

Reflection on research methodologies for ubicomp in developing contexts

Beth Kolko · Cynthia Putnam · Emma Rose ·
Erica Johnson

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Abstract As the user base for ubiquitous technology expands to developing regions, the likelihood of disparity between the lived experience of design team members (developers, designers, researchers, etc.) and end users has increased. Human-centered design (HCD) provides a toolkit of research methods aimed at helping bridge the distance between technology design teams and end users. However, we have found that traditional approaches to HCD research methods are difficult to deploy in developing regions. In this paper, we share our experiences of adapting HCD research methodologies to the Central Asia context and some lessons we have learned. While our lessons are many, reconsidering the unit of analysis from the individual to larger social units was an early discovery that provided a frame for later research activities that focused on ubicomp development. We argue that lessons and challenges derived from our experience will generalize to other research investigations in which researchers are trying to adapt common HCD data collection methods to

create ubiquitous technologies for and/or with distant audiences in developing regions.

Keywords Ubicomp · Human-centered design · User-centered design · Information · Communication and technology for development · Developing regions · Mobile phones · Text-based interaction · Social network · Unit of analysis

1 Introduction

In the short history of computer technology design (computers, mobile phones, etc.), individuals responsible for the design of technologies have usually shared common lived experiences with the end users of technologies [1]. However, as end user populations for computer technologies diversify globally, move out of the office, and begin to encompass more diverse populations such as people with disabilities, those with limited literacy, or older adults, the possibilities for a disparity between the lived experience of design team members (developers, designers, researchers, etc.) and end users have increased. In other words, technology creators are more likely to have a greater ‘distance’ from end users; distance can include cultural, physical, geographical, and psychological differences. Human-centered design (HCD) has a toolkit of research methods aimed at helping bridge the distance between technology design teams and end users, a toolkit that has proven invaluable over the years as designers strive to combine more functionality with usability. However, this toolkit can only carry the process so far; as the distance between designer and user increases, new methods and adaptations of existing methods are needed in order to achieve the fundamental goals of HCD.

B. Kolko (✉) · E. Rose
Human Centered Design & Engineering,
University of Washington, Seattle, WA, USA
e-mail: bkolko@uw.edu

E. Rose
e-mail: ejrose@uw.edu

C. Putnam
College of Computing and Digital Media,
DePaul University, Chicago, IL, USA
e-mail: cputnam@cdm.depaul.edu

E. Johnson
Global Studies, University of North Carolina,
Chapel Hill, NC, USA
e-mail: ejohnson@ericasemail.edu

Other authors have noted that traditional approaches to HCD methods are difficult to deploy in developing regions [2–4]. Such difficulties emerge from both systemic challenges and methodological limitations. While some of these challenges can be generalized to the development of all types of ICTs, it is especially important when considering ubiquitous technologies such as mobile devices and services because: (1) for a majority of users in developing regions, the first (and perhaps only) encounter with technology of any type will be ubiquitous in nature; (2) creating technologies that are designed to become embedded in people’s lives in an unobtrusive manner requires a deep understanding of the culture in relationship to the targeted technology; and (3) such technologies often operate in a networked rather than individualized fashion, for example, a mobile application that connects families rather than a stand-alone piece of computer software. Technology targeted to operate in a network requires an understanding of community usage patterns that are in place.

Ultimately, some of the challenges of using HCD methods in developing regions can be traced to two separate factors. First, traditional HCD methods make assumptions that do not always apply when designing for distant audiences—for example, direct access to end users. Second, the very kinds of ICTs that have been making the greatest impact in the developing world—mobile (i.e. ubiquitous) technologies—require different levels of engagement with users, specifically situating individual users within their social networks.

Our team of designers and researchers has worked in diverse settings in both the United States and in developing regions. In this paper, we focus on work conducted as part of the Central Asia + Information and Communication Technology (CAICT) project, which is a multi-year study of the use of ICTs in four countries in Central Asia: Uzbekistan, Tajikistan, Kyrgyzstan, and Kazakhstan. While our work is related to other information, communication and technology for development (ICTD) projects, our focus here is on the process of design research and how we adapted HCD research methods for ICTD work in Central Asia. We believe that many of our experiences and lessons learned generalize to other ICTD contexts.

