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Kentaro Toyama

School of Information
University of California, Berkeley
USA
kentaro_toyama@hotmail.com

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Human–Computer Interaction and Global Development

Kentaro Toyama

School of Information, University of California, Berkeley, USA,
kentaro_toyama@hotmail.com

Abstract

International development is concerned with making life better for the least privileged people of the world. Since the 1990s, HCI has engaged increasingly with development through an interdisciplinary field known as "information and communication technologies for development," or ICT4D. This article overviews the historical relationship between HCI and international development, compares their disciplinary approaches, and suggests that both sides would gain from ongoing interaction. International development could benefit from HCI's broad methodological tools, which include qualitative and quantitative research methods, design through iterative prototyping, and reflective inquiry. HCI could benefit from international development's exposure to a broader base of cultures, sectors, and concerns. These issues are discussed with specific examples from published papers and several well-known projects that apply HCI to development. Finally, future directions for an ongoing collaboration between HCI and development are also indicated.

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1

Introduction

Imagine the following scene in Kibera, one of the world's largest urban slums, located in southwestern Nairobi[1]:

> A 32-year-old man who drives a *matatu* (an informally operated miniature bus) for a living deposits 5000 Kenyan shillings at the local mobile-phone shack. Although he normally visits the shop to add to his mobile talk-time (most mobile phone accounts in the developing world are pre-paid), in this instance, he requests that the money be added to his M-PESA account and provides the shopkeeper with his mobile phone number. She complies, and a few seconds later, he receives confirmation of the transaction via a single SMS text message.
>
> The man then performs a few manipulations on his mobile phone — a sequence that he learned a year ago

[1] This story is based, in part, on work by Morawczynski and co-workers [95, 96] and Ratan and co-workers [90].

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> from a good friend — for which he receives another SMS confirmation: he has successfully sent 4000 Kenya shillings (Ksh) to his mother's mobile number. His mother lives in Nguni, a rural town about 70 kilometers away. Because she is illiterate and cannot distinguish between spam SMS and M-PESA notifications, he calls her immediately. They chat for a bit, and she tells him that she misses the time when he used to come see her more often. He responds that he wishes he could come home more often, too, but the roads seem to get less and less safe each month, even for an experienced matatu driver like him! At least, he can send her money safely now without having to worry that he'll get car-jacked and mugged on the way home. As he hangs up, he thinks about whether to spend or save the remaining Ksh. 1000.
>
> In Nguni, the man's mother sees that, in fact, the little square mark on her mobile has come on. So, she walks to the central petty shop in Nguni, hands the trader her mobile, and asks him for the cash. The trader reads the SMS and confirms the transaction, but says that he only has Ksh. 2000 in cash today, so she'll have to come back tomorrow for the rest. The mother takes the Ksh. 1960 (Ksh. 2000 less commission) and agrees to come back in a couple of days, not realizing that the trader, at her expense, will cheat her. He will take twice the commission he would have received if he paid her in one shot, as he is contractually obligated to do.

This is a typical usage scenario for M-PESA, a mobile payment service run by Safaricom that is wildly popular in Kenya. M-PESA transacted over US$1.7 billion in mobile payments since beginning in March 2007, and now has over 7 million customers [15].

For a designer or researcher interested in user experiences with technology, the service raises a rich array of interesting questions, ranging

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from those that are specifically usability-focused to broader and more philosophical questions:

- Can mobile-phone interfaces be designed such that even illiterate users can use them?
- Do new research methodologies need to be devised to work with subjects who can't read?
- Who is "the user" when one person asks another to perform a device task?
- Are there patterns of device usage that are consistent across developing countries? And, can design recommendations be tailored to such patterns? Or, is there something special about Kenya that would suggest that similar services elsewhere would not necessarily succeed?
- Do designers carry an ethical burden in such circumstances, of ensuring just use of the technology?

These are the kinds of questions asked by a growing field called "information and technology for development," or ICT4D. ICT4D considers how technologies such as the personal computer, mobile phone, and the Internet can contribute to global socio-economic development of economically impoverished communities.

Many of the questions of ICT4D are those that people in human–computer interaction have been asking for decades in other contexts. In fact, HCI already figures prominently in ICT4D projects, though it is not always called "HCI." The Association for Computing Machinery's special interest group on computer-human interaction (ACM SIGCHI) defines human–computer interaction as "a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" [54, 55]. By this definition, *all* of the questions enumerated above could be considered legitimate questions of HCI. In fact, in their foundational textbook on HCI, Schneiderman and Plaisant wrote, "As a profession, we will be remembered for how well we meet our users' needs. That's the ultimate goal: addressing the needs of all users" [124].

A key tenet of this article, therefore, is that HCI is central to ICT4D — it was so even before people who called themselves "HCI

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researchers" were involved, and it will continue to be true, until the failure of the last gadget in the world's last non-profit organization. HCI has great potential to influence global development where computing technology is involved, and its methodology could be a model for development even without technology.

