Institution: Sheffield Hallam University

Unit of Assessment: 36 Communication, Cultural and Media Studies, Library and Information Management

Title of case study: Rural e-Services

1. Summary of the impact (indicative maximum 100 words)

Working with a farming co-operative in India, this project developed new software design and deployment methodologies to create a mobile phone system, *Kheti*, (Ref 4) for providing on-the-spot, and locally relevant agricultural advice.

In trials, Kheti handled queries from over 100 different *farmers*, helping to avoid critical threats to their crops and livelihoods.

Software companies employed the methodologies: Safal Solutions applied them to microfinance IT projects in India, generating savings for over one million people; SAP Research used methods evolving from this project to create technologies for supply chain management by thousands of small-scale Cashew and Shea Nut *farmers* in Ghana, Burkina Faso and Ivory Coast.

2. Underpinning research (indicative maximum 500 words)

Rural e-Services was an interdisciplinary project funded between 2006 and 2009 through the EPSRC research programme, 'Bridging the Global Digital Divide' (BGDD), which falls in the general area of Information and Communication Technology for Development (ICTD).

Dearden was the Principal Investigator and co-ordinator of the overall project, with the majority of fieldwork undertaken by a research associate, Haider Rizvi. Collaborators at other institutions with lesser roles were: Xiaolan Fu, a development studies researcher at the University of Oxford, who employed a researcher to undertake a comparative study of business models of ICT in agriculture in developing regions (not published). In addition, Paul Matthews, who was employed by the Overseas Development Institute (an aid NGO) at the start of the project and later joined the University of the West of England, advised on knowledge management and co-authored one paper (Ref 5). Dearden was a Reader at Sheffield Hallam University (SHU) throughout the project. Dearden started at SHU in January 2000, and held the post of Senior Lecturer before appointment to Reader in November 2005 (a post he currently holds). Rizvi was employed by SHU from January 2007 to April 2009. SHU subcontracted software development work to Subodh Gupta of Safal Solutions, Secunderabad, India, a small software development company specialised in working with development NGOs.

Rural e-Services developed new software design methods, combining insights from participatory IT design, agile software methodology, and participatory social development. After reviewing literature (Ref 1), Dearden's team undertook action research with a co-operative of small farmers in Madhya Pradesh, India. Under guidance and supervision from Dearden, Rizvi collaborated with Safal Solutions to conduct the fieldwork and design and build the software. The methods are reported in Refs 2, 3 and 4 and the Kheti technology (Ref 5).

Research outputs are of two contrasting types. First, a socio-technical system (Kheti) and second, recommendations for software design methodology in ICTD.

The design of Kheti was guided by the priorities of the co-op members themselves. The Kheti software running on mobile phones allows farmers (with limited literacy) to create multimedia messages incorporating images and audio and send them to a web portal that can be accessed later by the agricultural advisor for the co-operative. Phones are held by local co-op representatives, who are paid to visit regularly a small number of villages and support the co-op members in those villages. The co-op representative typically visits on one afternoon to collect queries, and returns the following day to deliver the advice. Previously the agricultural advisor would have had to visit the farmer, and could only hope to visit each co-op member about once per

year. Kheti is distinctive in that it not only provides a more efficient channel for delivering agricultural advice, but crucially it helps to build social capital in the co-operative. It does this by linking members between different villages, and promoting more regular links between remote villages and the advisor at the centre (Ref 5).

Important advances were also made regarding software development methods for ICTD projects. First, Rural e-Services identified the importance of sustained relationship building between software providers and beneficiary communities as an initial phase of such interventions to enable honest and open critiques of software proposals (Refs 1, 2, 3, 4). Second, Rural e-Services shows how agile software development methodologies need to be adjusted in order to address the needs of rural development. For example, whilst agile software development recommends very short development cycles delivering new software over periods of a few weeks, in ICTD projects it can be important to slow down the iteration cycles to ensure that community members have sufficient time to learn and adjust to the latest software developments. The project also identified a new team structure for developing technology in ICTD projects by promoting a tight collaboration between a local development project manager who focuses primarily on the organisational change in the community, whilst having a good understanding of technical possibilities, and software developers who must have some awareness of the community situation, but should remain technically focused. These findings and their implications are reported in detail in Refs 5 and 6.

