Fostering Inclusive Innovation for Agriculture Knowledge Mobilization in Sri Lanka: A Community-University Partnership Development Project

Gordon A. Gow[1], Nuwan Waidayanatha[2], Chandana Jayathilake[3], Helen Hambly[4], Timothy Barlott[5], Mahmuda Anwar[6]

[1]Faculty of Extension, University of Alberta, Canada, [2]LIRNEasia, Sri Lanka, [3]Department of Agribusiness Management, Wayamba University of Sri Lanka, Sri Lanka, [4]School of Environmental Design and Rural Development, University of Guelph, Canada, [5]School of Health and Rehabilitation Sciences, University of Queensland, Australia, [6]School of Environmental Design and Rural Development, University of Guelph, Canada
[1]ggow@ualberta.ca, [2]nuwan@lirneasia.net, [3]hackjayathilake@gmail.com, [4]hhambly@uoguelph.ca, [5]t.barlott@uq.edu.au, [6]anwarm@uoguelph.ca

Abstract. Mobilization of scientific and indigenous knowledge in support of sustainable agriculture has been identified as a vital activity that faces numerous challenges today, yet constraints and limitations on traditional agricultural extension methods as well as high costs of information provision have been cited as barriers to improving the livelihood of farmers in developing countries, particularly those residing in the lowest socio-economic category known as 'base of the pyramid'. Information and communication technologies (ICTs) have long been regarded as forces for positive change in agriculture and rural development despite a track record of modest success with many initiatives. This paper describes the approach and initial results of an ongoing initiative involving researchers from Sri Lanka and Canada to create a community-university partnership intended to establish local capacity for inclusive innovation using low cost ICTs that can support knowledge mobilization within agricultural communities of practice. Initial results of the project point toward 'technology stewardship' as a promising approach for building capacity for local innovation through a community-university research partnership.

1 Introduction

Knowledge mobilization in support of sustainable agriculture has been identified as a vital activity that faces numerous challenges today (Aker, 2010). Information and communication technologies (ICTs) have long been regarded as forces for positive change in agriculture and rural development despite a track record of modest success (Duncombe, 2012). Among other things, ICTs are considered, particularly among frontline development practitioners, as important tools for mobilizing knowledge because they can lower transaction costs associated with information seeking or because they can introduce new ways to enhance farmer training through the use of audio visual media and Internet access (Farm Radio International, 2013). Most recently, the mobile phone has been the subject of intense focus within the ICT4D (ICT for Development) community because it is seen as a low cost, widely available communication tool that holds considerable promise for knowledge mobilization in the agriculture sector (Qiang, 2011).

Recent attention in the ICT4D community has also turned toward the importance of promoting change at the grassroots level with direct participation of technology users in what Heeks' (2013) has termed 'inclusive innovation.' Heeks' defines inclusive innovation as a process that empowers users to participate directly in the conceptualization and implementation of new ICT initiatives (Heeks et al., 2013), which may in turn encourage individual users of technology to further innovate using ICTs in ways that will fit their own needs (Pant & Hambly Odame, 2009). This approach shares features with 'participatory design' in the field of community informatics (Carroll & Rosson, 2007).

New opportunities to promote inclusive innovation have opened with the availability of several low cost, open source software platforms that enable customized services for text messaging, crowdmapping, and interactive voice response systems. Despite the possibilities these systems offer, enabling effective use of the technology (Gurstein, 2003) and building capacity within local communities to innovate with them remains a significant challenge for ICT4D projects in Sri Lanka and elsewhere (Kleine, 2013).

This paper describes the approach, initial results and possible next steps of an ongoing initiative involving researchers from Sri Lanka and Canada to establish a community-university research partnership intended to create local capacity for inclusive innovation using Free and Open Source Software (FOSS) to develop communication services that can support knowledge mobilization within agricultural communities of practice. The paper describes a series of relationship building activities based on a participatory design methodology that eventually led to a 'technology stewardship' model that was piloted through a set of communication campaigns carried out at several locations in Sri Lanka in 2014.

