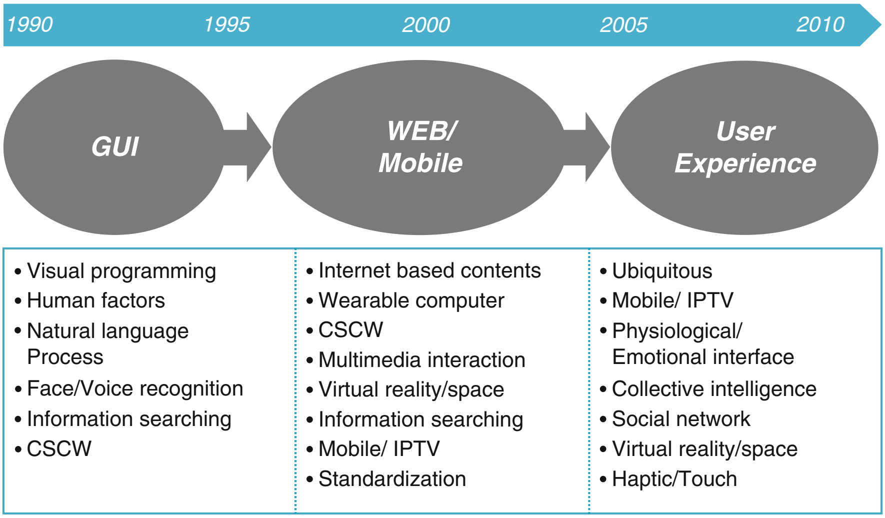

Fig. 19.3 Change of major keywords in Korea HCI conference

experience (UX) greatly increased. Particularly, UX design became a favorite subject for corporate practice as well as academic purposes. Social networking services also gained popularity. Collective Intelligence, collaboration and the openness of technologies used by social networking, is one of the frequent research subjects. Bare-hand-based, tactile and touch screen interfaces are also emerging due to their ease in a mobile environment. In addition to research keywords including emotional engineering, new keywords and academic interests were expanding the boundaries of the research area (Fig. 19.3).

Another active usability related professional academic society is KSDS (Korea Society of Design Science: http://www.design-science.or.kr). KSDS with more than 4,000 members publishes journals four times and holds two annual conferences. Since 1978 papers and presentations published at KSDS have been covering diverse usability-related topics including GUI, web, game, usability testing, design methods, ubiquitous computing, user experience design, interaction design, user interface design, or emotional design. And finally, ESK (Ergonomics Society of Korea: http://esk.or.kr) and KSES (Korea Society for Emotion and Sensibility) are also promoting diverse usability related researches.

19.3 Usability Related Research in Education

Like research activities from professional academic societies, usability-related researches in schools has been carried out in an interdisciplinary way by computer science, design, industrial engineering, management, psychology and so on. Particularly research labs at post-graduate levels have led the way both in fundamental research and applied research in collaboration with industry. Some major usability-related research labs include the Human-Centered Interaction Design Lab at KAIST (http://hcidl.kaist.ac.kr/web/Home), HCI lab at Yonsei University (http://hci.yonsei.ac.kr/), Intelligent System Lab at KAIST (http://ui.kaist.ac.kr/isl), Human Interface Systems Lab at Seoul National University (http://his.snu.ac.kr/), and User Interface Lab at POSTECH (http://ui.postech.ac.kr/index.htm). Those labs are carrying out usability related studies in different disciplinary contexts, Design, Business, Knowledge Service Engineering, Industrial Engineering, and Ergonomics respectively.

Among many other types of research in schools, the development of tools and methods is one of the key topics. The following cases of the Human-Centered Interaction Design Lab at KAIST exemplify research projects for the development of tools that help understand mobile phone user behavior.

19.3.1 Development of User-Research Tool for Mobile Phone: MOA

MOA was developed for observing the behavior of mobile phone user in a real use situation to identify tacit and latent needs (Lee and Oh 2005). Observing a mobile user is quite different from conventional user-observation techniques, as users are continuously moving while interacting with a small device. The key factors for success in this stage rely heavily on two issues: how to conduct user research as naturally as possible so that the user reveals his tacit or latent needs in an uninterrupted environment, and how to understand users at different levels of activities so that a researcher has a systematic understanding of users without missing any critical aspects of their needs. MOA allows researchers to observe users from three points of view for a comprehensive understanding of users: First, second, and third points of view (Fig. 19.4). First, MOA adopts the technology of a micro-wearable camera to

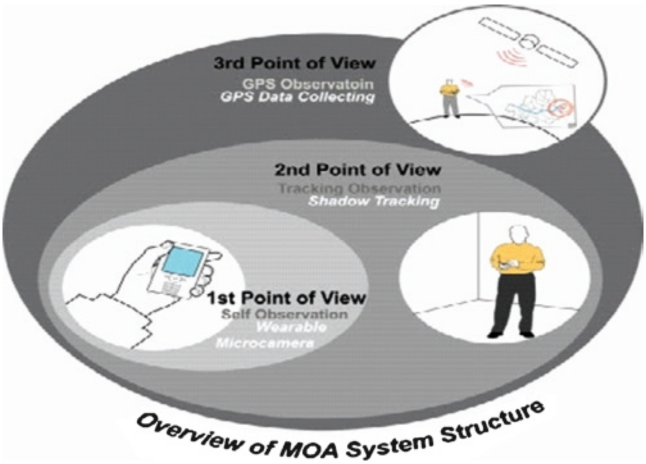

Fig. 19.4 MOA system structure

understand the user's self-point-of-view, what the user sees and interacts with at a micro level. A very small video camera developed as a medical endoscope is embedded into the user's eyeglass frame. Wearing the glasses as usual, without attracting other people's attention, the designer can get the video data of what the user sees and can observe and record their interactions with mobile devices automatically and naturally (Fig. 19.5). Secondly, the shadow tracking method is implemented to understand a second point of view where the researcher observes the user's gestures in holding and carrying the mobile device. Finally, GPS technology is used for a third point of view, to observe the user's macro behavior, like movement patterns, and positions.

In addition, software was developed for annotating video clips and identifying user's behavioral patterns. As shown in Fig. 19.6, the software allows the design researcher to view different aspects of user behavior from detailed interactions with the display as well as general physical gestures. GPS technology was used to get the user's moving path data. Through the software, researchers can easily sort out specific observational data and can make notes on specific use situations within the framework of user, interaction, object, and environment. A contextual diagram, as shown in Fig. 19.4 can be drawn by applying the MOA system, which shows the whole scenario of a user's mobile behavior.