3. References to the research (indicative maximum of six references)

Grants:
Grant 1. EPSRC:EP/E023827/1
Rural e-services: Participatory co-design of sustainable software and business systems in rural co-operatives
Principal Investigator: Dearden, Professor A
Started: 01 September 2006 Ended: 30 June 2009 Value (£): 178,521

Grant 2. Related Grants: (with the same title)
Xiaolan Fu, University of Oxford, EP/E026052/1:
Started: 28 September 2006 Ended: 27 June 2009 Value (£): 93,886
Paul Matthews, University of the West of England, EP/E027563/2
Started: 02 November 2007 Ended: 31 March 2009 Value (£):12,785

Publications:
Ref 1. Dearden, A. and Rizvi, H. (2008a). 'Participatory design and participatory development: a comparative review' In: *PDC'08: Experiences and Challenges, Participatory Design Conference*, Indiana University, Bloomington, Indiana, USA, October 1-4, 2008. Available from ACM Digital Library, http://dl.acm.org/citation.cfm?id=1795234.1795281 (peer reviewed full paper- available from university repository SHURA)

Ref 2. Dearden, A. and Rizvi, H. (2008b). 'Adapting participatory and agile software methods to participatory rural development' In: *PDC'08: Experiences and Challenges, Participatory Design Conference*, Indiana University, Bloomington, Indiana, USA, October 1-4, 2008. Available via ACM Digital Library, http://dl.acm.org/citation.cfm?id=1795234.1795246 (peer reviewed short paper- available from university repository SHURA)

Ref 3. Dearden, A. and Rizvi, H. (2009). 'A deeply embedded sociotechnical strategy for designing ICT for development' *International journal of socio-technology and knowledge development*, **1** (4), 52-70. DOI: 10.4018/jskd.2009062605 (peer reviewed journal - available from university repository SHURA)

Ref 4. Dearden, A., Rizvi, H. and Gupta, S. (2010). 'Roles and responsibilities in agile ICT for development' In Proceedings of India HCI / IDID 2010. *Electronic Workshops in Computing*, 1-12. http://ewic.bcs.org/content/ConWebDoc/35770 (peer reviewed conference full paper – open access - available from university repository SHURA)

Ref 5. Dearden, A., Matthews, P. and Rizvi, H. (2011). 'Kheti: mobile multimedia in an agricultural co-operative' *Personal and Ubiquitous Computing*. Volume 15, Number 6, Pages 597-607, DOI:10.1007/s00779-010-0335-3 (peer reviewed journal - available from university repository SHURA)

Ref 6. Doerflinger, J., and Dearden, A. (2013). 'Evolving a software development methodology for commercial ICTD Projects' *Information Technology and International Development* 9(3), 43 – 60. (peer reviewed journal – open access - available from www.itidjournal.org)

4. Details of the impact (indicative maximum 750 words)

Impact of the technology for research participants

The Kheti technology provided farmers living in remote villages with relevant and accurate on-the-spot agricultural advice from a trusted source (the advisor for the co-operative). Farmers who used photographs and audio to communicate the problem typically experienced a turnaround time from query to response - of between 12 and 48 hours. Prior to Kheti, the agricultural advisor would have needed to visit each village involving a half or whole day's journey over dirt roads.

In field trials conducted with the collaborating farmers' co-operative, over 200 messages were exchanged in the 3 month trial period, with over 100 different farmers using the service. Ninety eight messages were translated into English and analysed. Of these messages, 17 different crops were discussed, with queries being mostly concerned with identifying and eradicating crop pests, poor crop development, and crop disease symptoms. Major pest problems were identified and addressed promptly (e.g. a Hock Moth attack on a farmer's Soya field), which may have prevented a significant loss of annual income for farmers affected in that village (Ref 5).

In 2009, the project received the Manthan award for best practice in digital inclusion (Source 1). Rizvi and members of the co-operative travelled to New Dehli to collect the award and the project was widely reported in the Indian print media, including the Times of India. The Manthan Award was launched in 2004 by the Digital Empowerment Foundation, in partnership with the World Summit Award and the Department of IT, of the Government of India (and other partners). The annual award recognises the very best in e-Content and digital practices for development. Initially this was for the Indian sub-continent, but now covers the entire South Asia and Pacific region.