2 Project Background and Objectives

The University of Alberta, Wayamba University of Sri Lanka, LIRNEasia, and the University of Guelph have been involved since 2012 on a partnership development project funded by the Social Sciences and Humanities Research Council of Canada (SSHRC). The primary objective of the project has been to establish a community-university research partnership to explore the potential for low cost ICTs to enhance knowledge mobilization practices within agricultural communities of practice in Sri Lanka. To this end, the partners have been conducting various activities to build relationships intended to encourage and support community-based inclusive innovation using low cost ICTs, particularly for smallholder farmers.

The project moved into a new phase in 2013 with working relationships established between the university research team, the Sri Lanka Department of Export Agriculture (DOEA), Rangiri Radio, and the non-governmental development organization Janathakshan. This phase of activity was intended to introduce participatory design through a set of small-scale pilots, or 'communication campaigns' as they were termed in the project.

For our purposes a campaign is defined as a limited duration activity that has a specific objective with respect to needs of the community to whom it is directed. Each campaign is an intervention intended to serve immediate needs identified by the community. The campaigns also provided an opportunity to collect data through interviews, surveys, and tracking usage of the system through software records. A campaign involves several key participants: a sponsoring organization, such as DOEA who agrees to work with the research team to identify and define the parameters of the campaign. It also includes a 'technology steward' who is involved in operationalizing the ICT component for the campaign through his/her involvement in the participatory process and rapid prototyping with the community. The technology steward also plays a leadership role involving the community in the campaign by promoting it, encouraging people to participate, and providing oversight and support for various activities associated with the. A campaign could include various possibilities, or some combination, such as providing timely and targeted information to the community (e.g., market prices); providing moderated peer-to-peer communications services (e.g., peer Q&A forum); community-based data collection (e.g., responses to specific questions). The four campaigns included in this paper (identified by sponsor name) were: Janathakshan (Eastern Prov.), DOEA-North (Central Prov.), DOEA-South (Central Prov.) and Rangiri Radio (Nationwide).

The final phase of the project, now underway, involves a period of reflection and comparative analysis of results from the communication campaigns to develop a set of retrospective case studies (de Vaus, 2004). The partners are working together to refine a 'technology stewardship' model that will build on the

strengths of the communication campaigns and create future opportunities for further collaboration on agricultural extension programming in partnership with local university, government, and non-government partners. As part of this capacity building objective, the project partners are now beginning to work together to plan out a training strategy that will provide community stakeholders with resources and support necessary to encourage inclusive innovation with low cost ICTs to address emergent needs and to promote enhanced, cost-effective knowledge mobilization practices.

3 Participatory Design and Rapid Prototyping

Central to our overall objective is a participatory design intended to foster inclusive innovation through rapid prototyping. This method draws from and shares features with Blake and Tucker's (2006) 'Socially Aware Software Engineering' approach, but is distinct in that our project is not focused on software coding per se but instead adapts the user-friendly Free and Open Source (FOSS) platforms FrontlineSMS (text messaging), Ushahidi (crowdmapping), and Freedom Fone (interactive voice response) as its starting point.

Through our workshops and field visits we have demonstrated that FOSS platforms such as FrontlineSMS, Ushahidi, and Freedom Fone are well suited to rapid prototyping, making it possible to design and test a communication service in real-time with the direct involvement of community participants. This rapid turnaround time makes it possible for participants to immediately experience an implementation, creating the opportunity for direct feedback and, moreover, to provide the community with a working beta version of the system (Gow, 2013).

For example, early in the project, the team met with farmers in Maha Oya who raised the need for tracking and alerting of elephant movements in the area (elephants cause problems for farmers by destroying crops and buildings). Over the course of a two-hour meeting, the research team was able to work with the community to create and demonstrate a peer-to-peer alerting system using FrontlineSMS and a reporting system that could help community members to track elephant movements using the Ushahidi (Jayathilake & Gow, 2013). At the conclusion of the meeting, a beta version of the system was made available to the community for further experimentation.