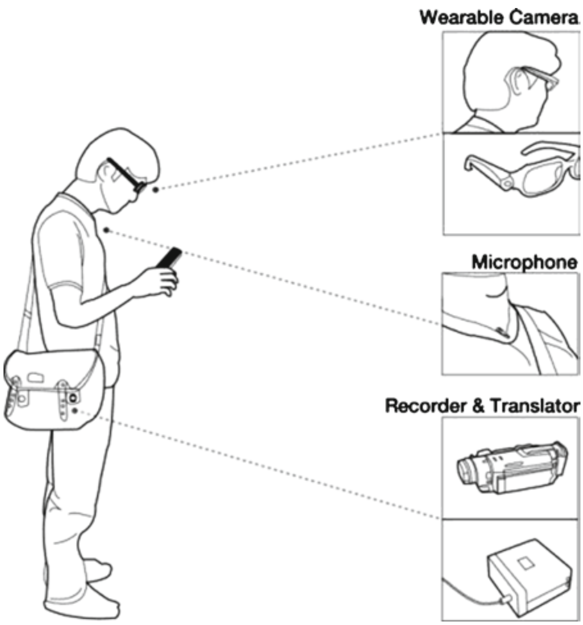

Fig. 19.5 Observation system with wearable camera

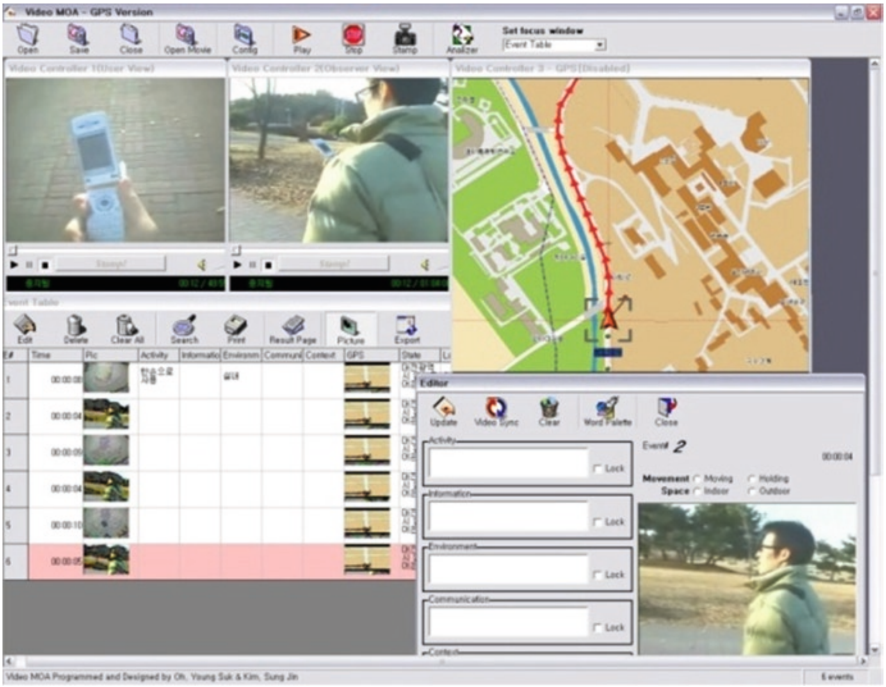

Fig. 19.6 Sample screen of video annotating software

19.3.2 Wi-Pro (Wish Prototyper)

While MOA relies on highly technological devices, Wi-Pro (Wish Prototyper) was developed with quite simple, low fidelity tools for identifying mobile phone users' wishes. This tool captured a list of wishes through a mock-up phone with a folding cover. Post-It notes under the cover allow the user to write down their wishes and what they would wish to do at a specific moment, if the mobile phone was real (Fig. 19.7).

While the user is handling the dummy, the user's actual mobile phone is analyzed with the user's permission to understand his use of the phone, for example, 'how does the user personalize the menu' or 'how does she organize addresses and other data.'

After one or two days of Wi-Pro, the user returns the mock-up (Lee 2006). All the wishes are analyzed in various ways, like the frequency of specific wishes, patterns over time, wishes in specific places, and so on. The user is invited to have a debriefing session and an in-depth interview about the wishes they expressed. This simple, low fidelity method is very quick and effective in understanding the user's tacit wishes and ideas.

Fig. 19.7 The Wi-Pro dummy mobile phone given to a user

19.3.3 Eye-Tracking Software

Recently, the IT-industry in Korea began to show more interests in the emotional aspects of usability rather than cognitive aspects. Particularly, there are emerging generations of users who enjoy emotional satisfaction from using products even when sacrificing the conventional sense of usability. In other words, a high level of emotional satisfaction can be achieved despite poor usability.

The Human-centered Interaction Design Lab at KAIST was asked to carry out research for understanding users' emotional responses to mobile phones. Being difficult to articulate in words, emotional responses were collected through the gaze analysis method. Special software was developed facilitating the analysis of eye-gaze patterns.

Recently, eye-gaze analysis and eye-tracking technology have been used in many areas. Like the cognitive sciences, usability research and marketing are applicable for various research disciplines. Also, as an input device for the physically disabled it gained huge attention from commercial industry. Moreover, it is now very widely used for usability testing and product development. For instance, it has proven very useful for spotting a website's usability issues.

Eye-gaze analysis, however, is difficult to use for designers. Eye-tracking data needs to be statistically analyzed, which makes this process complicated for untrained personnel. Furthermore, data from multiple sessions are usually not comparable, due to the sequential character of existing software, which requires finishing one session before another one can begin. Therefore, the KAIST research team developed a program called 'Eyetrack' that is specifically tailored to designers,

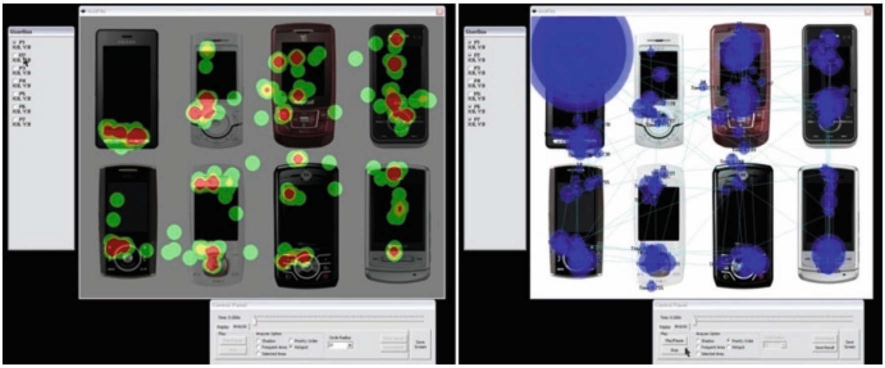

Fig. 19.8 A scene of 'EyeTrack'

who want to analyze user data from multiple sessions at once. The purpose of this software is to provide qualitative data extracted from numerous gaze-analysis images. 'Eyetrack' features two main functions. One is a 'Replay' function, which reruns users' eye-gaze data visually. It provides three different fixation mark visualization, where Eye Fixation refers to maintaining the gaze in a constant direction. The 'Color Variation' option visualizes chronological changes through green dots that in time turn red (Fig. 19.8).

The 'Analysis' function has different options for analyzing visually effective eye-gaze data. First, the 'Shadow' and 'Frequent Area' option is intended for distinguishing areas the user frequently focuses on. If a gaze lasts long enough, the according spot is drawn brightly. Then, the 'Selected Area' option supports users to draw and select any area. When a user chooses an area, and clicks the "Show result" button, the software calculates the quantity of points and gazing time. The 'Priority Order' option supports tracing the user's eye movement with lines and fixation marks differentiated by their size and the time it took for the user to focus on that area. Finally, the 'Hotspot' option indicates the intensity of the gaze by marking the highly spotted parts with different colors. The part of the image, which is not seen, is drawn dark. This sort of software has proven not only to be helpful for assessing product preferences, but also for designing a website or information structure to capture eye gaze data.

19.4 Usability Oriented Research Projects in Industry

Usability related researches in Korean industry are mainly being carried out by electronic companies such as Samsung and LG, or web portal companies such as NAVER and DAUM. This section explains how research on usability and product application are conducted in an actual Korean corporate environment.

IT-related firms in Korea flourished due to government-driven IT assistance since 1995. As a result Korean companies had their own teams that carried out research on usability. Today, these usability teams not only add the basic usability testing mechanism to their product planning stages, but also collect user experiences and develop new service models. In the following, two core service models developed by Samsung Electronics and NHN (naver.com) serve as illustration.

19.4.1 Cross-Cultural User Study

Corporate research themes have changed from a simple interface to various interactions based on different cultures. This can be interpreted as the fact that the main focus of the recent interface design has switched from the arithmetical front of efficiency improvement to the emotional front of user experience enhancement. Samsung Electronics, which operates the same product lines for each country, presumed that user experience for each country would be different since satisfaction with a product's UI software is different from country to country. Thus, the firm's research was conducted based on the assumption that the cultural differences of each country would yield differences in user experience.

Four digital devices were chosen for this study, which was based on comments from 48 interviews, 12 from one country and with four countries (Korea, China, India, the Netherlands) overall. The observation data was classified into ten categories, which were sub-divided into three sections: personal aspect, social aspect, and technical trend. The observations were focused on obtaining, managing, sharing and enjoying content.

Hofstede's variables helped to figure out how culture affects the interaction between the product and the user. Hall's dimension served to learn how appropriate each behavior was related to the use of the product. Meanwhile, Trompenaars's dimension helped to explain the purpose that the participants have when using the product. As a result, the type of experience the users expect with their mobile phones was different. The Korean users thought recording personal experience and sharing it with others was the best use of mobile media. The Chinese emphasized personal satisfaction and social recognition, and the Indians prioritized technical benefits a user and his/her group could enjoy. Finally, the Dutch interviewees preferred a phone identifiable with them, based on privacy.

