

Voices in the field: A mobile phone based application to improve marginal farmers livelihoods

Hendrik Knoche

EPFL

Station 14 IC

1015 Lausanne, Switzerland

+41 21 693 1315

hendrik.knoche@epfl.ch

PR Sheshagiri Rao

IRI

Earth Institute, Columbia University

Lamont Campus, New York, USA

+ 91 9448379025

girickp@gmail.com

Jeffrey Huang

EPFL

Station 14 IC

1015 Lausanne, Switzerland

+41 21 693 1315

jeffrey.huang@epfl.ch

ABSTRACT

Speech is one of the promising candidates to convey information to illiterate users through non-text user interfaces. This paper describes the challenges that marginal farmers in India face in terms of ICT accessibility on mobile phones in an ICT4D project. The central question is how to submit and convey information through low end mobile phones in ways that illiterate or semi-literate farmers will find trustworthy and help them adapt their farming practices.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User-centered design

General Terms

Speech interfaces, ICT-D, mobile phones, agriculture

Keywords

ICTD, ICT4D, Human-centered design, speech UI

1. INTRODUCTION

In many developing countries marginal farmers constitute a majority of the population. They have profited comparatively little from the economic boom and poverty reduction of the last two decades [3]. ICT has been touted as possible solution to reduce the inaccessibility of pertinent information for these target groups. Mobile phone constitute the most promising ICT platform to convey the required information. Speech-driven interfaces represent a promising key to provide millions of illiterate users universal access to information resources. The information sources need to be perceived as credible and persuade rain-fed farmers to adopt new methods. The work on innovation diffusion showed that uptake of innovation was particularly high when the innovations were introduced through established channels – extension workers, which the farmers knew and trusted [1]. This raises the bar considerably because it is not merely a question of how to digitally reproduce speech from text but that both its recreation and the user interface results in the most trustworthy and persuasive outcome. For example when speech is presented in

combination with other media such as pictures, animations, video and text as well as human operators or facilitators.

2. BACKGROUND

In 2004 the share of agriculture in employment in India was still at 67% [2]. In the province of Karnataka the size of the farms of 87% of farming families was less than four hectares. The share of these small farms accounts for 50% of the total cultivated area, that of marginal farmers (less than one hectare) 39%.

Our project aims to improve marginal farmers livelihood through ICT. The partners in the project included one technical partner in India (IISc Bangalore), one partner in Switzerland (EPFL) focusing mobile HCI and a local NGO in Chennakeshavapura – a small village in the Karnataka province – acts as a basis in the village for field trips and provides access to the local community. Marginal farmers in these regions mostly rely on rain for their crop. Draughts are common and rain-fed farmers are faced with large uncertainty about their yield at harvest time due to the influence of the amount and distribution of rain fall, pest and diseases of the crop and the availability of fertilizers and pesticides. User needs research with the target community showed that the marginal farmers lack both substantive and procedural knowledge on best farming practices [5]. The mobile phone provides the only feasible information platform under unreliable availability of electricity. The cell towers are independent of the energy grid and ordinary mobile phone use is possible with the available windows of opportunity for recharging the battery. Most importantly, many models act as a programmable platform and provide both audio input/output and a display for visual feedback. Our research will extend the existing line of knowledge on mobile accessibility for illiterate users, e.g. [11].

3. THE CHALLENGE

According to the user needs study the target application(s) running on mobile phones should be able to convey the following locally relevant information and procedural knowledge to potentially illiterate but in many cases numerate users:

- a) Farming strategies (such as choice of crops, choice of mono and multiple crops), price, expected yields and risk scenarios based on predictions by the weather board (see [6]).
- b) A schedule for farming practices

- c) Predictions of worst, average, and best case yields in financial terms
- d) Probabilities and control strategies for pest and disease incidences for crops
- e) Guidelines for harvesting
- f) Economic aspects of water management of existing bore well use or procurement of water in relation to c)
- h) Local water levels and their fluctuations in bore wells

Heeks' *et al.* identified *data*, *economic*, *social* and *action resources* as the four categories for an information chain to work in ICT-based development contexts [4]. In terms of *data resources* provisioning our project aims at gathering data through sensor boxes on agricultural parameters such as soil moisture and on ground water. Agricultural data retrieved from the boxes through mobile phones can be fed into crop simulation models could result in scenario embedded predictions such as worst, best and average case. Deep well sensors data can aid local water management. Speech recognition can help to create relevant *data resources* in a digital format by agricultural extension officers or community data creation e.g. through audio wikis [10] or through discussion forums that extend existing mass media coverage such as community radios [8]. ICT can reduce the *economic resources* required in various ways. As technology becomes cheaper and more powerful mobile phones provide an affordable platform to access the data. Speech interfaces can reduce the required skills – literacy being one of the biggest impediments – to access existing data. For us the challenges for speech processing at the intersection with HCI and *captology* lie in the required *social resources* that include provisioning of information from trustworthy sources through a mediation that is trusted. But also reduce the knowledge and effort required to access information, instilling users with confidence about their ability to access the data and helping motivate them to do so. Speech feedback can provide benefits for both navigation of the user interface and conveying content information. But its interaction with other modalities such as numbers, icons, pictures, animations and video needs to be considered (see for example [7]). Information uptake could benefit from the fact that speech can provide proof of relevance and trustworthiness of the information, for example if the voice is that of a known expert [8] or is attributed expert status by a trusted entity [9].

In terms of information retrieval usage we see two main scenarios:

- A. Illiterate farmers buy the telephone or add the application and a shop owner or someone from his social network instructs them in using it. Subsequent use is primarily solitary.
- B. Illiterate farmers will have only indirect contact with the system through a mediator. The farmer will listen to the information and see the display of phone that belongs and is mainly operated by an extension agent.

In terms of *action resources* there is little that speech processing or HCI research can provide as farmers require money, skills, raw materials and other technologies to turn acquired information into action.

4. OUTLOOK

We are planning a series of human centered and participatory design iterations. Starting with elicitation techniques around media use in general and mobile phone use in particular. After

having understood whether the farmers themselves or extension workers will be the primary users of the application we will create personas, usage scenarios and storyboards to communicate the user needs to the development team and help in the iterative design process. Through various prototyping techniques we aim at incrementally growing our understanding and the application. We plan to engage in action research with the local NGO to understand and improve their way of interacting with the local community through ICT. Involvement of marginalized farmers is in participatory research in general and ICTD in particular is no trivial matter. As a first step the NGO could provide a tangible benefit to participating marginal farmers by delivering day wage labor opportunities through mobile phones. This would ensure a better participation in our research.

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