

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.

M.L. Best (✉)

Sam Nunn School of International Affairs and School of Interactive Computing,
Georgia Institute of Technology, Atlanta, GA 30308, USA
e-mail: mikeb@cc.gatech.edu

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 were 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?

¹Of 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 milieu “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 [Ankowa 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 life-world” 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.

References

- Ankowa, Y., DeRenzi, B., Ho, M., Luk, R., Moraveji, N., Ramachandran, D., et al.: Stories from the field: reflections on HCI4D experiences. *Inform. Technol. Int. Dev.* **5**(4), 101–115 (2009)
- Best, M.L.: Designing interactive systems for development: rethinking system fundamentals. Presented at the DIS 2008 Workshop on Building an International Community, Cape Town, South Africa (2008)
- Best, M.L., Smyth, T.N., Serrano-Baquero, D., Etherton, J.: Designing for and with diaspora: a case study of work for the truth and reconciliation commission of Liberia. In: *Extended Abstracts on Human Factors in Computing Systems*, pp. 2903–2918. ACM, Boston (2009)
- Brewer, E., Demmer, M., Ho, M., Honicky, R.J., Pal, J., Plauche, M., et al.: The challenges of technology research for developing regions. *Pervas. Comput.* **5**(2), 15–23 (2006)
- Chavan, A. L.: Another culture, another method. In: *Proceedings of the Human Computer Interaction International Conference* (2005)

- Chetty, M., Buckhalter, C., Best, M.L., Grinter, R.E., Guzdial, M.: *Description of Computer Science Higher Education in Sub-Saharan Africa: Initial Explorations*. Georgia Institute of Technology, Atlanta (2007)
- Deo, S., Nichols, D., Cunningham, S., Witten, I., Trujillo, M. F.: Digital library access for illiterate users. In: *Proceedings of the International Research Conference on Innovations in IT* (2004)
- Donner, J., Gandhi, R., Javid, P., Medhi, I., Ratan, A., Toyama, K., et al.: Stages of design in technology for global development. *Computer* **41**(6), 34–41 (2008)
- Douglas, I.: Global mapping of usability labs and centers. In: *Proceedings of the 27th International Conference Extended Abstracts on Human Factors in Computing Systems* pp. 4393–4398. ACM, Boston. <http://portal.acm.org/www.library.gatech.edu:2048/citation.cfm?id=1520672> (2009). Retrieved 18 Sept 2009
- Dourish, P.: *Where the Action Is: The Foundations of Embodied Interaction*. MIT Press, Cambridge (2004)
- Gitau, S., Donner, J.: New paths: exploring mobile-only and mobile primary internet use in South Africa. Presented at the W3C Workshop on the Africa Perspective on the Role of Mobile Technologies in Fostering Social Development, Maputo (2009)
- Guignon, C.B.: *The Cambridge Companion to Heidegger*. Cambridge University Press, Cambridge (1993)
- Heeks, R., Bhatnagar, S.: Understanding success and failure in information age reform. In: Heeks, R. (ed.) *Reinventing Government in the Information Age: International Practice in IT-Enabled Public Sector Reform*, p. 49. Routledge, London (1999)
- Heidegger, M.: *Being and Time* (trans: Macquarrie, J., Robinson, E). Harper & Row, New York (1962)
- Joshi, A., Ganu, A., Chand, A., Parmar, V., Mathur, G.: Keylekh: a keyboard for text entry in indic scripts. In: *CHI '04: CHI '04 Extended Abstracts on Human Factors in Computing Systems*, pp. 928–942. ACM, New York (2004)
- Kumar, R., Best, M.L.: Impact and sustainability of e-government services in developing countries: lessons learned from Tamil Nadu, India. *Inform. Soc.* **22**(1), 1–12 (2006)
- Medhi, I., Sagar, A., Toyama, K.: Text-free user interfaces for illiterate and semi-literate users. *Inform. Technol. Int. Dev.* **4**(1), 37–50 (2007)
- Medhi, I., Menon, G., Toyama, K.: Challenges in computerized job search for the developing world. In: *CHI '08 Extended Abstracts on Human Factors in Computing Systems*, pp. 2079–2094. ACM, New York (2008). doi: <http://dx.doi.org/10.1145/1358628.1358640>
- Mitra, S., Rana, V.: Children and the internet: New paradigms for development in the 21st century. In: *Asian Science and Technology Conference*, Tokyo, Japan, Vol. 61 (2000)
- Nielsen, J.: *Guerrilla HCI: Using discount usability engineering to penetrate the intimidation barrier*. In: Bias, R.G., Mayhew, D.J. (eds.) *Cost-Justifying Usability*, pp. 245–272. Academic, Orlando (1994)
- Nielsen, J., Molich, R.: Heuristic evaluation of user interfaces. In: *Proceedings of the Conference on Human Factors in Computing Systems*, Seattle, Washington, pp. 249–256 (1990) doi: 10.1145/97243.97281
- Ong, W.J.: *Orality and Literacy: The Technologizing of the Word*, 1st edn, p. 201. Routledge, London/New York (1982)
- Sherwani, J., Palijo, S., Mirza, S., Ahmed, T., Ali, N., Rosenfeld, R.: Speech vs. touch-tone: Telephony interfaces for information access by low literate users. In: *Proceedings of the IEEE International Conference on ICTD*. Doha, Qatar, pp. 447–457 (2009a)
- Sherwani, J., Ali, N., Rose, C.P., Rosenfeld, R.: Orality-grounded HCID: understanding the oral user. *Inform. Technol. Int. Dev.* **5**(4), 35–48 (2009b)
- Smith, A., Joshi, A., Liu, Z., Bannon, L., Gulliksen, J., Li, C.: Institutionalizing HCI in Asia. In: *Human-Computer Interaction – INTERACT 2007*, pp. 85–99. Springer, Berlin (2008)
- Thadaboina, V.: ICT and rural development: a study of Warana Wired Village Project in India. *Trans. Stud. Rev.* **16**(2), 560–570 (2009)
- Veeraraghavan, R., Yasodhar, N., Toyama, K.: Warana unwired: Replacing PCs with mobile phones in a rural sugarcane cooperative. *Inform. Technol. Int. Dev.* **5**(1), 81–95 (2009)

- Vijayaditya, N.: A wired village: the Warana experiment. In: Bhatnagar, S.C., Schware, R. (eds.) *Information and Communication Technology in Development: Cases from India*, pp. 132–140. Sage, New Delhi (2000)
- Walton, M., Vukovic, V., Marsden, G.: ‘Visual literacy’ as challenge to the internationalisation of interfaces: a study of South African student web users. In: *Conference on Human Factors in Computing Systems: CHI’02 Extended Abstracts on Human Factors in Computing Systems*, Association for Computing Machinery, Inc., New York (2002)
- Winograd, T., Flores, F.: *Understanding Computers and Cognition: A New Foundation for Design*. Addison-Wesley, Reading (2005)
- Winrock International. *Guide to Energy Options for Small-Scale Rural ICT Projects* (2004)

Global Usability

Douglas, I.; Liu, Z. (Eds.)

2011, X, 354 p.,

ISBN: 978-0-85729-304-6