These differences revealed what users want with media products, and provided insight on how to position mobile products in local markets. Also, this research showed, the expected core values of products can be differentiated by culture. A mobile device that would be appropriate for the Chinese market is the one that has an appealing and unique identity. It seems like the Chinese users prefer a mobile device that has multi-functions. For Korean users, it seems like a device with which they can create and share experiences is the most appealing one. They prefer easy, useful, transformable, sharable, enjoyable products. For Indian users, a product that can leverage a variety of contents is useful. A relatively affordable

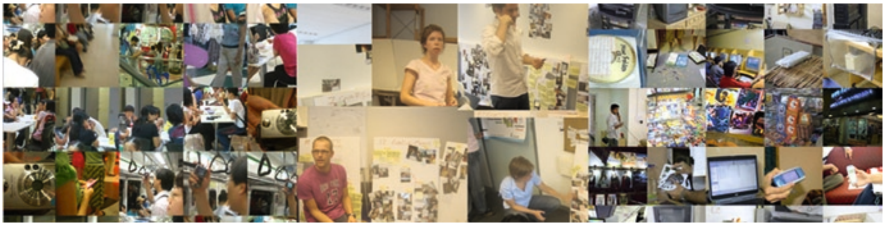

Fig. 19.9 Mosaic images of user research with participants from four different countries

price and a service system through which they can consume a lot of contents would be welcomed in their market. Also, providing a solution to allow a group of people to share one device would be a realistic suggestion as well. For Dutch users, it seems like practical and value-oriented products are most appealing. Throughout our investigation, we learned that they prefer to purchase products that would sustainably pursue identities related to socio-cultural issues (e.g., etiquette) or eco-friendly campaigns (Fig. 19.9).

As found in the research results, the observations of the device-manipulating patterns among the users showed the central values of user experience based on the cultural characteristics and differences With these UI design key points, the Samsung team produced basic guidelines for each country. They then examined values and cultural persona expected for a product and shared the results with the UI design team. The basic research on the context of user experience provided an actual development outcome and a source for further research.

19.4.2 Usability Research for IT Devices

Unlike the past mobile phones that are mainly used for calling functions, current smart phones boosted by the development of internet-based technology now do much more than making and taking calls. Particularly, as social networking sites such as Facebook and Twitter gain popularity, mobile phones that offer social networking services have been in high demand.

With regard to mobile UI design, Samsung Electronics is conducting extensive research toward actual users to provide better usability and user experience. This section introduces one of the case studies (Rhee and Lee 2009) performed in 2009 to understand the methodology of the research and an actual UI design case.

The first study is the case of detecting users' needs for the design of a mobile social networking service. The purpose of this process was to discover insights that can provide better user experience by finding out the context factors that create users' needs, in order to model and to apply them to the actual UI design. To do this, the patterns of daily mobile phone use, online and house activities, social interests and participation were observed based on design methodologies for various types of users (Fig. 19.10).

Fig. 19.10 Interview and results mapping

Interviews, shadowing and a technique called photo blogging, an advanced type of the user diary technique, were applied. The approach revealed some interesting features about the users' activities and experiences: Each of the participants was very practical, driven by their needs and with unique tastes. Music was the most universal tool to express the individual's personality. Regarding Facebook, the most representative website in the social networking service, just a small portion of the users were active. Environmental factors that triggered the need for natural interaction included curiosity about 'mysteries' of day-to-day life, random objects, time spent alone and the boring feelings that came from it. Collective intelligence including recommendations was also interesting. All of these results were applied as basic functions of a mobile service for future development.

Users' behavioral patterns on mobile communities can be divided into three parts: sharing, contacting and collaborating (Fig. 19.11). These three elements also provide key factors for mobile UI design. Sharing, contacting and collaborating are the goals of social activities and can indicate the person(s) who played a major role in those social activities and the content (Fig. 19.12).

As seen in the case above, Samsung Electronics first tried to understand users based on its user research prior to the development of the service. The results helped construct a model about users' social activities, and provided the base of the UI design. The electronics manufacturer applied the research results to the UI of mobile phones and designed the actual concept for the mobile user interface (Fig. 19.13). A common goal of the community is seen at the top of the UI screen, and the community members who share the goal are displayed below the title. The rest of the space is composed of the content of activities, including multimedia data and text, which allows the members to contact, share and collaborate with each other. This UI concept was organized as an actual mobile UI as shown on Fig. 19.14.

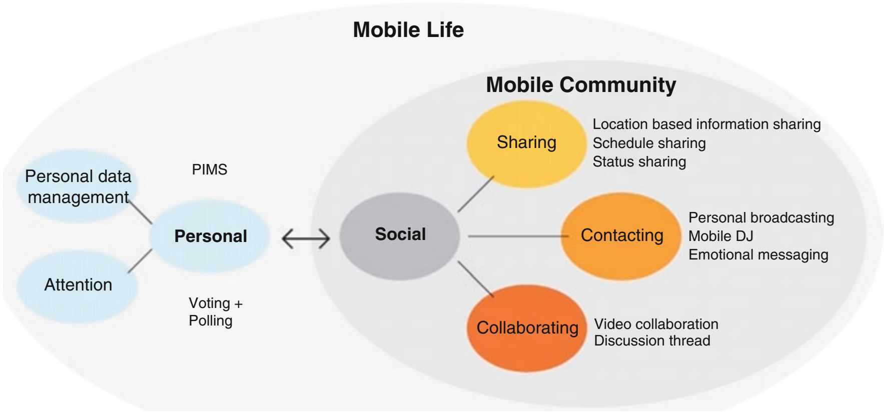

Fig. 19.11 Composition of users' mobile community activities

Fig. 19.12 Social activities among people consist of people, goal and content (Rhee and Lee 2009)

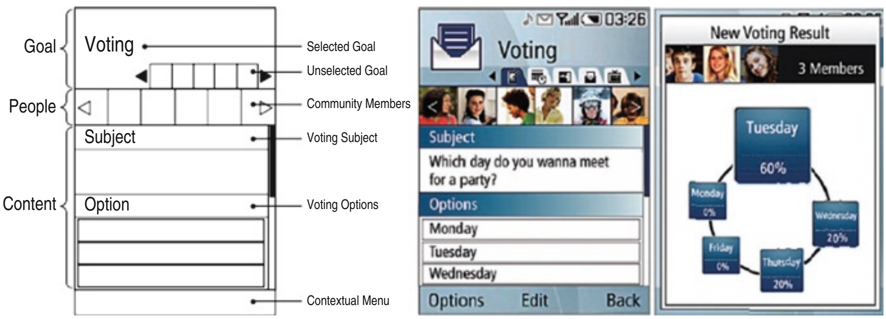

Fig. 19.13 UI draft designed to support mobile social networking (Rhee and Lee 2009)

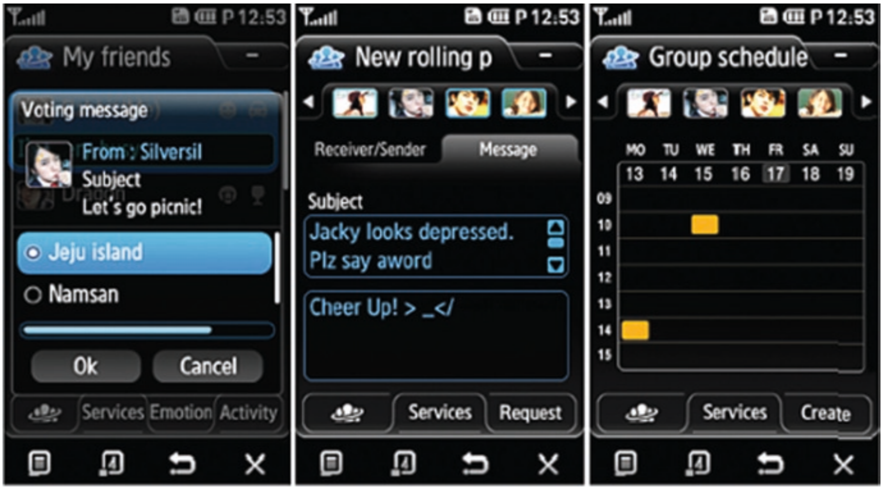

Fig. 19.14 Actual mobile UI designed from user research results and modeling (Rhee and Lee 2009)

Mobile producers like Samsung Electronics are well aware of the importance of UI and interaction and have made continuous effort to improve them. As found in the case, detecting users' hidden, potential experience and providing new features will be the key to product success. The case showed a successful example of research results applied for the development of product software. It also provides insights to the industry that show how the research results can be utilized for corporate practices.