Similarly, the team has been able to quickly demonstrate and prototype ideas for enhancing farm radio broadcasting in the North Central and South Central Provinces Sri Lanka by using text messaging to create new forms of interactivity between broadcaster and audiences using mobile phones to create what Hambly Odame (2012) has termed 'Radio+' (radio plus) service. Radio+ combines new, social media with radio, to offer listeners active opportunities for engagement in broadcasting to a wider audience, or in 'narrowcasting' to a specific social group or audience (e.g. youth, women farmers, etc.). Demonstrations and prototyping of

Radio+ was carried out at our practitioner workshops as well as during field visits with six regional radio stations in Sri Lanka (Hambly Odame, 2013).

In conjunction with the rapid prototyping activities, research partner LIRNEasia has taken a lead role to develop and distribute 'turnkey' ICT packages that enable the team to quickly deploy low cost ICT platforms in rural and remote communities. These are self-contained units comprised of a mini-PC and screen, GSM modem, and pre-loaded software (Waidyanatha, 2013). The turnkey packages were tested during field visits in September 2013, with a number of resulting observations that will lead to further refinements (Waidyanatha, 2013). In combination with the turnkey packages, the project has also created a series of bilingual video clips that provide guidance on how to set up and use FrontlineSMS for various types of applications.

4 Promoting Technology Stewardship as Community Practice

One of the key observations emerging from our rapid prototyping activities is that while the FOSS platforms are important to the participatory design process, by themselves they are not sufficient to foster the development and deployment of new services and we soon recognized the need for intermediaries to engage communities in the process. Intermediaries play a role in part because of their familiarity with the kinds of social practices prevalent within their community (Shove, Pantzar & Watson, 2012). This is an important consideration in light of recent studies that have shown that adoption and use of digital information services is closely related to how well these services align with the everyday social practices of people (De Silva et al., 2013; Zainudeen & Ratnadiwakara, 2011). To foster this alignment, we sought to enroll competent 'community knowledge workers' (Grameen Foundation, 2013) or 'technology stewards' as key participants in the campaigns.

Technology stewardship is a multi-faceted role that Wenger and his colleagues (2009) have identified exists within communities of practice. The role is important for bridging social practices with technological solutions that are appropriate for the community:

> Technology stewarding adopts a community's perspective to help a community choose, configure, and use technologies to best suit its needs. Tech stewards attend both to what happens spontaneously and what can happen purposefully, by plan and by cultivation of insights into what actually works. (p. 24)

Technology stewardship should not be confused with 'IT support.' The tech steward has a leadership role that involves several streams of activity and a diverse set of skills and interests:

- An insider's understanding of the community;
- An awareness of technology developments and opportunities;

- The ability to make informed choices about technology choices and initiatives;
- The ability to assist with adoption and new technology practices;
- The ability to help community members integrate new technology practices into everyday social practices;

On the one hand, tech stewards are a broker between a community and the technological resources available to them. In our case, the technology stewards perform this brokering role in the participatory design process. On the other hand, because technology is often seen as a response to a perceived need and because the tech steward identifies with the larger values and direction of the community, the role is also one that helps give voice to challenges and aspirations that may have implications extending beyond immediate technological solutions. For example, the steward assigned to the Janathakshan-sponsored campaign in the Eastern Province helped the community articulate to us the challenges faced as a result of recent drought that resulted in many young men leaving their farms to seek work elsewhere. This not only impacted the outcome of the campaign but raised other issues that clearly touched on concerns outside the scope of the project.

Technology stewardship, therefore, is a multifaceted role that requires a diverse skill set that includes technology training and digital literacy, training in participatory design and community engagement techniques. Stewards do not necessarily have to live in the community in a physical sense, but they do need to have contact with the community on a regular basis and be trusted by the members of that community.

Enrolling technology stewards into the project involved a multi-step process. We first worked closely with the sponsoring organizations to identify suitable individuals for the role. For example, in the case of the DOEA, Extension Officers stepped into the role because of their connections to the community and a perceived opportunity for the technology to improve communications between the Department and local farming groups. Rangiri Radio assigned members of its staff to assume the role in conjunction with their regular duties.

