Getting from research to practice in M4D

Andy DEARDEN[1], Ann LIGHT[1], Benjamin KANAGWA[2], Idris RAI[2]
[1]*C3RI, Sheffield Hallam University, Sheffield, S1 2NU, UK,*
Tel: +44 114 225 6878, Email: {a.m.dearden, a.light}@shu.ac.uk

[2]*Faculty of Computing & Information Technology, Makerere University, Kampala, Uganda*
Tel: +256 753 866 810. Email: {bkanagwa, rai}@cit.mak.ac.ug

Abstract: In this paper we argue that, if technical M4D research is going to contribute positively to development, the activities of specialized, highly paid 'researchers' must be combined with skilled contributions from many other actors. In particular, there is a critical need to develop the capacity available in development organizations, community based organizations, and in local economies, to innovate and to adapt technologies to support their objectives. This suggests that the methods that we adopt in research and in design should be open to local appropriation and contribute to capacity building, and that education programmes are needed in developing countries to support the broader processes of innovation.

We describe the Mobile Innovation & Enterprise partnership, which is working to develop the innovation capacity available in Uganda.

1. Introduction

When positing the possibility of one or more interdisciplinary research fields, with titles such as ICTD, ICT4D, HCI4D, M4D or 'Technical ICTD', we must ask fundamental questions about the nature of knowledges, the nature of research, and the meanings of 'development' that are being applied.

While it is legitimate to argue that an interdisciplinary field should encourage dialogue between different perspectives, this should not be used as an excuse for lazy epistemological relativism where anything is acceptable. In seeking to define "effective" or "reliable" methods for designing technology and for generating new knowledge in M4D we are forced to ask:

- How do we understand 'knowledge'? In particular, how do we understand knowledge related to ICT systems, and knowledge related to 'development'?
- How do we understand the process by which knowledge is shared, and how does knowledge generated by an activity labelled as technical research relate to the practice of applying mobiles in development activities?
- What do we believe about the methods by which new knowledge can best be generated or obtained?; and
- How do we see the relationship between activities within M4D research and designing activities within M4D practice?

Our understanding of these questions will have a significant effect on arguments about how different individual and organizational actors (e.g. researchers, practitioners, NGOs, government agencies, universities, funding agencies, commercial organizations and local communities) engage and collaborate in research and in designing mobile applications and services. The suggested relationships then have consequences for the design and research methods that we might recommend for technical research on M4D.

In this paper, we explore some of these questions and argue for an approach to technical M4D research and practice that demands capacity building at multiple levels.

3. What kind of development?

There is a vigorous debate around the meaning of 'development'. The Millenium Development Goals raise dimensions of financial income, health, education, environmental sustainability and gender equity. The capabilities perspective (Sen, 1999), which treats development as freedom, including political voice is an increasingly influential framing. Such definitions of development are incompatible with strategies that create permanent situations of dependency, and limit the power of local self-determination. If the form and function of ICT is entirely controlled by remote organizations without local accountability or engagement, this will unavoidably set limits on the capabilities (in the sense of Sen, 1999). If we aim to design technical mobile research that is for development, the approaches that we adopt must be sensitized to how they empower people locally to progress their own visions of development. Process and outcome must be open (Light and Anderson 2009). Hence ICT programmes *for* development must adopt strategies to build local capacity so that communities at local, regional, national and international levels can enact their own choices, and leverage both indigenous knowledge and knowledge acquired from external sources.

4. Research for development

The goal of research is the generation of new knowledge. Research in M4D produces knowledge in a number of different forms. Four common types of research output are:

1. Research may generate a new understanding of how people are using existing mobile technologies; e.g. Wakunuma (2007) discusses the social impact of mobile phones on the empowerment of Zambian women, or Jensen's (2007) report on the use of mobiles by fishermen in Kerala;
2. Research may create toolkits to enable innovative ways of constructing mobile systems, e.g. the SensMobile framework (Gross & Paul-Stueve, 2010), or the EpiCollect system (Aanensen et al., 2009);
3. Research may devise innovative methods for designing mobile systems; e.g. Dearden & Rizvi (2009); and
4. Finally, research may lead to the creation of an innovative artifact or system, that demonstrates a new way of interacting using mobiles, e.g. Maunder et al (2008) describe the BigBoard system;

Each of these types of research will have different relationships with the goal of conducting research *for* development. We therefore need to carefully examine the means by which the knowledge generated can be applied to promote development.