Impact for software design organisations

Our collaborators in India, Safal Solutions, have revised their software development processes to integrate the novel methods and techniques generated by the Rural e-Services project. They have applied these methods to multiple IT design projects over the past 5 years, all reflecting our research finding concerning institutional strengthening as a crucial element of ICTD. Safal's projects have focused on management information systems (MIS) for institutions associated with both microfinance and primary agricultural co-operatives (PACS) (Source 2).

Through the dissemination of our novel methods, we have developed a relationship with a team at SAP Research (Karlsruhe, Germany) who are conducting projects using mobile phones to connect agricultural supply chains in West Africa. Dearden used key findings from the Rural e-Services study (Refs 3, 4, 5) to advise SAP Research on ways of combining agile software development with participatory institutional development strategies. This resulted in the development by SAP Research of a methodology called DRAMATICS (formerly, TIM), the associated methods and applications for which are described (in Ref 6, Source 3). At the core of the DRAMATICS methodology is a clear definition of roles including internal and external software developers and a locally based 'change manager' (equivalent to the 'development project manager' role identified in Ref 4). The DRAMATICS methodology also extends the work of Rural e-Services by defining a sequence of phases of project evaluation, each of which demands different frequencies of software iteration and different process models for managing software changes.

Impact for farmers and farming Co-operatives

In collaboration with the Centre for People's Forestry (CPF), Safal has applied our new

participatory methodologies to develop a management information system, both for CPF and the Primary Agricultural Co-operative Societies (PACs), that the centre supports. The CPF and their partners are providing valuable agricultural information, advice and business credit lines to over 10,000 people in Andhra Pradesh, including 3000 PACS members.

SAP Research has adopted and adapted our methods to design and deploy novel software using mobile phones to support co-operatives of Cashew farmers and Shea Nut collectors in Ghana and Burkina Faso (Ref 6). The resulting applications improve the traceability of produce in the supply chain, enabling the co-operatives to qualify for Fair Trade premiums. The technologies are now being used to increase the incomes of over 8000 farmers in West Africa, with plans to extend the work to support 10,000 cocoa farmers in Ivory Coast for the 2013 harvest (Sources 3 and 4).

Impact on microfinance co-operatives

Safal Solutions has used the methodologies devised through Rural e-Services to develop IT systems for microfinance in India (Source 2). Microfinance involves groups of people on very low incomes (usually women) forming joint savings and loan clubs within their villages and keeping paper records. Savings rates may be as little as 10 or 20p per week. Although the amounts involved may not be sufficient to open a bank account, good record keeping (including digitising records) allows individuals and the group to build up a credit history and so access small loans. However, capturing the data from these village savings club is challenging and labour intensive. Safal's software and socio-technical model helps microfinance NGOs to efficiently capture and manage this data, enabling some of the poorest members of Indian society to access banking services. Safal's new software has been applied by: the Jeevika project in Bihar state, which provides financial services to 700,000 women; TRIPTI in Orissa state which aims to support 300,000 women; and Arohan, a microfinance institution in West Bengal which serves 300,000 families.

Impact on students in developing countries

The Rural e-Services project was used to underpin an 18 month British Council-funded Education Partnership with Africa between SHU and Makerere University, Uganda. As a result of the partnership, 50 students at Makerere have been supported in developing innovative mobile applications to address challenges and opportunities they identified, both nationally and within their local communities. The student projects included: an automated reminder system for pregnant women reminding them of clinic appointments and encouraging good pre- and 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; collecting water & power meter readings using mobile phones; and an SMS based 'recommendation community' for restaurants and hotels in Uganda. (Source 5).

5. Sources to corroborate the impact (indicative maximum of 10 references)

Source 1. Manthan Award for digital inclusion
(http://manthanaward.org/section_full_story.asp?id=829)

Source 2. Letter of appreciation from Safal Solutions.

Source 3. Letter of appreciation from SAP Research.

Source 4. Evidence of impact of the SAP Research Cashew project:

a) http://mapya.wordpress.com/2013/02/26/the-pc-west-africa-cashew-conference/
b) http://www.new-ag.info/en/developments/devItem.php?a=3106
c) http://www.youtube.com/watch?v=jbefxfhACi0

Source 5. British Council brochure: *Education Partnership in Africa*, British Council (2011) available from enquiries.development@britishcouncil.org or from Sheffield Hallam University