What about the converse? What can HCI gain from engaging with global development? Hopefully, this article will provide an adequate basis for readers to come to their own conclusions, but here are some possibilities.

First, global development presents largely unexplored territory for HCI research, terrain which will become increasingly relevant. In 2008, there were 1.2 billion PCs in use [23], and most of HCI so far has been focused on those 1.2 billion devices. This means that a much larger group of people, numbering over 5 billion, has not been addressed by the majority of HCI research — many of them live in cultures that may respond in new ways to modern technology, and in any case their experience with computing devices will be different from past users. While this latter population is largely unfamiliar with PCs, they are meanwhile becoming rapidly familiar with another powerful computing device — the mobile phone. There were 4.6 billion active mobile-phone accounts in the world in 2009 [63]; this is more than the total population of the world today who are over 20 years of age.[2] All this suggests that what ought to be considered the "typical user" and the "typical computing device" will shift from what have been the traditional concerns of HCI and computer science more broadly.

Beyond such quantitative trends, ICT4D also poses qualitatively new questions to the HCI community. For example, UNESCO estimates that in 2009 there were 774 million illiterate adults in the world [143], and this number is likely conservative. How should one design user interfaces for non-literate users? And, even if you can read in your own language, software is written primarily for the world's dominant languages. Many languages are spoken only by small communities, for which it is cost-prohibitive to localize software. Are there

[2] These statistics do not necessarily mean that every adult on the planet owns a compute-intensive mobile phone, as many countries have penetration rates above 100%, and individual phone ownership in the world's very poorest communities still remains rare.

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ways to extend software reach without all-out language localization? Or, consider that there are cases when the cost of an SMS text message becomes a barrier for services that save lives [128]. How should user decisions based on pricing of products and services be incorporated into HCI methodology? Many people in low-income communities are intimidated by new technology, or have little experience answering hypothetical questions. What new methodologies can be devised to overcome such experimental challenges? These are just a few examples of questions that emerge in ICT4D contexts which expand HCI's borders.

Engaging with different populations can also temper overgeneralization in HCI. It is frequently lamented that undergraduate students are not a representative sample of the human population, and yet a good portion of psychology and HCI studies are conducted almost entirely with such biased samples. An implicit assumption of generalizations drawn from these studies is that undergraduate students in developed countries are reasonable representatives of modern PC users, at least with respect to traits that matter for HCI. Not all such claims, however, will extend to people from very different groups, such as those who are preoccupied with the source of their next meal, or those who keep track of critical business contacts entirely in their head. Thus, HCI in developing-country contexts may help add greater precision to existing claims.

At a personal level, involvement with HCI can bring great rewards to the researcher. Many HCI researchers go into "the field" out of a concern for people and a desire to support them in their interactions with technology. Certainly, there is satisfaction in discovering the critical set-top box feature that consumers seek out, or the UI nugget which helps an office worker use spreadsheets 10% more efficiently. Imagine, though, if that attention were directed not just at increasing convenience in suburban homes or efficiency of office work, but at easing suffering and alleviating poverty? If the design of a computer system could help a rural healthcare system deliver vaccines 5% more effectively, that would likely be at least as satisfying as making an online social networking site 5% easier to navigate.

Finally, as discussed further in Section 3, ICT4D tends to emphasize participatory approaches, and this is perhaps where HCI for global

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development exerts its strongest pull. Researchers work closely with partners and collaborators in the field — whether it is in the slums of Nairobi or in the arid desert of Rajasthan. Work in such environments often comes with significant challenges, but the emotional returns can be dramatic. Few things are as rewarding as witnessing the moment when a child who has barely interacted with books, first interacts with a PC. Or, when a smallholder farmer who is featured in a how-to video, first sees himself "on TV". Or, when a slum resident discovers to her surprise that she can find relevant jobs via her mobile phone. These are common experiences for the researcher working in ICT for global development.

This article will provide background to ICT for global development (Section 2), discuss the methodological and historical interplay of HCI with ICT4D (Section 3), provide examples of HCI projects in global development (Section 4), pull out recurring themes and lessons (Section 5), and conclude with some thoughts on future directions.

This article is by no means an exhaustive survey or a thorough history of the field. Despite its youth, ICT4D has covered wide ground, touching just about every domain of global development and many geographies. Instead of attempting a comprehensive overview, a compromise between breadth and depth has been attempted. Moreover, the focus of this article is on the most mature class of ICT4D research — that in which beneficiaries of development efforts directly interact with technology. Other ICT4D possibilities, such as the use of ICT in the operations of development organizations, ICT for networking among development professionals, or ICT for policy-making, are not given as much attention, in part because these applications of ICT have not yet received as much attention among researchers. Perhaps a future issue of this series will provide introductions to these other flavors of ICT4D.

In any case, it is hoped that the contents will provide a point of departure for those in HCI who are new to global development, as well as provocation and ongoing discussion for those who are already involved.

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