19.4.3 Usability Study by Naver.com

The broadband Internet infrastructure was introduced in Korea earlier than in other countries largely because of the government's strong drive for IT development. According to the Information and Communication Technologies Development Index published by the International Telecommunication Union in 2009, Korea ranked second following Sweden out of 154 countries worldwide and demonstrating that the broadband Internet network in Korea is well established. This suggests that Korea accommodates an environment more advantageous to promoting Internet services than other countries may do.

Many Korean Internet users spend a major portion of their time on the Internet and satisfy their entertainment needs from various Internet services including blogs, e-mail, search, news, shopping, community, maps, messengers and games. A report published by Market researcher IDC in 2007 showed that a Korean typically produced and distributed 92 GB of information on average, which is double the worldwide average of 46 GB. (Table 19.1; Lipsman 2009).

Table 19.1 ICT development index (IDI) (2002 and 2007)

Economy	Ranking 2007	IDI 2007	Ranking 2002	IDI 2002
Sweden	1	7.50	1	6.05
Korea (Rep.)	2	7.26	3	5.83
Denmark	3	7.22	4	5.78
Netherlands	4	7.14	6	5.43
Iceland	5	7.14	2	5.88

ITU, the ICT development index, 2009, p 22

Table 19.2 Global search service rankings (Source: Comscore 2009)

Ranking	Company	Query in 2009 (Market share)	Number of sites
1	Google	76 billion (67.5%)	16 sites
2	Yahoo	8.9 billion (11.6%)	41 sites
3	Baidoo	8.0 billion (7.0%)	2 sites
4	MSN	3.3 billion (2.9%)	43 sites
5	Naver	1.5 billion (1.3%)	1 sites

Portal service providers hold the highest number of users in Korea. When Yahoo Korea (www.yahoo.co.kr) was launched for the first time on the Korean market in September 1997, the service of the Silicon Valley-based company was close to a local service provider. However, Naver soon replaced Yahoo Korea and has kept the top spot in user participation since 2004. No other company so far has outperformed Naver in revenue, unique visitors and page views, largely because the firm runs its unique universal search method and its services including Knowledge iN, Blog and Café that are suited for Korea's specific situations. Naver also ranked fifth in the number of queries collected worldwide as shown on Table 19.2. The figure is a surprise given Korea's small population and particular language.

However, Google, which topped the ranking above, remains insignificant in the Korean portal market: The search engine site was placed on the 48th spot of the entire Korean sites; and its market share is less than an eighth of that of Naver, the top runner in terms of unique visitors. The second and third place holders following Naver are also local search portal sites.

Local portal service providers are so competitive in Korea, because:

- The universal search service is optimized for the Korean search environment and market needs.
- They offer a Web 2.0-based Internet environment where user participation is high.
- Their interface design is more convenient for Korean users.

Behind these major reasons lies the continuous effort of NHN, the mother company of Naver, to study the unique nature of Korean users and constantly improve usability. In this case study, two factors that reflect the three success key points were selected to explain how Naver has been performing its user-oriented design process (Table 19.3).

- User-oriented design case for the universal search service
- User-oriented design case for the Knowledge iN service

Table 19.3 Current status of domestic portal sites (first week of August, 2009, Koreanclick)

Rank	Name of site	URL	Unique visitors	Reach (%)	TTS (×1,000 min)	PV
1	Naver	naver.com	25,244,376	78.06	2,893,412	5,604,374,820
2	Daum	daum.net	21,505,332	66.5	2,125,723	4,283,549,075
3	Nate	nate.com	16,560,873	51.21	651,260	1,152,549,631
4	Cyworld	cyworld.com	14,626,831	45.23	1,035,739	3,102,199,475
9	Yahoo	yahoo.co.kr	8,214,179	25.4	312,880	637,239,855
12	Paran	paran.com	7,135,867	22.06	137,083	366,473,118
48	Google	google.co.kr	2,935,575	9.08	32,632	75,887,204

19.4.4 User-Oriented Design Case for the Universal Search Service

Unlike Naver, other search engines selected the method of showing web page results with the highest relevance to a search word using their internal algorithms. The problem, however, was that such a method was not efficient due to the insufficient accumulation of information written in Korean around 1999, when the Internet service was just born. On the contrary, Naver's universal search was an advanced search service that analyzed a variety of databases such as web pages, images, blogs, cafes, dictionaries and news, and that displayed the results of the search word in the order of relevance (Naver IT dictionary 2010).

As a way of improving the quality of search results, Naver adopted two search ranking systems. One is called collection ranking that automatically arranges the order of the collection of results by analyzing each search word's popular information type. The other is a multi ranking that determines which information should be displayed on top in each section (Fig. 19.15). Both systems enabled Naver to bring up the highest possible quality of information (Naver Diary Blog 2010).

NHN applied eye-tracking studies to generate their layout. The eye-tracking research found that most of the users focus on the upper part, and pay less attention as they go down the screen. As a result, a search box was displayed at the top of the universal search screen, and a tab-style navigation bar was listed to lead users to each part of the search database. The results of the search query are displayed at the lower part of the screen based on the relevance level. To the right of the screen, related keywords, real-time skyrocketing keywords, survey and search history sections are located to encourage secondary searches and to provide search trend information.

As the competitors such as Daum and Nate followed the interface of universal research, Naver defined the standard for Korean search-engines. Eventually, the user interface of the universal search service became an example of overcoming the limitations of the unique Korean language environment, and of the lack of web content accumulation.

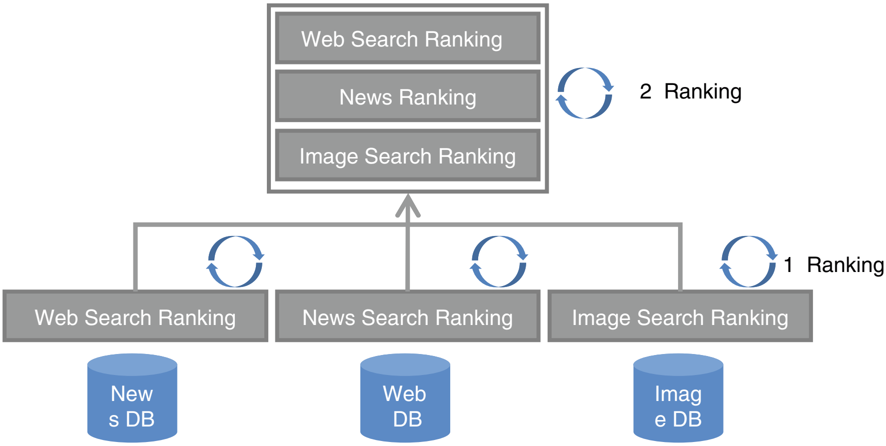

Fig. 19.15 Determination of position for Naver's universal search results

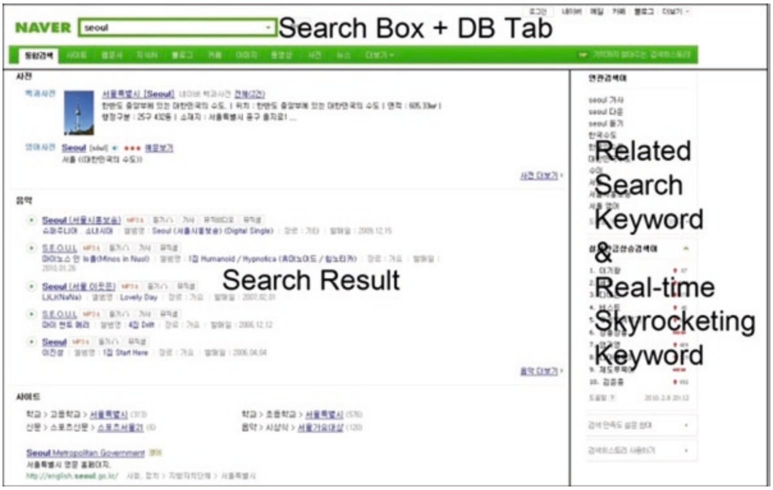

Fig 19.16 Interface design of universal search results (upper part of the search results)

Naver's effort to provide new services that boost user experience for the Korean market is still continuing. One of the popular services is the 2005 "real-time skyrocketing keyword". The real-time service allows users to know search words currently pursued by other users. Naver is offering this real-time service on its website as well as on IPTV, smart phone applications, subway internet-TV platforms, and on cable TV (Figs. 19.15–19.17; Lee 2007).

