

Fluid design and community development

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ABSTRACT

The Village eScience for Life (VeSeL) project is working with communities in rural Kenya to develop appropriate technologies for improved agricultural practice. In this paper we outline our socio-technical approach to design, based on the concept of “fluidity”. We detail the ways in which fluid design principles guide the development of a water management scenario with the community.

Categories and Subject Descriptors

H.5.2 [User Interfaces]: Evaluation/methodology, Graphical User Interfaces, Input devices and strategies, Interaction styles, Prototyping, Screen design, Standardization, Style guides, Theory and methods, User-centered design

General Terms

Design, Human Factors.

Keywords

Development, developing world, Africa, Asia, participatory design, Human Computer Interaction, Fluidity.

1. INTRODUCTION

Research on VeSeL began by asking how we can design and develop appropriate and sustainable technologies for developing communities. This is a complex undertaking, requiring a mutual understanding between communities and researchers of each other’s context. Moreover, it is critical that appropriate technologies, based on sound design principles, emerge from this dialogue.

Within the wide HCI community there is a general recognition of the need to move from “traditional” HCI methodologies, which primarily focused on improving usability, to a newer model that emphasizes the centrality of the social [2]. The subfield of HCI for development (HCI4D) can be viewed as an instance of this shift. A starting point for many HCI4D projects is human- or user-centred design (H/UCD). Broadly, this approach approaches design based on the needs of the user. However, Kolko and Rose [3] have pointed out that UCD as a methodological approach has primarily focused on Western ideals of what is useful. They state (and we agree) that this

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entails that the traditional view of UCD needs to be broadened in order for it to be “culturally appropriate” in a variety of contexts. Marsden [4] points out there are severe difficulties for doing participatory design in developing countries. Furthermore Medhi [6] argues for design principles that account for the subtle but critical socio-cultural issues faced by users in this context. We promote the concept of *fluidity* to anchor the design process when working with developing communities. This process begins by gaining an appreciation of the subtleties of the social contexts in which we work.

2. THE CONCEPT OF FLUIDITY

The concept of fluidity is important in the process of designing “appropriate and sustainable technology”. At the first level, an object is a *fluid object* when it is adaptable, flexible and responsive to the context in which it is placed. Second, a fluid object is not rigorously bounded – it helps shape the socio-technical landscape through its functionality and through the activities associated with it. Perhaps most importantly, fluidity forces the designer to think through what the functionalities of the technology really are; often they extend and are deeper than first conceived. The Zimbabwe Bush Pump [1] is a good example. Its mechanical parts define the boundaries of the pump. However, these can be replaced with whatever is at hand and the pump will still work. The pump then is not a solid, rigid object but one that is fluid, malleable by its surroundings.

3. FLUIDITY AND THE COMMUNITY

The concept of fluidity provides a way to begin to think about how HCI ‘works’ in the developing world. The following principles of fluidity may prove useful not only throughout the design cycle but also when technology is deployed:

1. *Clear and Present Need:* the design process and technology to be designed should have clear value to the community, e.g. by addressing current needs.

2. *The potential for “ingenious” adaptation:* Both the design process and the technology designed should be locally adaptable. In the case of the bush pump, locally available parts can replace some of the original bolts.

3. *The place of the community:* Providing a role for the community (often a village) in the design, on-going use and maintenance of the technology is vital to its sustainability. True success comes when what is developed can *constitute its own community*. If this community-building aspect fails, then the technology fails.

4. *No unnecessary complications:* For a fluid technology to be successful it must be simple: “the designer knows when he has reached perfection, not when there is no longer anything to add, but when there is no longer anything to take away” [1].

5. *Ownership and access:* The community must feel that they own the technology and that it is freely accessible to them and adaptable by them (for example no content copyright issues).

6. *Distributed action*: Implementation of technology requires that methods and insights of the local community are paramount.

4. WATER MANAGEMENT SCENARIO

Here we explore aspects of fluidity with reference to a scenario for the participatory design of appropriate and sustainable technology with a rural community in a semi-arid area of rural Kenya.

VeSeL is currently working in Kambu, a small village in the south of Kenya, halfway between Nairobi and Mombassa. The area is one of the poorest parts of Kenya, and suffers from continuous drought. Literacy levels are about 50 percent. A system of national extension officers has supported the farmers, but this facility has been withdrawn recently. However there is a well-organised and self-motivated community-based organization, the Mtito Andei Initiative (MDI) dedicated to improving local living conditions. Working through MDI with the local community, we identified three main needs:

- Water Education. Continuous drought for the last four years has led to crop failures and hunger. Some wells have been dug and there is spring water 30 kilometres away. However, available water is not always used efficiently for agricultural practice.
- Increased awareness of appropriate agricultural practice and technology such as drip irrigation and drought resistant crops, is needed.
- There is also a need to publicize community needs and projects and access local, national and global expertise, partners and support.



Figure 1. A family plot in Kambu where VeSeL is working

Based on these needs, in consultation with the community, we intend to implement a technology-enhanced demonstration *shamba* or agricultural plot, on land near a water pump built by an aid project. This will be used to demonstrate appropriate agricultural practice and water management and grow watermelons and *Jatropha* (which can be used for bio-fuel); these are two crops the community has expressed a keen interest in. This focuses our work on clear and present community needs (principle 1). The local school together with farmer self-help groups will own, set-up and maintain this plot (principles 3 & 5). School children and teachers will use ICT in the school plot to learn new practices, to record crop growth, to sense environmental variables and to report on and disseminate locally and globally their experience. Returning to their homes in a community that is dispersed over a wide area they will spread knowledge of effective practices (principle 2) provide a

community focus and also engage the community beyond the school (principle 6).

In order to facilitate adoption and adaptation (principle 5) beyond the school, we are designing ICT support for the *shamba* as a “mobile resource kit” (MRK) which can be carried on a bicycle. This consists of small low-powered devices both for disseminating and collecting information: mobile phone with GPRS Internet connection; a simple, easily deployed sensor network for monitoring soil, water and environmental conditions; laptop or palmtop computer; and charging equipment. The MRK is flexible and adaptable, and will support the community in running socio-technical experiments to explore the ways in which they can use technology (principles 2 & 3). Through supported reflection on these experiments the community will adapt, refine and simplify both technology and socio-technical experimental methods (principle 4).

The MRK is designed to support *two-way* information flow between remote and local communities, building on existing successes such as the community radio station. For example, local community members may collect content in the form of interviews, stories and photos and contribute it to an online “Knowledge Management System” (KMS). They may receive information and responses to the content they contribute from local and remote sources over the radio, on devices (e.g. MP3 players) borrowed from the resource kit or as SMS messages to a mobile phone.

By linking new technology to resources the community already owns and existing communications channels, we hope to give a sense of collective ownership and access. The community already has a stake in the radio station (it is the only community-owned station in the country), and linking it to the VeSeL KMS could give it a more active role in information flow to and from the outside world. Furthermore, by linking an open-source KMS with a local MRK, and focusing activity in an area of local concern through the demonstration *shamba* we aim to support distributed action and sociotechnical experimentation while preserving community access and control.

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