As such, our goal in this paper is to share our experiences adapting HCD methodology to the Central Asia context, reflect on and analyze those adaptations, and ultimately provide a view on methodological challenges involved with developing ubiquitous technologies for developing regions. To that end, in this paper, we present the research process associated with the creation of a mobile social software product. Although we discuss elements of the application, this is not a product-focused paper. It was the process of application development that we feel most clearly illustrates some of the methodological

challenges associated with designing ICTs, and specifically ubiquitous technologies, for diverse populations.

2 Background

As the user base for technology has expanded to developing regions, there has been an increased volume of literature concerned with presenting and discussing ICTD projects, policies, initiatives, prototypes, and proposals. While the goals of ICTD efforts vary, designing technology for development is largely concerned with products/services that address difficulties people face in everyday life. Some notable trends in the ICTD literature concerned specifically with ubiquitous technologies include the following:

- Many efforts have focused on the mobile phone because of the rapid diffusion of mobile phones compared to computers and the Internet in developing countries. Additionally, many projects target either voice or SMS/text input to compensate for literacy deficiencies. An example includes Veeraraghavan et al. [5], which describes an extension of an earlier study in which the Microsoft-funded research group replaced PCs with an SMS/text-based mobile system to help farmers managing information in a sugarcane cooperative. Also see [6–9] for other mobile-based efforts for developing regions.
- Most projects describe a situation in which the designers, developers, and researchers are either from a western context, educated/employed at a western university, or are part of a team funded by a western source. A notable exception includes deSilva-Garza et al. [10], in which the research/design team created a low-budget information system for the automotive industry in their home country of Mexico.
- Most ICTD work is focused on the product and/or service that was designed rather than the process of design and how users were included. Notable exceptions include: (1) Donner et al. [1] in which the authors reflect on their extensive experience developing technology solutions in India as part of Microsoft research and (2) Anokwa et al. [4] in which the authors (nine North American graduate students) provide an account of lessons they learned while doing research for ICTs in developing contexts. Our work here adds to this discussion by detailing methods and experiences that led to the development of a ubiquitous mobile technology.¹

¹ The CAICT project also developed prototypes concerned with local transportation, see [11].

3 Our research

Our focus on Central Asia began with exploratory work by author Kolko in Uzbekistan in 2000. Central Asia was a region of interest because it was in early stages of general ICT adoption and diffusion. It is a multi-ethnic, multi-lingual area that has several characteristics common to emerging markets and developing regions. However, it is also somewhat unique from other developing regions because the population is very literate; literacy rates are estimated at over 98% [12]. Also, as part of the former Soviet Union, the region has extensive infrastructure already in place. Therefore, a steady rate of ICT diffusion seemed plausible and even likely. While over the course of the past decade, the spread of technology has certainly not been at the pace predicted, this in and of itself has become a fascinating point for investigation and has led to some of our design activities. Indeed, we have found that characteristics of the slow diffusion pattern have made Central Asia an especially productive research site and have allowed our research to identify a variety of local conditions that impact how ICT usage evolves.

The next sections focus on two types of research we have conducted in the region: (1) surveys and (2) ethnographic studies. Both types of research led to the design of a text-based mobile information directory that addressed an information gap in the region. But the data gathering and design process for this ubiquitous technology product also led to a necessary shift in the research process: an expansion and reconsideration of the unit of analysis.

3.1 Unit of analysis: addressing challenges for the design of ubiquitous ICTs in developing contexts

We want to frame the following conversation about research methods within a consideration of units of analysis. Reconsidering the unit of analysis was a lesson we learned from early research activities, and it was also a frame for later research activities that focused on mobile application development. The following sections demonstrate our shifting focus on the unit of analysis in response to the dual challenges of technology design for developing regions combined with social network embedded ubiquitous technologies.

First, we want to point out that traditional research methods in ubicomp come from a western perspective and therefore bring forth a culturally embedded value system that tends to focus on individuals, particularly in technology design, as the unit of analysis. A western framework is also evident in influential design methods that involve users; this includes methods from participatory design and user/human-centered design. We argue that as the field

broadens its focus to include design contexts in developing regions, it makes sense to reconsider the individual as the unit of analysis.