Fig. 19.17 Real-time skyrocketing search service applied to IPTV

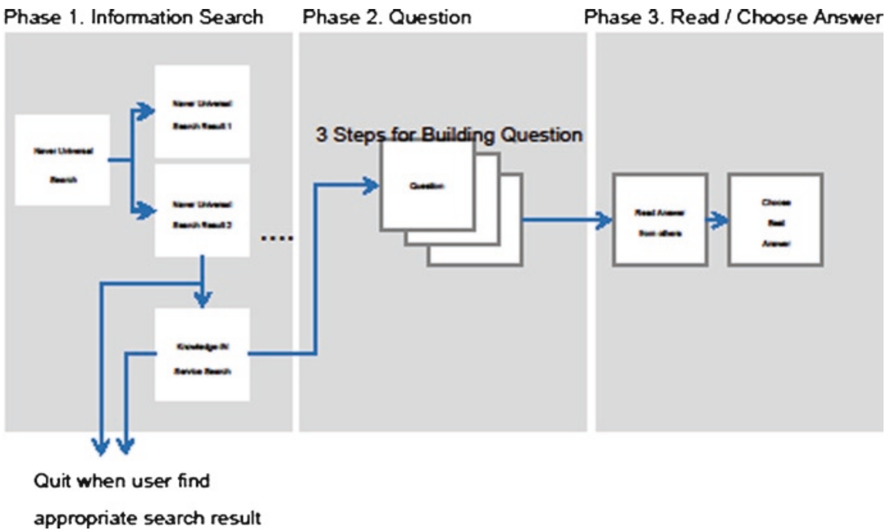

Fig. 19.18 Basic workflow of knowledge iN service

19.4.5 User-Oriented Design Case for the Knowledge in Service

Another representative service includes Knowledge iN (kin.naver.com), one of the most famous Web 2.0 contents in Korea. The program is built upon participatory collective intelligence in the form of questions and answers. Knowledge iN began as a solution to pile up all kinds of information that people thought of and shared with others. In 1999 a similar service by Hankyoreh Newspaper named DBDIC, was already creating a buzz among a limited number of users indicating that such an information-sharing service had a huge potential. Naver launched the Knowledge iN service in 2002 and based its system on bonus points called ‘naegong’, which were awarded for good answers. (Fig. 19.18).

To keep improving customer satisfaction and maintaining the growth momentum, Naver has worked on upgrade plans in three sectors: First, the company continuously managed and researched the behaviors of Knowledge iN users to strengthen its community features, induce an active participation, and to provide beneficial experiences for customers. Based on their research results, the firm learned the value of "subject-matter experts." Having known that such "experts" value their reputation and want to make their names popular, the firm introduced "Knowledge iN Hall of Fame." Secondly, the company consistently enhanced the overall usability of the service. To this end, Naver continued to perform an improvement project that allows anyone who has not gained the best answer to find other routes to solve it. Finally, as the Knowledge iN service tended to process more entertainment content rather than knowledge, the firm launched Open Dictionary, a collective intelligence service built up by users. To restore the reliability of answers in Knowledge iN, experts such as doctors and lawyers were asked to give answers for their specialty Open Dictionary database.

Knowledge iN is also popular among mobile phone users. However, it was tricky to use the existing service for a mobile use. Usually, mobile users have two reasons when using Knowledge iN: First, the user is in a certain situation and needs to search for an answer. Secondly, the user just wants to spend time scanning through the part she is interested in. While the former is a typical reason for regular search services, Knowledge iN is more like a big community that stores mostly personal-level information. Therefore, a personalized interface was suitable for the Knowledge iN design. In consequence, Naver designed a mobile exclusive version for mobile Knowledge iN service to satisfy these needs (Fig. 19.19). Naver's mobile interface design now has a simple search function and highly accessible custom functions.

In summary, Naver consistently studies the Korea-specific Internet infrastructure, online contents and use patterns, in order to release optimized services based

Fig. 19.19 Desktop and mobile versions of knowledge iN

on study results. The company's determination was consistently evaluated and developed in the market and inspired the competition. Naver's smart user experience design provides interesting insights on how a small local company can satisfy their customers and distinguish itself from global giants such as Google.

19.5 Usability Oriented Support from Government

The government-led usability research is divided into the design industry, the cultural content and the IT industry. The three categories are receiving intensive support from the Ministry of Knowledge Economy (MKE) and Ministry of Culture, Sports and Tourism (MCST). The MKE, combined from the former Ministry of Industry and Resource and the Ministry of Information and Communication, processes design-related projects that have been performed by the industry and resource ministry, IT projects that have been carried out by the information and communication ministry, and other new missions. The MCST oversees the promotion of the cultural content industry with the goal of developing the cultural industry.

The information communication business is focused on establishing a research foundation for IT policy making, supporting technological development, and producing experts. For example, the agency aids with the development of fundamental technologies such as GUI, UX, digital design technologies and processes developed by industrial corporations as part of the IT-based digital design infrastructure project. Selection and support of the project by The Information Technology Research Center (ITRC) has also been underway since 2000. Under this project, the agency designates capable laboratories as ITRCs, extends developmental support and nurtures specialists who are able to develop core technologies and perform projects.

The software industry is also intensively supported by the agency. It tries to promote the area by establishing software industrial strategies, streamlining software regulations and providing government policies and standard guides such as software engineering technology policies. The agency also grants funds for students of the school with prominent achievements in software areas in order to nurture software experts. For this goal, the organization set up Software Skill Standards to respond to the complication, diversification and specialization of software technologies and the industrial environment. The standards serve as a guide for software generalists to become specialists. The IT promotion agency's focus also includes the early discovery of potential brain power and innovative ideas through embedded software conferences to enrich the foundation and maintain competitiveness for the embedded software industry. Additionally, the agency's scope of activities contains stimulation and development for open source software, exports and convergence software. The institute specifically is involved in feasibility studies, content development, human resource training, the certification and distribution of content quality, and even marketing for the Korean e-learning business.

Many of the design projects sponsored by the Ministry of Knowledge Economy (MKE) are processed by the Korea Institute of Design Promotion. The promotion agency is a government-affiliated, design organization which was established in 1970 to revive the economy through the export of design and take the initiative in design promoting policies. The promotion agency accomplished as many achievements as the Korean design did. Major jobs by the promotion agency are largely classified to design-related support such as technological development, the Good Design selection project, education, exhibition, research and international cooperation. Specifically in the education area, the promotion agency operates education programs about the UI and UX development process for designers in various fields to improve their capabilities (Korea Institute of Design Promotion 2010a). The agency, as part of its commitment to the convergence design college promotion project, also provides $264,600 annually to establish and operate master plans for a systematic foundation by selecting several colleges that submitted their plans on at least three converged design education areas (Korea Institute of Design Promotion 2010b).

The ‘Ministry of Culture, Sports and Tourism’ is committed to developing the ‘Cultural Content Industry’ through its ‘Korea Creative Contents Agency’. The agency is a public institute that makes policies for the benefit of the content industry, extends its support for “culture technology” up to the commercialization stage, and promotes content to grow it as a major export boost. The agency’s job also includes the support for digital broadcasting networks and the promotion for game distributions and digital content businesses to gather more creative cultural content. With a raised interest in digital content, the agency allotted major portions of its budget to five technological and industrial development areas—computer graphics, digital virtual worlds, broadcasting and communication convergence content, u-learning content and virtual reality content—with the government’s pledge for the next-generation convergence content industry (Staff reporter 2009).

Other than governmental activities mentioned above, the ‘National Information Society Agency’ in the ‘Ministry of Public Administration and Security’ strives to improve the accessibility of all governmental websites for e-government. One notable activity is the annual evaluation of accessibility of the websites of all the governmental institutes. Evaluation criteria include ‘easy recognition’, ‘easy use’, ‘easy understanding’, ‘effective technology application’, and particularly ‘usability for social minorities like the elderly or the disabled. In addition, the agency publishes national standard guidelines of accessibility for web contents, creation of web contents, and web usability.

