REF2021

Institution:
Sheffield Hallam University
Unit of Assessment:
UOA11 - Computer Science and Informatics
Title of case study:
People at the Heart of ICT for Socio-economic Development
Period when the underpinning research was undertaken:
2006 - 2020

Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Andy Dearden	Professor of Interactive Systems Design	January 2000 – October 2020

Period when the claimed impact occurred:
2014 - 2020
Is this case study continued from a case study submitted in 2014?
No

1. Summary of the impact

Research by Professor Andy Dearden has generated new software engineering methods and approaches in ICT for Development (ICTD) and ethical standards for research in ICTD. Collaborating with multinational software corporation, SAP, Dearden's research has informed the software engineering methodology, DRAMATICS. This methodology has been used to develop SAP's Rural Sourcing product, which has reached 500,000 small scale farmers across Africa increasing incomes and improving sustainability.

The research has led to the adoption of new ICT practices in an NGO working with marginal farmers in West Bengal. This has facilitated an innovative, sustainable climate monitoring service which has also enabled over 1,000 families to respond to Covid-19 and two major cyclones. Research on ethical standards by Sheffield Hallam has been adopted by the Information and Communication Technologies and Development Conference series and by the International network of Postgraduate students in ICTD, protecting future research stakeholders from abuse.

2. Underpinning research

The field of Information and Communication Technology for Development (ICTD) is characterised by failures to deliver sustainable change (see, for example: Dodson et al. "Considering failure", Inf. Tech. and International Dev., 9(2), 2012; Toyoma, "Geek Heresy", Public Affairs, 2015; Pei & Nardi, "We did it right, but it was still wrong", CHI, 2019). Since 2006, Dearden's work has developed new approaches in software engineering, design and research for ICTD that seek to change this picture by placing people at the heart of ICTD in systems design, in the ethics of research practice, and in the management of ICTD interventions.

Working with a small software house and an NGO in India, as part of the EPSRC 'Bridging the Global Digital Divide' initiative, Dearden developed and evaluated ways to integrate participatory approaches to socio-economic development with participatory IT design and with agile software engineering processes, a combination that had not previously been explored. The results were demonstrated in the specific case of a new mobile application to support a co-operative of marginal farmers in India (**R1**, **R2**). The work highlighted how the roles of actors in a 'design for development' process contrast with traditional models used in agile software development for commercial clients. The goal was that the direction of 'Development' should be consistent with local understandings, goals, and priorities rather than being determined and imposed by (powerful) outside agents.

These works have been cited by many others working in this field. Between 2010 and 2013 Dearden collaborated with Joerg Doerflinger at the leading multinational software corporation, SAP, on the development and formalisation of their DRAMATICS methodology (**R4**) which was used by SAP to develop their *Rural Sourcing* Management product. DRAMATICS is unique in being specifically oriented to ICTD projects being undertaken by commercial enterprises and has been cited at least 25 times by other research groups (according to Google Scholar).

The questions of participation and control over projects, and the complexity of the practice of ICTD naturally led to questions about the ethical conduct of such work. In response, Dearden (**R3**) reviewed the ethical guidance that was available for ICTD practitioners and researchers and demonstrated that there was a lack of guidance specifically addressing this complex multi-disciplinary area. This led to an initiative to collaboratively develop a new set of 'minimum ethical standards for ICTD Research', which was led and facilitated by Dearden with Dorothea Kleine (Professor of Geography, University of Sheffield) (**R6**). The new standards document helps governance bodies to identify ethical risks associated with research activities. It highlights specific areas such as genuinely informed consent when participants may have no prior experience of what 'research' means, or when digital tools are provided that can automatically harvest vast datasets which could undermine participants' privacy. Other areas covered include: responding to the huge differentials in status and social power between researchers, participants in developing regions, and between different people (e.g. men and women) in a community; consideration of relationships with commercial partners; partnerships with local institutions to ensure that international research contributes to local capacity building; accountability of research and reporting back to participants in ways that are meaningful for them; appropriate acknowledgement and compensation for research participants; ownership and treatment of data.

Our most recent work on participatory methodologies for ICTD (**R5**) is a collaboration with an NGO that works with marginal farmers in West Bengal, India to promote sustainable adaptations and agricultural practices in the face of the climate emergency. This work developed an approach to co-design that supports the sustainability and autonomy of our partners, allowing them to improve their capacity to innovate using ICTs, guided by their own values and priorities. This novel approach embeds participatory design processes and new ICT practices within the framework of pre-existing behaviours, rather than attempting to impose externally determined visions of the role of ICT. In this mutual learning process, we and our partners enrich our understanding of the interplay between locally held values and different possible technology choices, allowing our partners to make informed decisions about the adoption and application of technologies.