Since traditional research has typically focused on individuals' needs and experiences with technology, it has often overlooked the role of the social network. (There are notable exceptions, however, in which the important role of social networks, primarily strong ties, has been researched in developing countries, see for example [13]). While social networks play an important role in many communities, they are especially crucial in contexts, such as Central Asia, where social networks offset the lack of reliable and trusted information from traditional institutions found in many developed world contexts, such as the government, police, and court system [14]. In other words, when traditional institutions such as government or media are not seen as trustworthy or stable, individuals rely heavily on their social networks to compensate. Such social structure patterns dictate how people conduct all kinds of activities, and they also determine what technologies most easily find a home in new settings. Thus, ubiquitous computing efforts for developing regions are likely to emphasize technology solutions that leverage social networks since those networks dominate how information and other resources flow in the environments. But this also means such efforts need to be equipped to consider a different unit of analysis in order to leverage the pre-existing power of the social network.

Knowing these social structure patterns already exist, focusing our research efforts on social networks points to an opportunity to recast the research space in ubicomp and other HCI fields. While there is a legacy of research that focuses on the social network at the macro-level (for example, social network analysis, see [15]), there is less methodological attention that focuses on the social network as the unit of analysis in design research. In other words, we know social network analysis is a rich area for research studies when it comes to studying technology adoption patterns or evaluating deployed systems. However, there is less literature on how to incorporate the social network into exploratory field research and focused HCD design activities, and given the domains in which mobile applications operate, it seems essential to investigate ways that social networks can be used in research at the micro-level. Including groups of connected people in design activities can provide helpful and different insights into the design process. In our research, which we discuss in the following sections, we learned to include friend groups or family groups, a choice that, while necessary, created both challenges and opportunities that merit some discussion. In addition, the change in unit of analysis has accompanied other shifts in methods that specifically address challenges of doing research in developing world contexts.

4 Survey research

Throughout this study, we have conducted survey research that has gradually discarded as untenable more and more western assumptions about how to administer surveys.

4.1 2000–2003: survey data collection and challenges

The very first survey component of this project was an instrument developed by author Kolko in late 2000 for Internet cafes in Tashkent, Uzbekistan. Administered in December 2000, this survey measured usage patterns and attitudes toward the Internet and computers. Surveys were printed in Russian and Uzbek, and left at the Internet cafes, in which each owner/operator was asked to invite customers to fill out the survey. However, when the surveys were to be collected just before leaving the country, Kolko found that customers at only one of the Internet cafes had completed surveys. Alternate means of collection were then implemented: (1) a local colleague revisited the cafes and collected some completed surveys; and (2) some surveys were later completed and mailed. This was a lesson learned about the contextual nature of research and where and how one could reasonably make assumptions about self-administered survey response rates. As a result of this experience, later survey activities relied exclusively on face-to-face survey administration.

In 2002, the project was funded for a one-year investigation of Internet use in Uzbekistan. The 2002–2003 project included two field trips to the region to conduct survey and interview work. Surveys in both fall 2002 and spring 2003 were administered either in person by the researchers or via trusted networks. In spring 2003, a survey that added Internet usage questions was left with managers of NGO Internet access points in three larger Uzbekistan cities: Tashkent, Bukhara, and Samarkand. These were managers with whom the researchers had personal and/or professional relationships, and they participated in the research process by personally handing the surveys to users of their access points. These were Internet access sites that were restricted to certain kinds of users and that required sign-in by users; managers also knew their clientele personally since they were involved with other projects at the NGO. In other words, we had learned our lesson about self-administered surveys from the 2000 research, and we instead leveraged a personal network for data collection.

However, we encountered another challenge when administering the surveys in 2003, which provided a unique field learning experience. The US war on Iraq began at the same time as the administration of these surveys, which affected the tone of our research. In a general sense, the co-occurrence of the Iraq war complicated our movement through the countryside. It also changed how

potential respondents reacted to the research team. Either before, during, or after the informed consent process (during which we identified ourselves as researchers from a US university), we were almost uniformly interrupted by the question “do you agree with President Bush?” How we, the researchers, responded to this question became a kind of litmus test for respondents as they decided whether or not they would agree to participate in the research. While this exchange was not part of the formal research procedure, it did alter the power balance between researcher and subject. In a traditional research setting, informed consent is about establishing a sense of trust with participants. In this particular instance, participants interjected their own process for establishing trust with us.