19.6 Conclusion

The remarkable development of the IT industry in Korea ignited the engine of usability research and helped produce various research spinoffs such as usability research through education, human resource training, fundamental study on usability, collaboration with corporations, the establishment of a society dedicated to usability, journal publication and conferences in the academic field. Companies, for their part, developed new products through new technologies, studied and conducted an intensive investment in their usability research, user interface, interactive design and technology development. Each firm also integrated their software development and design teams into an independent department of a UX institute for concentrated research. The government applied the advanced IT technologies to its administrations and agencies to promote usability factors at the government level. Government agencies including the contents and design promoting organizations also provided short-term education about usability, support for basic research and distribution of information. They also took the lead in 'convergence education on usability' for colleges.

Meanwhile, subjects of usability research in Korea have evolved from simple GUI to usability studies on the emotional front, user experience for innovation, and cultural comparisons. The concept of usability recently has widely expanded in the frame of user experience. In the past, Korea focused on improving products imported from industrialized countries. Yet, as the nation is now one of the leading economies in the global market, usability research in Korea is not only applied to existing products, but also to new interface and interaction design as well as the overall experience design for future products. Korean market leaders are also actively involved in usability research for overseas customers due to the export-dependent nature of Korea's economy. Given all these developments and progress, Korea has the prospect of growing beyond the domestic market and leading design research across the globe.

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Chapter 20
Usability in Thailand

Teeravarunyou Sakol

20.1 Overview of the Country

Thailand is located in the central part of South-East Asia – it covers an area of 513,120 km^2 and is bordered to the north by Burma and Laos, to the east by Laos and Cambodia, to the south by the Gulf of Thailand and Malaysia, and to the west by the Andaman Sea. The Thai population was 67,070,000 in 2009. The culture of Thailand is very much influenced by India, China and the rest of Southeast Asia. There has been large-scale immigration from China, and to a lesser extent, from India. The culture of Thailand is primarily influenced by Buddhist morals, value, and customs. Thailand is nearly 95% Theravada Buddhist, with minorities of Muslim (4.5%), Christian (0.7%), Mahayana Buddhist, and other religions. Thai culture is greatly influenced by traditional Buddhist beliefs regarding ancestral and natural spirits, which have been incorporated into Buddhist cosmology (National Statistical Office of Thailand 2009).

Most of Thailand's labor force works in agriculture. However, the relative contribution of agriculture to GDP has declined while export of goods and services has increased. The main industries are automobiles and automotive parts (11%), financial service (9%), electric appliances and components (8%), tourism (6%) and others. In Thailand, many industries are mainly original equipment manufacture (OEM), where products are produced by Thai companies under foreign brand names. Even though Thailand exports a lot of high and low technology products such as automobiles, electronic appliances and consumer products, industry still has a very low number of products that are designed in Thailand. After a rapid increase in the gross value of industrial output in China in 1986, the Thai government has foreseen the problem of OEMs shifting from Thailand to other countries with cheaper labor. As a result, the Thai government has recognized the importance of the creative industries, which combine the country's cultural assets with technology and

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innovation to create products with distinctive features. The Thai government encourages industry to have their own original designs and brands especially in small and medium enterprises (SMEs). There are government agencies that support the SMEs such as Department of Export Promotion, National Innovation Agency, and Thailand Creative & Design Center. These organizations have their roles to assist SMEs to design their own products. Thus, this has the implication for the needs of usability expertise to design an innovative product.

20.2 Overview of Usability in Thailand

Usability in Thailand is covered by several communities including computer science, computer engineering, information technology and product design. Usability in Thailand can be classified into two main areas:

20.2.1 Usability for Human-Computer Interaction

Human-Computer Interaction (HCI) education in Thailand is covered under digital media, computer engineering, information technology and robotic schools. They teach different aspects of HCI based on their backgrounds. These kinds of fields produce the computing-technological products. Most schools teach students how to create an interaction by using computer technology and media. For Thai industries, HCI is most widely used in the area of web application and interactive exhibition. Software designers use the design guidelines to develop their own applications. For the exhibition design, designers create an experience of interaction between displays and audiences that is mostly found in expositions and museums. An example can be seen from the Museums of Siam (National Discovery Museum Institute 2010) where the interaction techniques including hologram movies and interactive paint brushes are used to tell the story of Siamese anthropology.

20.2.2 Usability for Human-Centered Design

The second type of usability links to the Human-Centered Design (HCD) principle. The non-computing technological products like consumer products and furniture require usability principles to make the product easy to use and universally applicable for all types of consumer. For the product design, many design schools in Thailand have used 'The Design of Everyday Things' Norman (2002) as their reference book. Moreover, usability is similar to the principle of HCD, since the product should be designed based on users' points of view. HCD integrates users as a part of the design process, using methods such as user observation, participatory design and usability testing. The aims of HCD are to create the products that respond to the needs of users and are easy to use. For the interior and packaging design, the concept of Universal Design (UD) includes the principle of usability. This term is defined by the Center for Universal Design at North Carolina State University as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." (The Center for Universal Design 2008). The UD principle is similar in conception to the Heuristic Evaluation (Nielsen et al. 1994). However, the difference is that the Heuristic Evaluation focuses on an interface design of computer software, whereas the UD emphasizes specifically the tangible interface and ergonomics. There are some of the seven principles of UD that are the same as heuristic evaluation guidelines such as maintaining flexibility in use, making important information perceptible, and providing tolerance for error.

20.3 Usability Education in Thailand

There are currently no schools specialized in HCI in Thailand and no specialist programs. Many of the courses that are available are electives in departments of computer engineering, information technology, or robotics. There is only one school specializing in HCD. The school of architecture and design at KMUTT started a graduate program in 2005. Usability education can include the following fields of study.

20.3.1 Human-Computer Interaction Education

The first part of the HCI curriculum focuses on the artistic and aesthetic senses of computer media. There are around ten universities such as Silapakorn University, Sripatum University, Asian University, Rangsit University and others. Many of them have a school of Digital Media, Interaction Design or Multimedia. The aim is to produce students to serve industry in the fields of advertising, animation, game, and website development. Such universities offer this type of curriculum because of the fast growth of animation industry in Thailand and the promotion of software Industry Promotion Agency which hosts an annual event called Thailand Animation and Multimedia (TAM). The second group of the HCI curriculum focusing on science and technology consists of around 20 universities that offer information technology, robotics and computer engineering classes. Some of them integrate HCI into the program of study. For example, the Faculty of Management Science at Prince of Songkla University, and the Institute of Field robotics and Computer engineering at King Mongkut's University of Technology (KMUTT) have HCI as an elective class. Those schools produce software tools for usability testing, for example, the data logger of cursor movement on web pages.

20.3.2 Human-Centered Design Education

The third group of the HCD curriculum concentrates on the aspect of tangible interface. There are around ten schools that teach product design including Chulalongkorn University, King Mongkut's Institute of Technology Ladkrabang (KMITL), KMUTT, Rangsit University and others. The School of Architecture and Design at KMUTT is the first offering a usability testing class in its masters program for 3 credit hours. At undergraduate level, students are also taught user observation and participatory design.

20.4 Academic Research and R&D of Usability

20.4.1 Academic Research of Usability in the Thai Context

20.4.1.1 Journals

There are no journals specifically related to the usability in Thailand. As a result, many Thai researchers have published their papers in international journals instead. Some of the research topics are related to the cognitive and cultural aspects of design. For example, the cultural differences in attention and perceived usability: color combination of animated graphics is a study that compares American and Thai cultural groups (Noiwan and Norcio 2006). The findings lead to the conclusion that users across cultures tend to ignore animated banner graphics when they look for specific information on highly informative Web pages. Another type of the usability topic specific to the Thai context, is for example, "the Software prototype of Civil Court Case Management in Thailand" (Rungruangpattana et al. 2009), which was evaluated by using usability methods. The objective in this research is to improve the court process by decreasing the time delay and expense in case management. The results showed that a new design was effective and would benefit several groups of people ranging from the court personnel to the general public.

20.4.1.2 Conferences

Thai authors participate in oversea conferences relating to usability. Many authors are from different fields such as education, computer engineering, architecture and information technology. "A Comparative Analysis on Web Heuristic Usability between Thai Academic Web Sites and US Academic Web Sites" (Noiwan et al. 2000) is a study using a checklist model by Keevil and Associates. Some problems in using these checklists have been found. It was evident that US web sites have higher usability indexes than the Thai web sites. The web design styles between Thai and US web sites are different in terms of aesthetic issues and information provided.

