Chapter 10

Human–Centered Design for Development

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ABSTRACT

This paper describes the challenges faced in ICTD by reviewing the lessons learned from a project geared at improving the livelihood of marginal farmers in India through wireless sensor networks. Insufficient user participation, lack of attention to user needs, and a primary focus on technology in the design process led to unconvinced target users who were not interested in the new technology. The authors discuss benefits that ICTD can reap from incorporating human-centered design (HCD) principles such as holistic user involvement and prototypes to get buy-in from target users and foster support from other stakeholders and NGOs. The study's findings suggest that HCD artifacts can act as boundary objects for the different internal and external actors in development projects.

INTRODUCTION

Rain-fed farming provides the bulk of the world’s food supply and has tremendous potential to increase its productivity to meet the 2015 hunger reduction target of the Millennium Development Goal (MDG) (Trisorio-Liuzzi & Hamdy, 2008). Changes and innovations are needed in land, water and crop management but the efforts required achieving this need to focus on increasing human and institutional capacity, build knowledge and improve management and infrastructure (Trisorio-Liuzzi & Hamdy, 2008). These changes should also improve the livelihoods of rainfed farmers’ who have not participated in the economic booms of the last two decades. How will farmers adopt innovations and which role can ICT play in this?
With the mobile phone as ready-at-hand platform a number of commercial agricultural information services have been recently launched but it is unclear whether these services will be adopted and whether they will foster further adoption of innovations in land, water and crop management. Decision support systems (DSS) that can help farmers make decisions on the poorly understood complex interactions of soil moisture, seeds, fertilizers and pesticides. Crop-soil simulation model based DSS have not seen much uptake by farmers in developed countries (Stephens & Middleton, 2002) let alone developed countries (Matthews & Stephens, 2002). They seem a poor fit for the problems that farmers need to solve (Stone & Hochman, 2004). However, most reports point to the absence of user involvement in the different stages of designing these services, which calls for research and development guided by human-centered design. Wireless sensor networks (WSN) that could help reduce the effort required to gather environmental data from the field to feed DSS are slowly maturing but have so far not proven their usefulness in this context. This makes the adoption of DSS in agriculture by resource-poor farmers in developing countries a challenge on various levels.

ICTD efforts that are part of a development projects have many goals. Funding organizations demand measurable results such as sustainability, i.e. continued benefits to the target population after the projects end, to better justify allocation of funds. The scope is typically much larger than in HCI studies or in HCD. Uptake and continued use is usually outside the scope of these research areas and left to industrial players. The same goes for standard desirable development outcomes such as local empowerment and capacity building along with policy implementation. Involving target users in participatory workshops or design activities represents another challenge as scientists do not have the trust of the rural population and trusted intermediaries such as NGOs can be skeptical whether engaging in joint activities with the researchers is worthwhile. We will present the lessons learned from the case study of an ICTD project, which aimed at improving the livelihood of resource-poor farmers but failed to interest them. The follow-up project relies on an HCD approach and focuses on getting buy-in from target users through iterative prototyping of applications. This will enable the farmers to envision using novel agricultural services on affordable mobile phones and in longitudinal studies they will be able to experience the value of these services themselves.

In the following section we provide background on innovation diffusion with a focus on agricultural contexts, the modes of farmer involvement in research, a wave of novel agricultural information services and the up-to-now disappointing adoption of DSS in agricultural contexts. Section 3 reviews the approach taken in an ICTD project developing a WSN-based DSS and describes the problems encountered. We then discuss the value of user evaluation of early prototypes and the use of mock-ups, storyboards, human subject consent forms and other HCD artifacts as boundary objects that provide can convince stakeholders, NGOs and other actors and present some wider ranging conclusions for ICT4D. The outlook section presents our revised approach to the second phase of the project.

**BACKGROUND**

Rain-fed farming produced the bulk of the world’s food and generated 62% of the world’s staple food (FAO, 2005). In 2009 agriculture employed over 240 million people in India—52% of the workforce (CIA, 2009)—many on small landholdings. In the province of Karnataka the size of the farms of 87% of farming families was less than four hectares (Barker & Molle, 2004). The share of these small farms accounts for 50% of the total cultivated area, that of marginal farmers (less than one hectare) 39%. Marginal farmers in India have profited comparatively little from the economic boom and
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