4.2 2003–2008: survey data collection and challenges

Based on findings from our initial work in Uzbekistan, the project was funded for an additional 5 years and was expanded to include three additional Central Asian countries: Kyrgyzstan, Kazakhstan, and Tajikistan. We began this new phase of the research by piloting an extended version of the earlier Uzbekistan survey in Kyrgyzstan 2003–2004. At this point, we planned to conduct a longitudinal survey, questioning the same respondents about their attitudes and behaviors surrounding technology over a 4-year period.

Again, we discovered many of our western tactics for survey structure and deployment were challenged [16, 17]. For example, finding a random sample was a nontrivial problem. Most people in Central Asia do not have landlines, so that common random sampling method was not available. Our eventual sampling strategy involved four steps. First, we used government census population to determine the approximate percentage of residents dwelling in urban versus rural locations. Second, from this stratification, we randomly selected 70 initial sample points distributed in the urban/rural locations. Third, enumerators used a random walk method in which each was given with a route starting point (i.e., address, including street and house number) as well as the order of turns and house selection procedures (with every fifth household to be interviewed). Finally, a Kish grid method [18] was used to randomly select a household member (15 years or older) to be interviewed. Approximately 10–15 respondents were interviewed in each of the 70 locations.

We faced additional challenges because of the US war on Iraq. We could not use our own local researchers because working with Americans placed our researchers at risk. There was national legislation passed in one of our research sites that made providing “sensitive” information to foreigners a treasonous crime; what constituted “sensitive” was not defined. This made several of our local

researchers hesitant to conduct social science fieldwork. One of our local researchers was arrested and another got harassed when she travelled to the capital for our training workshop. Consequently, we contracted a local research firm, the BRiF research group located in Kazakhstan, to provide the in-country enumerators for the survey deployment. However, our initial plan of conducting the survey longitudinally had to be abandoned when it became apparent that even repeated visits from an American-associated research team 3 years in a row would put respondents at risk for harassment or perhaps worse.

In the end, the survey was successfully deployed by the BRiF research group over a 3-year period, 2006–2008, with a 1,000 respondents in each country, each year (for a total $N = 12,000$). The only major change in the survey questions was the addition of a mobile phone module in 2007 to address the rapid diffusion of mobile technologies.

Through the process of these survey activities, we modified our research strategy to adapt to developing world contexts (e.g. sampling methods) as well as specific geopolitical concerns. Our adaptations of methods were time-consuming and required perpetual re-shifting, but we did eventually generate useful findings. Indeed, two major findings from the survey supported the idea for the design of a mobile information directory:²

- First, we found that respondents who used the most technology, i.e. computer + mobile phone, used their face-to-face social networks (family, friends, and neighbors) more to gather most types of information when compared to those who: (1) only used a mobile phone or (2) did not use any ICT technologies [19]. This finding not only ran counter to research that argues that technology is largely an individualizing force [20], it also highlighted the persistence of the importance of face-to-face social networks for goods and services. In other words, we saw that technology acted as an enabler of existing social network structures; an existing structure that required a rethinking about the individual as a unit of analysis when considering technology design for the region.
- Second, we witnessed a sharp increase in mobile phone use, especially when compared to other technologies over the 3-year period that we conducted the survey, see Fig. 1, for technology growth comparisons in Kyrgyzstan.

This finding suggested that technologies aimed for rapid diffusion would leverage the mobile phone. These findings, developed from the survey work, were analyzed

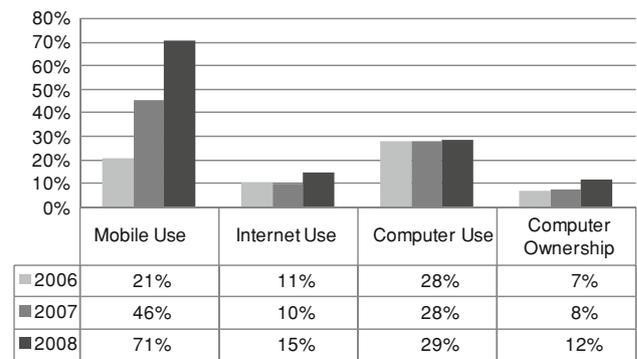


Fig. 1 Technology use by year in Kyrgyzstan

in conjunction with ongoing ethnographic work also conducted as part of the project.