Another example is "Factors influencing the Adoption of Thai eGovernment Websites" (Wangpiaptwong et al. 2005). The main purpose of this study is to explore which factors influence the adoption of eGovernment websites regarding information quality and system quality aspects. The study confirms that information quality such as accuracy, relevancy, and completeness, was more significant than timeliness and precision. Efficiency was the most significant factor.

An interest in Universal Design is seen in the topic of "Accessible Market: A Prototype for People with Disabilities in Thailand" (Kutintara et al. 2009). The authors studied how disabled people might access a Thai fresh market. The result indicated that people with disabilities could not access the market because of lack of suitable parking zones, lack of ramps, walkways with obstacles, the lack of a zoned area for the food court and of standards of food stalls. Another paper titled "A Case Study of Usability Testing of Software Tools for People with Learning Disabilities" (Poobrasert et al. 2009) from the Rehabilitative Engineering and Assistive Technology, Institute of National Electronics and Computer Technology Center illustrates activity in this area. Seven software applications from NECTEC were evaluated by using heuristic evaluation.

Thai researchers come from different backgrounds and their approaches for usability are varied and different. Some research used a comparison of cognitive performance between eastern and western cultures, while some focus on specific issues of case studies such as Thai organization, or Thai software. On the other hand, some of them have done the research based on their particular interests such as assistive technology and disabled people that may be applied in a more global context.

20.4.2 Research and Development for Small and Medium Enterprises (SMEs)

Many products from SMEs are new and have never been used by mass-consumers before. In Thailand, there are 2.83 million entrepreneurs (according to the Office of Small and Medium Enterprise Promotion 2008) producing product ideas that require substantial usability testing before launching them in the market. Two case studies demonstrate how usability expertise supports the SMEs, namely IP Phone and Air Pak. The IP phone uses the principle of HCI while the Air Pak focuses on HCD.

20.4.2.1 Case Study of IP Phone Usability

The Telecommunications Research and Industrial Development Institute (TRIDI) focuses on technology development and R&D. One of the products that they strongly support is IP phone, which allows telephone calls to be functioned over the IP network. The Forth cooperation public company is a local manufacturer that develops and produces office phones. TRIDI, a funding agency that would like to assist the company in terms of exploring new markets and products hired consultants from Redek (R&D company under KMUTT). Forth would like to integrate the IP Phone technology in the housing of an existing office phone, given that the cost of plastic injection molding is expensive. The company targets IP Phone use for tourists and office workers since there are a large amount of tourist attractions and international businesses. In Thailand, the IP phone is not popular for Thai users. One of the reasons is that users seem intimidated by the complexity of computer embedded products. As a result, usability is crucial for this type of product.

Instead of positioning the product at low price, the company would like to increase the added value of the product in a specific Thai context and niche market. The ultimate goal of this project is to develop a telephone housing, touch screen interface, navigation panel, and graphic user interface (GUI). The problem of the existing interface is that the information structure is not designed for a casual user. The new design of the software interface uses icons and was designed based on the same style and layout as mobile phones. Two groups of eight Thai tourists and eight office workers participated as the focus group and in usability testing (see Fig. 20.1). The focus group was used to verify the consumption demands and understanding of users' interpretation of the icons. For the usability testing, subjects were introduced to the IP phone and assigned to use the software prototype from the computer screen.

Fig. 20.1 Focus group, usability testing, software and hardware prototyping of IP phone

The results from the Focus group suggest that the IP phone for Thai office workers and tourists had some specific needs and issues. For example, subjects preferred to have a daily calculation of their expenses on hotel services during their stay. The reason is that they needed to control their budget especially when they stay at luxury hotels. Thai office workers requested conference calls to communicate with other business companies outside the country. They would like to record the meeting conversation to have a clear understanding of the foreign language and write the minutes of the meeting.

The results from the usability testing suggested that the interface theme of the IP phone should be similar to the mobile phone in order to reduce the problem of learning. Only some items should be changed, for example, the redundancy of the contact number and speed dial functions. For the hardware interface, subjects from both groups preferred to use a larger touch-screen interface. The navigation buttons on the left side of the screen interface was not seen as necessary. In general, they did not have difficulty when they used the product. They could finish all tasks in a short time, since the depth of screen structure was no more than three levels.

The result of the study was presented to the TRIDI committee and promoted in a seminar with Thai SMEs. Many of the audience were inspired and started to have new ideas on their own products. TRIDI realized the importance of usability for which they had never given the funding before. The Forth company also used the result of usability to develop and strengthen their products.

20.4.2.2 Case Study of Usability Testing on Respiratory Protective Device

The usability testing of a respiratory protective device (RPD) is another example of a product from a SMEs inventor. It was inspired from the real case of a fire that occurred in the Royal Jomtien Hotel at Pattaya, Thailand on July 11, 1997. The fire killed 91 hotel guests and staff and seriously injured 51. As a result, that SMEs inventor designed a product called Air Pak (Alias name). Air Pak, a type of RPD, supports evacuation of people from smoke-filled or fire-affected environments by providing a limited oxygen supply. It consists of a heat resistant plastic hood (up to 165°C) and aluminum canisters containing compressed breathable air (12 bar, 1 min duration) with a heat resistant silicone air tube (up to 220°C) as a delivery method (see Fig. 20.2c). Air Pak is a self-contained open-circuit compressed air escape breathing apparatus with a hood. Foreign standards that are applicable to Air Pak are BS EN 1146(1997) and AS/NZS 1715(1994). Since the product is still questioned in terms of safety and ease of use, the inventor of Air Pak wanted to know how usability testing could be used to evaluate the product.

The usability testing process of Air Pak took around 3 months from the literature review of industrial standards as shown in Fig. 20.3. Before starting the test, the researchers did the pre-test analysis by interviewing the firefighters and collecting the data from the inventor who designed the Air Pak. It was discovered that Thai standards as well as studies regarding RPD were limited. Thai specifications of RPD for use in Thailand were not available; therefore, the literature review relied

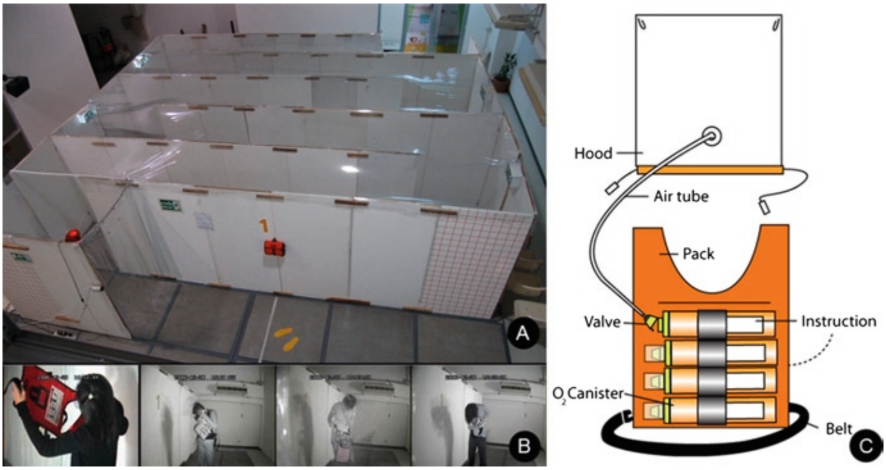

Fig. 20.2 Testing room and Air Pak for usability testing

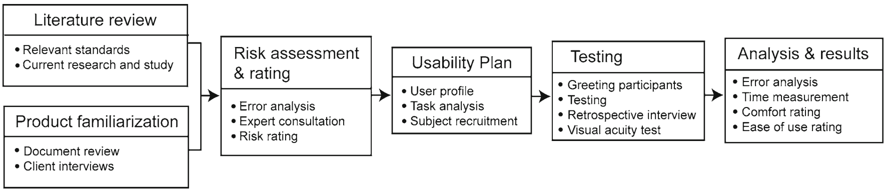

Fig. 20.3 Process of Air Pak testing

purely on international standards and research findings alone. Although there are numerous standards in the market, many of them relate to product performance such as material and physical properties. There is still a lack of human performance tests in existing industrial standards for such safety equipment. In product familiarization, researchers must understand the product usage and functions more clearly. The user profiles of the Air Pak are company workers and tourists.