All of the technology stewards were trained by the research team to use and customize the software platforms and were also introduced to some basic participatory research methods intended to help them engage with their communities in both promoting and sustaining the use of the new services that they would be introducing with their communities during the campaign.

Initial results from the campaigns show that technology stewards do indeed play a key leadership role helping communities adopt and use new communication services, even when those services involve familiar technology like mobile phones (Waidyanatha et al., 2015). The technology stewards were able to carry out activities related to the campaign objectives and encourage

adoption and use of the service when they were consistently using the system themselves.

The technology steward in the DOEA North campaign was an Extension Officer working the area and familiar to the community. He proved to be a keen user of the system and sent over 700 messages over the course of several weeks, providing farmers with reminders of upcoming meetings, information on crop disease and other best practices. Relatively few farmers used the system to reply or ask questions. Further efforts by the technology steward to encourage input from farmers were constrained by their reluctance to compose text messages (as contrasted with reading messages sent to them). In consultation with the community, the technology steward suggested to the research team that a voice-based system might overcome some of these barriers and the project team is now working with DOEA to launch a follow-up campaign that will include Freedom Fone (a voice-based messaging system).

The DOEA South campaign under-performed when compared to its counterpart in the North. In the DOEA South campaign the tech steward role was shared between two Extension Officers, resulting in a split in responsibilities. Our initial observations suggest that this made it difficult for either steward to coordinate their actions and to develop as sense of ownership of the campaign as one steward was responsible for managing FrontlineSMS, the other for prototyping with the community.

The Rangiri Radio campaign received full support of the station management who saw it as a way to enhance its radio programming. Listeners were asked to text in song requests or other questions. The software records show hundreds of incoming messages each day of the campaign, which pushed the capabilities of FrontlineSMS to its limits. However, the technology steward did not initially use the system for their farm radio program, instead opted to introduce it with their popular music shows.

This of course opened up the question concerning situations in which a technology steward uses a system in ways *not* initially intended by the sponsor or the research team. Provided of course the uses are consonant with the wider community of interest, it may be important to let the technology steward explore innovation in ways that may not immediately respond to a particular need but instead lay the ground to prepare the community for the introduction of other campaigns. In this case, the Rangiri Radio campaign was seen to be offering its listeners a new form of interactivity in a compelling format (song requests) that could then be subsequently introduced into its farm radio programming.

In the case of the Janathakshan campaign, the tech steward had comparably little support from the sponsoring organization in part due to changes that took place with the sponsor during the campaign. However, he was able to send out a large number of messages initially in an effort to get farmers to self-subscribe to the system but had modest uptake from the community. This outcome may be

partly explained by survey data that we collected on use and adoption of technology in the community that showed a relatively low level of prior use of text messaging. This was compounded by social and economic challenges stemming from post-war conditions in this northern region of Sri Lanka, as well as literacy barriers for Tamil speakers trying to understand messages composed in phonetic Tamil using the limited character set available on their mobile phones.

5 Conclusion

With the conclusion of the campaigns in fall 2014, both DOEA North and Rangiri Radio expressed interest in continuing with the project and expanding beyond FrontlineSMS to begin experimenting with an interactive voice response system using Freedom Fone. Technology stewards in both cases remain actively involved in a broker role as they liaise with their communities to introduce this new service. In the less successful cases, our initial analysis suggests that we need to examine more closely two key considerations: if and how technology stewardship can be effective as a shared responsibility within a community, as in the DOEA South campaign; and to what extent a technology steward may need to engage in preparing a community for the introduction of a new service (e.g., basic technology literacy workshops) as in the Janathakshan campaign. This kind of training can also be helpful to identify and address unforeseen systemic issues in the adoption and use of the technology by the community.

Project partners are also considering the possible benefit of designing a more formal training program for technology stewardship. The DOEA has expressed interest in expanding the campaigns to include other Extension Officers in other districts. As such, there is an opportunity to examine how the research partners could play a role in developing and delivering a stewardship curriculum that addresses both technical and community engagement aspects in its curriculum, all with a view to building community capacity for local innovation with low cost ICTs.

6 Acknowledgments

7 References

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