5 Ethnographic research

At various points in the project, our teams have conducted research that employed an ethnographic approach. In the following section, we discuss these research efforts in two sections: (1) multi-site field methods and (2) design ethnography.

5.1 Multi-site, short-term ethnographic field methods data collection and challenges

The bulk of the first ethnography took place in Tashkent, Uzbekistan, but also included short visits to Almaty, Kazakhstan, Ashgabat, Turkmenistan, and smaller cities in Uzbekistan including Samarkand, Bukhara, and Ferghana. Five months were spent in Tashkent, observing the growth of the technology industry and user base. Through teaching at two local universities, interacting with local technology business owners, and multiple visits to all Internet access points, Kolko established a benchmark of emerging Internet access.

By December 2000, there were 12 public Internet access points in Tashkent, a city of three million. These included access points at NGOs and multi-lateral organizations such as UNDP. Through multiple visits to these access points, Kolko conducted observations about the physical space associated with Internet access, activities of users, and business practices. Through conversations with owners, it became clear that most customers in the access points were using offline resources such as word processing or playing games. A significant amount of the usage was also by groups—whether two or three people clustered around a computer, or individuals playing games with one another through a local area network. Public engagement with the community resource of the cybercafé was often a

² The specifics of the design concept itself originated with the ethnographic research which we detail below.

community and collective activity. A much smaller percentage came to use the Internet as solo paying customers, but the availability of other activities and group usage allowed the businesses to generate revenue even from those users without inclination or financial resources to use the Internet on their own. At the time, there was very little local language content online—although there was a substantial amount of Russian language content (Russian is widely spoken in urban areas). Further, adding Internet access to general computer use roughly doubled the hourly cost of use; as such, the Internet was not very useful or usable.

Attempts to continue ethnographic work on Internet cafes was challenging for a number of reasons characteristic to the region. Business licenses were difficult to come by for prospective owners, so many sites operated under the radar. In the early 2000s, many of the businesses were rumored to be run by local mafia, and the operators of those cybercafés were especially tight-lipped, making research difficult. Questions such as “Which ISP do you use?” were often answered with “That’s confidential.”

Further, because of the local business climate, and issues with the local ‘tax police,’ there were no published listings of Internet sites, and many operated without signage. This made finding sites to observe (and survey) difficult. Our method for finding cafes in various cities involved walking the city (often in teams) using a city map divided into grids, asking cybercafé owners to suggest other sites, and canvassing our local contacts who lived in residential areas outside the city center. We also asked people who worked at ISPs and who sold computers to suggest any businesses with which they were familiar. We continued to collect data about how people gathered and shared information, what technologies they used, and how they navigated their world. All of these observations fed into the scoping for a mobile information directory.

Many of the challenges in collecting this data were common to ethnographic approaches generally, such as the importance of local lore in navigating the landscape. Some of the approaches reflected specifics of the local political condition; employing ethnographic method in these settings required adaptations to sensitivities to protect respondents. While this early ethnographic work had allowed us to observe technology usage patterns in public and in homes, among youth and working adults, through computers and mobiles, we realized that a traditional ethnographic approach was not giving us the depth of knowledge we needed to pursue the design work for the mobile-based information directory. And while it was clear from the cybercafé observations that group usage of technology was common, we needed to fundamentally shift what we considered a research site and a research subject (aka, unit of analysis). This realization changed who we

talked to in our later ethnography, how we asked our questions, and the questions that we asked.

5.2 Design ethnography data collection, themes, and challenges

In summer 2006, our research team conducted design ethnography³ [21, 22] in Kyrgyzstan. Design ethnography differs from traditional ethnography in several ways. First, it primarily focuses on identifying design opportunities rather than creating theory. In addition, design ethnography tends to be a limited or more bounded experience in terms of time. Unlike traditional ethnography, where a research may spend time in the field for years, design ethnography is conducted in shorter bursts of time and contextualized with other methods, both qualitative and quantitative. In our case, we spent 2 weeks in the field. The decision to do a shorter-term engagement was driven by the methodology of the design ethnography itself and also time constraints of the research team. We felt this time frame was appropriate because of other ongoing research in the field, both in terms of the previous ethnographic work and also our ongoing quantitative research in the region. Additionally, as in other research efforts, we continued to involve local research partners in the data collection.