In the case of research examining use of mobiles, outputs could support policy debates and inform the decisions of individuals, community based groups and organizations (in the statutory, private or third sector). In the case of novel software architectures for building mobile systems, the expected pathway from research to social development is clear. The assumption is that the architecture is to be used as a framework from which groups engaged in social development (and software designers working with them) can create systems to support their objectives. A similar pathway can be imagined for innovative design methods, which can be applied to assist groups working in social development. Though the transfer and adaptation of methods between different cultural settings is a complex issue requiring further research. But, a common feature of all these first three routes from ICT research to development is that successful translation from research into positive development outcomes is dependent on the active contribution of actors who are not (primarily) ICT researchers.

In the case of developing novel mobile interactive systems the question of how these novel technologies will impact on development is more complex. Unless we adopt a naïve technological determinism, we must critically examine how each of these innovations might

actually support development. One possible answer is that the innovation may be adopted by groups or organizations that are working in the field of development, and these technologies can then help them to enact their development mission. This is a model in which technology supports the making of social change, rather than one in which it is designed to directly facilitate it (see Dearden and Light, 2008, for more on this distinction). If this pathway is envisaged, then lessons from previous generations of technology in development (Douthwaite, 2002), as well as results of widely cited research in HCI (Berg, 1997; Bowker & Star, 1999) point to both the pragmatic difficulty of devising solutions that are appropriate to context without allowing for extensive local adaptation in each setting; and to the political significance of local adaptation as an expression of freedom (& hence development). Thus, this form of technical ICT research, also needs non-researcher actors in order to be translated so as to qualify as research 'for development'.

Thus a key element of any strategy for research in Technical ICT that aims to be explicitly *for* Development, is the capability of those involved in development to utilize the outputs of the research. This capability has to go beyond being able to maintain systems that are designed and built elsewhere. The key to successful translation of mobile technology research into development outcomes will be largely through processes of innovation driven by development actors, activists and technologists based in developing regions. It will be work on the ground that makes the difference, whether or not this includes formal academic researchers and exogenous teams. A corollary is that, for M4D research to be effective, there will be a pressing need for a cadre of people with skills in innovation with mobile technology, and for sustainable organizations to support local technology innovation efforts.

Innovation and enterprise

Based on this understanding of technical ICTD research *for* development, Sheffield Hallam University, in the UK and Makerere University in Uganda are working together to build up sustainable capacity to underpin future innovation with mobiles in Uganda. We take the view that sustainable capacity for M4D research *for* development will (at least) require:
- Students and graduates with the skills that will enable them not only to work as developers within the mobile industry, but also skills in innovation and design;
- Staff within the faculty of CIT who are able to develop and nurture these skills in future cohorts of students;
- Strong links between CIT, the mobile sector, and development actors in Uganda;
- Ongoing research, development and M4D activities to maintain these networks.

With funding from the British Council Education Partnerships with Africa programme, the Mobile Innovation & Enterprise project is an 18 month collaboration to develop:
1. A group of graduates skilled in creating innovative applications using mobile technology;
2. Increased capability at Makerere in teaching innovation, user-centred design, business and entrepreneurships skills relevant to the IT industry;
3. A business plan for a sustainable mobile phone innovation centre at Makerere.

To achieve these aims, the project involved a group of 3rd year undergraduates doing their final year projects developing mobile technologies, and applying interaction design methods. Each team (between 3 and 5 students per team) designed and developed an application for one particular domain, building links to relevant partners (e.g. local hospitals, businesses, and agricultural organizations). To prepare, the students participated in three workshops.

The first workshop, focused on methods for understanding users and contexts. The second explored divergent thinking and ideation; and ways of reviewing design concepts from usability, practicality and commercial perspectives. One aspect that seemed new and challenging for the students was developing skills of contextual enquiry. However, the students rapidly adjusted to this novel role, and we were impressed by their confidence in approaching external stakeholders to collect information. The third workshop focused on

technical skills and the pragmatics of building software on mobile devices. Here the students were more comfortable, adapting existing skills to a slightly different technical environment.

At the end of their projects, the students presented their work at a series of 'showcase' events to demonstrate the capability available at the university to a wider group of stakeholders including members of the Mobile Monday Kampala chapter (MoMoKla), and commercial stakeholders from the Ugandan mobile sector.

The students' projects included: an mobile application for collecting water and electricity meter readings and reporting to utility providers; an automated system to send out reminders to pregnant women reminding them of clinic appointments and encouraging them in good pre & post-natal care; an SMS query routing system to enable a community of farmers to share knowledge with each other; an SMS based sports betting application; and a mobile based 'recommendation community' for restaurants and hotels in Uganda.

In parallel, CIT have been developing other partnerships, with government, NGOs, private companies, and major donors interested in mobiles. We are working with the new National Software Incubation Centre at Makerere to create a sustainable business model to support students in turning their innovative ideas from sketches and prototypes into businesses.

ACKNOWLEDGMENTS

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