3. References to the research

R1. **Dearden, A**., & Rizvi, H. (2008, October). Participatory IT design and participatory development: a comparative review. In Proceedings of the Tenth Anniversary Conference on Participatory Design 2008 (pp. 81-91). http://shura.shu.ac.uk/29

R2. **Dearden, A**., Rizvi, H., & Gupta, S. (2010). Roles and responsibilities in agile ICT for development. In, Procs. India HCI 2010/Interaction Design & International Development 2010, 1-12. http://shura.shu.ac.uk/3549/

R3. **Dearden, A**. (2012), See no evil? Ethics in an interventionist ICTD, See no evil? Ethics in an interventionist ICTD, ICTD '12: Proceedings of the Fifth International Conference on Information and Communication Technologies and Development, March 2012, 46–55. https://itidjournal.org/index.php/itid/article/view/1049.html

R4.   2018, Doerfiinger, J., & **Dearden, A**. (2013). Evolving a software development methodology for commercial ICTD projects, Information Technology and International Development 9 (3), 43-60. http://shura.shu.ac.uk/7358

R5.   Kendall, L., & **Dearden, A**. (2018, August). Disentangling participatory ICT design in socioeconomic development. In Proceedings of the 15th Participatory Design Conference: Full Papers-Volume 1 (pp. 1-12). https://doi.org/10.1145/3210586.3210596

R6.   **Dearden, A**., & Kleine, D. (2020). Interdisciplinarity, self-governance and dialogue: the participatory process underpinning the minimum ethical standards for ICTD/ICT4D research.   Information   Technology   for   Development,   1-20. https://doi.org/10.1080/02681102.2020.1840321

All articles were rigorously peer-reviewed prior to publication in leading journals in the field.

4. Details of the impact

Rural Sourcing Technology in Low Income Countries

Using DRAMATICS, a software engineering methodology developed in collaboration with Sheffield Hallam, SAP created, and continue to innovate, their *Rural Sourcing* solutions product. This product is now used in agricultural supply chains involving over 500,000 small scale farmers in low and middle-income countries across the world (**E1**). In developing countries, smallholder farmers have an increasingly important role in establishing food and economic security for growing populations. The open and immediate access to information offered by *Rural Sourcing* is supporting the shift from subsistence farming to commercial agriculture and thus reducing dependence on expensive (hard currency) imports. For example in 2018, SAP reported on *Rural Sourcing* being used by Kalangala Oil Palm Growers Trust (KOPGT), a co-op of 2,000 farmers in Uganda, to support their business growing palm oil for the local market. *Rural Sourcing* provides farmers with open and immediate access to the global market price for palm oil and processes all transactions digitally which has improved farmers' incomes. KOPGT have also reported significant cost savings by using the cloud-based system maintained by SAP, as only one IT person is required on the staff of KOPGT (**E10**).

Rural Sourcing is also being used to enable sustainable cocoa farming for Barry Callebaut, the world's largest cocoa trader, through interactions with 65,000 cocoa farmers in Cote d'Ivoire (**E9**). Information from individual farmers about their farms and their communities can be recorded digitally enabling more specific advice and support. Vice-President Cocoa Sustainability at Barry Callebaut reports the use of *Rural Sourcing* "… is an essential step in our commitment to make cocoa more sustainable" (**E9**). In addition to providing farmers with improved access to raw materials and training, *Rural Sourcing* has enabled traceability of cocoa beans from farmer to warehouse.

DRAMATICS is recommended as a key resource for organisations implementing the 'Principles for Digital Development', endorsed by most of the major international donors engaged in ICTD (e.g. UNICEF, WHO, UNCTAD, UNHCR, USAID, DfID, SIDA, Gates Foundation, etc.) (**E2**).

Adoption of minimum ethical standards for ICTD research

The Town Hall Meeting at the ICTDX conference in Ahmedabad, India (Jan 2019) voted overwhelmingly to adopt Version 2.0 of the Minimum Ethical Standards for ICTD Research and to integrate these standards into the reviewing process for future conferences (**E3**). ICTD is the major academic conference in the ICTD field with over 100 attendees at each conference. The adoption of these standards influences all the projects that these researchers engage in across the world and serve to protect research participants from potential abuse. Dearden's research on ethics in

ICTD (**R3**) has also informed the behaviour of multiple researchers working in the domain, as illustrated by the work of a team from Carnegie Mellon University with a school for Deaf children in India (**E4**).