The purpose of the design ethnography was to contextualize some of our previous survey findings and look further into design opportunities. Specifically, our research goals were to gain a better understanding of (a) why mobile usage rates are so high and (b) the kinds of uses people are finding for mobiles. In addition, because the goal of this study was to ultimately develop solutions that accommodate local usage patterns and meet local needs, the design ethnography focused on social networks and difficulties participants faced in everyday life in order to identify possible domains for which a technological solution could be beneficial.

The team was comprised of four US researchers and three Kyrgyz researchers. The work was conducted by a mixed nationality team with pairs of US and Kyrgyz researchers working together. Previous work by this project and others in developing regions, for example see [4, 23], has demonstrated the value of local researchers as cultural as well as linguistic translators, and so even when the US research team member spoke the local languages, it was important for study informant trust and openness to have local researchers as part of the team.

To leverage the larger social unit of analysis that we had identified as critical in previous work, the study protocol included focus groups with groups of three people, previously connected either via kinship bonds (the Family

³ Also known as ‘rapid ethnography’.

interviewees) or friendship (the Youth interviewees). Individual interviews were also conducted with each group member. In addition to the interviews, each study informant filled out a grid describing patterns of help they received or gave within their social network. Finally, all study informants were asked to draw a representation of their social networks which included frequency and location of interaction as well as any technology used to facilitate those interactions. A total of four groups were interviewed: Family and Youth in the capital city of Bishkek, Kyrgyzstan, and Family and Youth in a small town in the northern part of the country.

We attribute the design ethnography as the primary inspiration for a prototype mobile directory, which we later tested for usability (see [24]), although the problem space was identified by the previous qualitative and quantitative findings. In summation, three key factors inspired the shape of the service: (a) no standard phone directories are available in the country; (b) Kyrgyz highly value close social networks for information, assistance, and goods; and (c) there is a strong upward trend in mobile phone use and ownership in Kyrgyzstan, whereas the growth of computer and Internet use is relatively flat [24, 25]. For this paper, we turn to some reflections on the top level finding and lessons learned while conducting the design ethnography.

5.2.1 Design ethnography themes

The results of the design ethnography highlighted a variety of themes. First, Central Asian individuals have sophisticated patterns of information exchange within their social networks that allow them to navigate a world where traditional institutions and external informational resources are not primary social support structures. This theme underscored differences between designing ICTs for users Central Asia from users in developing regions: Second, in terms of design, we found that there was a lack of creative ubiquitous mobile applications that move beyond traditional applications and delivery mechanisms that are prevalent in developing world contexts. Third, our design ethnography work emphasized the value of in situ research to expose design challenges and opportunities that are economically, culturally, and technologically appropriate for end users in developing contexts. The latter two themes underscore the importance of not simply importing solutions to underdeveloped countries that may work in the developing contexts.

5.2.2 Design ethnography challenges

There were also several challenges that we encountered that we argue will generalize to other researchers conducting design ethnography in developing regions. Based

on interviews with the three lead researchers on the project, we organized their responses about the challenges into four categories (1) terms of engagement; (2) language barriers; (3) participant observation; and (4) recruiting.

5.3 Terms of engagement

Based on our previous knowledge of the culture and experience in the region, we knew that the notion of hospitality and reciprocity is highly important in social interactions in Kyrgyzstan. To account for this, we built in time for social exchanges before, during, and after the research.

We acted as the host for two participant groups in our rented apartment and were in turn hosted in two of the family homes of our group participants. The standard procedure was to gather everyone together around a table with tea and snacks. We would explain who we were and why we were here. We gave a brief overview of the project and explained how the interviews would proceed. The atmosphere could be described as friendly, yet formal. The socializing time occurred at the beginning, middle, and end of the interview sessions, accounting for perhaps 25% of the research time. That process was slower than what we were familiar with in an office setting in the US or the West, where typically a respondent arrives, is offered a drink, and the research immediately starts. Our western focus was evident in this regard as well: while we really organized and planned the interview sessions to include socialization time, we found that in the interviews when we were visiting people in their homes, there was even more time spent socializing. We were treated as guests and our hosts provided a large array of different food and snacks. In addition to the food, the host family introduced us to their extended family and we posed for group photos with them. Again, contrasting this experience to our experience of doing research in the United States, we were treated more like honored guests than researchers. The dynamics of these rules of engagement required a different mode of conduct, but since our research study was focused on groups and our interviewing was conducted in a group setting, it was crucial for the group research team to establish a rapport as a unit.