For this testing, the performance measurement method was used to verify the usability issues. A walkthrough of the product by researchers and an interview with the inventor had identified the tasks involved in the use of Air Pak starting from searching for information, reading instructions, wearing the tool jacket, and removing it. Since the product cannot be tested without a suitable environment, a simulation of the environment needed to be built. The testing room was designed with partitions and covered with plastic sheet on top as seen in Fig.20.2a. Inside the room, there was only emergency signage that could give the direction of the walkway in the dark. To make the situation more real, the alarm was turned on while participants used the product. Many infrared cameras were installed at the corner of the walkway to capture the behavior of users while they walked through the rooms. For the next stage, 30 subjects were assigned to use the product, fifteen males and 15 females with an average age of 32 of which ten subjects were randomly assigned to crawl, another ten walk and the rest to run through the smoke. After the testing, an interview with subjects was conducted to find out problems that could not be captured from the surveillance camera. Subjects also rated comfort and ease of use for this product using a Likert scale.

The data from video was analyzed and summarized as statistical data. The measurement of effectiveness is the success or failure to achieve the goal. The most unsuccessful task was the pressing of the valve lock. Only 1 of 30 subjects was able to hold the lock valve to release the oxygen. It meant that 29 subjects did not use the oxygen while they escaped. For the efficiency measurement, subjects spent more time putting on the equipment than they took to escape. However, they did figure out how to plug the air tube into the canister. Most errors made by subjects were in putting on the hood, releasing the valve lock, and reading the instructions respectively. Many subjects read the instructions back and forth while wearing the equipment. Although the instructions were quite clear, they still made a lot of errors. The reason might be a difficulty in operation; for example, the valve was difficult to press. If the product has too many steps to operate, subjects tend to make mistakes under the time pressure.

The Air Pak testing illustrates the cognitive function of subjects when operating the product. The dislocation of instruction, fear of the plastic hood, and misuse of the valve lock are examples of users' problem solving and mental models, in actual rather than ideal circumstances. After the researchers submitted the usability report to the owner of this product, they agreed to improve their products without any hesitation.

20.5 Extent of Activities: Universities with Educational Programs, Industrial Activity, and Conferences Meetings/Organizations

20.5.1 Facilities

Unlike in developed countries, usability labs are rare in Thailand. Several labs are similar to usability testing labs, but with different purposes. For example, the Nation newspaper has a one-way mirror room to observe how readers read the advertisements in the newspaper, which is similar to the Faculty of Medicine, Ramathibodi Hospital, where psychiatrists use one-way mirrors to observe autistic children's behavior. The usability lab at KMUTT is specifically used for design evaluation. It has two testing rooms. One is for the small products that fit an area of 13 × 19 ft. The room is flexible and can be arranged into different activity areas such as a computer room, children's playroom and meeting room. The examples of products tested here are computer games, radios, websites, and toys. Another room is for large-scale products with an environment area of 22×36 ft. This room has a high ceiling and access floor with cable under it. Examples of the products tested are office layouts, simulation of fire escape, furniture designs, car driving simulation and others. Both rooms can be simultaneously observed with one control room. There are surveillance cameras, one-way mirrors, audio amplifier and sound capture installed in the room. The software used for the analysis is Noldus® Observer. Other usability tools include an eye tracking device for the study of perception and human attention. The school operates this lab for academic purposes and industrial service. Students can use this lab to test their designed products and to analyze them with the software. It is also used by industry or foreign usability companies to test products.

20.5.2 Conferences and Seminars in Thailand

Ergonomics Society of Thailand (Charoenporn 2005) introduced the usability issue into the conference programs in Southeast Asia. The Eighth Pan-Pacific Conference on Occupational Ergonomics (Jaehyun et al. 2007) discussed the topic ‘Design for Accessibility and Usability’. There were many participants from Hong Kong, Korea and Thailand. Many research papers focused on usability, such as the interpretation of traffic signs (Chan et al. 2007), navigation of a mobile phone interface (Park et al. 2007), and a tool for supporting usability design (Chaivoraporn et al. 2007). In terms of the research, many of the papers are connected to interface design and new products.

TCDC hosted a seminar on ‘the Benefit of Universal Design packaging’ on February 27, 2008. The workshop invited speakers from Japanese companies and the Japan Packaging Institute. The key objective of the seminar was to promote how usability affects the design of packaging especially for elderly and disabled people. Assoc. Prof. Orrasa Jirapinyo from King Mongkut’s Institute of Technology Ladkrabang also gave a lecture on the user-friendliness of universal design in packaging.

Another conference related to usability was the ninth Southeast Asian Ergonomics Society Conference (SEAES 2008). Several papers were from the Philippines and Indonesia. Many of them referred to the usability of consumer products and context such as the emotional reaction to products (Seva et al. 2008), cultural difference (Seva et al. 2008) and product safety (Teeravarunyou et al. 2008).

World Usability Day 2009 include a seminar event hosted by UsableLabs (UsableLabs, 2008) from Prince of Songkla University on November 2. A 2 hour seminar introduced Thai audiences to usability practices. The seminar focused on the design of social webs, design for every day living, and usability in the real world. Most of the audiences were students from the Faculty of Engineering, Sciences and Management sciences. UsableLabs had received funding from a variety of organizations including the Thai Health Promotion Foundation, the Thailand

Research Fund and the King Prajadhipok's Institute. UsableLabs also promotes usability and knowledge management through the website named GotoKnow.org.

The increasing number of conferences and seminars demonstrates that the usability issue is gaining in popularity in Thailand, but there are still not a large number of studies in this area. There is a need for a specialist conference to promote usability to practitioners. On the academic side, usability is popular in HCI and HCD. However, usability is still relatively unknown in many Thai industries. To promote usability, education should increase the number of usability courses and research projects.

20.5.3 Sample of Industrial Projects and R&D Carried Out in the Country

For HCI, there are some educational industries that promote electronic products. For example, Inex is a company that produces and sells the electronic equipment for education. High-school students all over the country are encouraged to build robots, since Thailand hosts many robot competitions. When the demand of the robotic market in Thailand began, Inex started to promote HCI through it's 'Prototype Electronic Magazine' in June 2009, (Inex 2009). This magazine demonstrates how to make an interactive product.

Exhibition design for events is another rapidly increasing market. Pico Thailand is a company that services events and exhibitions with the implementation of interactive systems. Two examples of this are at the museum of Siam and the children's museum (Pico Thai 2008). XtremePlus is another company that mainly focuses on interactive technology (XtremePlus 2008). The examples of products that they created are interactive fog screens and touch screens.

Many foreign companies desire to evaluate their products for the Thai market and this includes usability testing. Although many Thai industries do not use the usability services, there is a lot of demand from foreign consultant companies. They would like to ensure that their products are appropriate to Thai culture, context and use behavior. One example is the Nokia phone. Nokia desired to know the local context that affects the usability of its products, such as text messaging in Thai alphabets. They hired a Thai consultant to collect the usability information for them. They also requested other methods from social science and marketing, such as in-depth interviews and diary probes. This in effect was a combination of user study, usability and market research.

Usability testing is a relatively new issue for the Thai software industry. Many developers rely on product training rather than improving the usability of their products. They do not integrate usability testing into their process due to either lack of awareness or additional cost implication. The use of specialist design consultants at the early stage of the design process is something that is currently a rare occurrence. However, progress towards this should be something that needs to be encouraged.

20.6 Conclusion

In conclusion, usability is increasingly important for the Thai SMEs market, and several companies have engaged in projects co-funded by Thai government agencies. Many of them create innovative products with technology supported from universities and research organizations. This provides an excellent opportunity for usability to impact the SMEs products and make them more innovative and applicable to the user.

In the future, both industry and government should be educated on how usability is important in improving products. In addition, the government should initiate more projects and funding for usability. Moreover, governments should incorporate usability into industrial standards in order to strengthen product quality. New types of careers related to usability such as usability specialist, interaction designer and user experience designer should be established in Thailand. For the supply side, specialized degree programs in HCI should be established. The programs should emphasize interaction, user experience, usability testing, and user research. The collaboration among faculty from diverse disciplines should be encouraged and supported through a unified community with its own national conference and web site dedicated to usability.

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