The International Network of Postgraduate Students in ICT4D (IPID) has also begun to adopt these standards (**E5**). An account of the development of the standards has been published by the leading academic journal in the field of ICT4D, providing further endorsement (**R6**).

Improved Innovation Capacity in DRCSC

We have been conducting action research with DRCSC (an NGO working with smallholder and marginal farming communities in 11 districts of West Bengal, India) to develop new approaches to their use of ICTs and their ability to innovate with ICTs. Together, we have developed a model of 'technology stewardship and innovation' which is being implemented by staff in DRCSC developing innovative ways of using their existing ICTs. The result has been a sustained (and sustainable, because it is endogenous) improvement in their reporting and organisational learning practices (**E6**).

Within DRCSC, field officers and community members have developed an innovative approach to their internal working practices. They have adapted their existing use of WhatsApp as a way to share good practice stories amongst community mobilisers and field officers working in different districts and blocks (**E6**). This group has recently hosted their first ever video conference for a vital consultation workshop on 'Rebuilding the Sundarbans' that involved 40+ staff from across the organisation (**E7**). The workshop was conducted at a time when travel in the Sundarbans was extremely limited by the Covid-19 lockdown, and the after-effects of Cyclone Amphan (21/5/2020), yet the discussion was vital and urgent. The community members and staff hosting the event had never previously used any video conferencing tools, but participants were keen to reuse these technologies in future.

DRCSC are now using our stewardship model to guide a programme in which young people from the communities where they work to act as 'climate volunteers'. The volunteers look after weather monitoring equipment and gather data which feeds into localised weather forecasts. The volunteers share the forecasts with the community using community noticeboards leading to better decision making by individual farmers, their family members (e.g. women in these communities are typically responsible for animal husbandry) and richer discussion of weather and climate related issues (**E6**, **E8**).

As stewards, the volunteers have enriched their understanding of weather patterns, of the potential of digital tools, and the differences (in type and veracity) between data sources. This allowed one of the climate volunteers to alert the network and the community to the gathering tropical storm that later became Cyclone Bulbul (Nov 2019) before the Indian Meteorological Service confirmed the cyclone warning, giving the local community extra time to prepare. The stewards have also been able to adapt their practices to share public health information as Covid-19 spread across India (**E6**, **E8**).

The weather programme is currently providing improved forecasting to at least 1000 marginal farmers and their families in 11 villages. DRCSC are able to sustain the programme from within the existing resources (**E6**).

5. Sources to corroborate the impact

E1. Letter from Development Architect, SAP confirming value of DRAMATICS method

E2. Principles for Digital Development website: Design with the User: https://digitalprinciples.org/principle/design-with-the-user/ and

List of Endorsers confirming adoption of principles and list of organisations endorsing principles. https://digitalprinciples.org/endorse/endorsers/

E3.   ICTD conference motion https://ictdethics.wordpress.com/ confirming adoption of principles by ICTD conference.

E4.   'Speak Up: A Multi-Year Deployment of Games to Motivate Speech Therapy in India' – paper confirming adoption of Dearden's recommendation and outcomes for deaf and hard of hearing school children in India

E5.   Letter inviting Dearden to train students with the International Network of Postgraduate Students in ICT4D (IPID), sponsored by the Swedish SPIDER centre on minimum standards for ICTD/ICT4D research ethics.

E6.   Letter from the Development Resources Communication and Services Centre (DRCSC, NGO in West Bengal). Confirms how our research facilitated a method for reporting and monitoring of our field work activities, weather forecasts and agricultural advisories for over 1000 farming families, to inform people early of Cyclone Bulbul helping to save assets and natural resources, and to increase sustainability for long-term provision.

E7.   Recording of online consultation workshop on rebuilding Sundarbans hosted by staff at DRCSC (YouTube).
https://www.youtube.com/watch?v=JV8Q_N_mHcc&feature=youtu.be

E8.   Project Evaluation Report: Creative Communication to Promote Resilient Agricultural Practice: A Technology Stewardship Model (2019-2020). Independent evaluation on the impacts of some of the interventions conducted in our work with DRCSC.

E9.   Barry Callebaut website: Barry Callebaut collaborates with SAP to offer an innovative app to boost sustainability data management.
https://www.barry-callebaut.com/en/group/media/news-stories/barry-callebaut-collaborates-sap-offer-innovative-app-boost-sustainability

E10.   SAP report on use of Rural Sourcing technology in Uganda.
https://news.sap.com/2018/03/how-digital-agriculture-is-helping-uganda-grow-its-middle-class/