5.4 Language barriers

As mentioned earlier, our team was comprised of US researchers and Kyrgyz researchers. One member of the US team and all the members of the Kyrgyz team were fluent in Russian and English. We paired a US researcher with a Kyrgyz researcher to interview one participant during the individual interview sessions. For the group sessions, we arranged the design team differently. The whole team was in one room, and each Kyrgyz researcher

interpreted for the person they were assigned to, but the interpreters also offered their understandings for some of the back and forth conversation. Obviously, it is challenging to conduct research via interpretation and a group interview complicates that further. We also prioritized the ability to be a cultural translator and nurture trust over the ability to be a professional linguistic interpreter. While methodologically this allowed us to conduct more in-depth research, it also posed challenges to getting complete interpretations. Interpreting in a group, and being prepared to translate dynamics among a group as well as specific responses, is not part of formal simultaneous interpretation for individuals. As such, we needed to emphasize that our research was as much about the group as it was individual responses.

5.5 Participant observation

While we were in the country for a relatively short time, we had a variety of opportunities for participant observation. Our local researchers played a key role in this activity. Within the first day of arriving in Kyrgyzstan, the local interpreters insisted we go to the mountains for a picnic before starting work. While initiating such a ‘playful’ interlude was not especially consistent with our traditional research approach, this experience underscored the notion of hospitality, the importance of food and meal preparation, gift exchange, and establishing rapport before embarking on business. Later, one of the local interpreters invited us to his home for tea. While this visit underscored the importance of hospitality, it also provided insight into another neighborhood, family, and familial roles.

5.6 Recruitment

Recruiting participants for our studies was difficult. We relied on local researchers to find participants; as such, participant recruitment was based on a snowball type sampling.⁴ Additionally, since we were looking for a group unit of analysis, i.e. people who were connected via a social network, we had to find a family group or group of friends that were all available at the same time. The combination of group sampling and logistics was a significant barrier.

6 Conclusions

The primary point we want to extract from this discussion is the importance of adapting research methods for developing world design research, and, specifically, shifting the unit of

analysis from individual to group. While using HCD/UCD methods in developing regions requires adaptation, changing research focus from individuals to groups is similarly challenging. Juggling terms of engagement, translation, recruitment, and trickiness of participant observation when everything is focused on groups adds a layer of complexity [25]. While changing the unit of analysis from the individual to a larger social network has been the most pervasive lesson that has influenced our work, we found that changing the unit of analysis often made other research activities more challenging, including:

- The social nature of important outside events in which people share common opinions within their social networks (re Iraq war) can modify research methods in unpredictable ways.
- The terms of engagement are framed by social and cultural norms; norms that in our case went beyond an intellectual acknowledgement but also informed the very nature of how we viewed the social network as a unit of analysis.
- Unexpected modes of observation became sources of information about the social networks of not only our informants but also of our research assistants.
- Methods used in western contexts for sampling do not apply, and that face-to-face social networks can be essential for recruiting and conducting survey research.

Our argument that a shift toward a focus on groups rather than individuals as research subjects is essential to ubiquitous computing research in the developing world is based on assumptions about usage patterns and technology development trajectories (i.e., the centrality of mobiles). And while many of the lessons extracted from the research process discussed generalize to similar situations, we also recognize that every distant audience and specific setting introduces unique challenges. We are in agreement with the conjecture made by Anokwa et al. [4] that ICTD researchers need to report on challenges and tell their stories in order to expand the HCD toolkit into the next phases of technology growth. This article represents our stories in hopes of adding to the young field of ubiquitous computing in developing contexts.

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⁴ Snowball sampling is a participant recruiting technique in which existing participants, (or in this case research assistants), recruit new participants among their acquaintances.

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