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ORGANISERS

GENERAL CONFERENCE CHAIRS
Gary Marsden | University of Cape Town
Julian May | University of the Western Cape

PROGRAM COMMITTEE CHAIRS
Jonathan Donner | Microsoft Research India
Tapan Parikh | University of California, Berkeley

NOTES CHAIRS
Marshini Chetty | University of Maryland, College Park
Ulrike Rivett | University of Cape Town

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Jenna Burrell | University of California, Berkeley
David Barnard | TechSoup Global

DEMO CHAIR
Carlos Rey-Moreno | UWC Computer Science

SHOWCASE CHAIR
Bill Tucker | University of the Western Cape
REGISTRATION DESK
The registration desk will be located on the Level 3, Kramer Building, Middle Campus, University of Cape Town. Lost & Found items please contact the registration desk staff.

Registration Desk times
Saturday 7 December 2013 07:30am – 16:00pm
Sunday 8 December 2013 07:30am – 16:00pm (Baxter Theatre)
Monday 9 December 2013 07:30am – 16:00pm
Tuesday 10 December 2013 07:30am – 16:00pm
Name Badges are to be worn at all times during the conference or entrance to the various talks will not be allowed

WIFI LOGIN
KRAMER BUILDING | Username: conference@wf.uct.ac.za, password: uct2013
BAXTER THEATRE | Username: ICTD2013, password: capetown

COCKTAIL FUNCTION
Saturday 7 December 2013 – Jameson Hall, UCT Upper Campus. Drinks tickets for the Cocktail will be in your name badge pouch.

CONFERENCE DINNER
Sunday 8 December 2013 – Moyo Clocktower Precinct, Waterfront
Please ensure when attending the dinner on the Sunday evening that you bring along your dinner ticket; drinks tickets will be available in your pouch as well.
Transport will be provided from Baxter Theatre at 6pm and return to transfer to hotels/residences that we had booked.

AUDIO VISUAL PRESENTATIONS
Presentations should be handed to the Audio Visual staff on a memory stick/flash drive in the meeting rooms, during the break prior to your talk. Please inform the technician in the venue if your presentation has sound or video clips.

EMERGENCY CONTACT NUMBERS
Police: 10111 | Ambulance: 10177 | Cape Town International Airport: 021 9371200

CAPE TOWN
Cape Town and the Western Cape are considered among the most beautiful areas in Africa. Characterised by a cultural melting pot of Indonesian, French, Dutch, British and German settlers, the local Khoisan (Bushman & Hottentot) tribes and the Bantu tribes from the north, the pristine coastline with its white sandy beaches, the magnificent countryside with its bountiful rivers, wetlands and dams, and the unique flora kingdom, together with a “Mediterranean-like” climate and friendly community, make it a perfect destination for any visitor. Cape Town is the legislative capital of South Africa, and the historic buildings of the Houses of Parliament are situated in the Cape Town city centre. Situated at the foot of Table Mountain, the Cape Town Central Business District is a relatively small area, which allows for easy exploration on foot. Numerous excellent hotels, loft apartments, trendy restaurants and bars can be found in the heart of the city and along the coast. Take a trip up Table Mountain; visit the Victoria & Alfred Waterfront, with over 270 shops, a wide selection of restaurants and art and craft markets. Last, but not least, take the trip to Robben Island, where Nelson Mandela was formerly incarcerated. The City Central area offers a wide range of attractions and activities and the visitor can experience the “Mother City” at her best.
CURRENCY AND BANKS

The unit of currency in South Africa is the South African Rand (ZAR) and is indicated with a capital R so that, for example, three Rand and fifty cents would be written R3.50. South Africa has a decimal currency system with one Rand equalling 100 cents. Denomination of Rand notes are R200, R100, R50, R20, and R10 and of the coins are R5, R2, R1, 50c, 20c, 10c and 5c. The following exchange rates were applicable at time of sending out this document.

1 United States Dollar = ZAR 10.00 | 1 Euro = ZAR 13.00

Facilities for cashing traveller's cheques are available at banks (operating hours are Monday - Friday 09:00 - 15:30, Saturdays 08:30 - 11:00) and at most hotels. Banks are closed on Sundays. Foreign exchange agencies are open during the week and on Saturdays. Automatic teller machines (ATM) are open 24 hours and are located at most banks as well as at the Congress Venue. International credit cards (Visa, Diners Club, MasterCard and American Express) are accepted at the majority of hotels, restaurants and shops.

AIRPORT TRANSFERS & TOURS

For information or to book airport transfers contact Robin Troup, Q.T.S (Quality Touring Services), robin@wildsafari.co.za - tel: +27 82 657 2334

TAXI SERVICES

The taxi rate varies between companies and runs at about R10/km and is advisable to ask for a fare estimate before you agree. Unicab – 0822 250 250 / Elite Taxi – 0861 635 483 / Cab Express – 021 448 1616 / Exite Taxi - 021 448 4444 / Affordable taxi – 072 296 3518 / Cabs on Call – 021 522 6103 / Grab a Cab – 021 556 6344 / Marine taxi – 021 434 0434 / Sea Point taxi – 021 434 4444 / Rikki Taxi – 0861 745 547.

ELECTRICITY SUPPLY

The electricity supply in South Africa is 220 - 240 volts, 50 Hz. The connection for appliances is a round three-pin plug. Most hotels provide dual-voltage two-pin razor sockets (100-120 volts and 220-240 volts). Adaptors will be on loan from the registration desk.

HEALTH

There are no compulsory vaccination requirements for persons entering South Africa although a certificate for yellow fever may be required if you are entering from certain South American or sub-Saharan African countries. Certain parts of the country have been designated as malaria risk areas. If you intend travelling to one of these areas, it is essential that you take prophylaxis before arrival and whilst in the area. Protective clothing and insect repellents should also be used. Cape Town is a malaria risk free area. South African doctors and dentists are highly trained professionals and hospitals are well equipped. Participants are requested to make their own arrangements with respect to health insurance prior to departure and consult their local general practitioner for personal expert advice. For international travel and health advisories please visit the WHO website at www.who.int/ith or www.cdc.org. It is safe to drink tap water throughout South Africa. However, for those who prefer bottled mineral water, this is readily available in various stores. Smoking is prohibited by law in most public buildings in South Africa (airports, Cape Town International Convention Centre, restaurants etc) except in designated smoking areas.

INSURANCE

The ICTD Conference accepts no liability for any personal injury, loss or damage of property belonging to or additional expenses incurred by congress participants either during the congress or as result of delays, strikes or any other circumstances. Participants are requested to make their own arrangements with respect to health and travel insurance.

LANGUAGE

The official Conference language will be English.
SECURITY

For those participants who have not previously visited South Africa, or Cape Town, and are concerned about personal safety, we wish to assure all visitors that Cape Town is like any other major city with areas with greater or reduced risk of crime. Common sense will ensure a trouble free and enjoyable congress and vacation. The area around the CTICC and adjacent hotels is safe and well monitored at all times but we advise that you do not walk alone after dark in unpopulated streets. Ostentatious displays of wealth should be avoided at all times. During the congress, the information desk at the CTICC and your hotel’s concierge will be able to assist you with information on places to visit and the appropriate means of transport.

SHOPPING IN CAPE TOWN

Most shops in the city centre and suburbs open between 08h00 and 17h00 to 17h30 hours. Shops in major shopping malls open at 09h00 and close at 19h00 hours or later (especially at the V&A Waterfront), even on Sundays and most public holidays. Government agencies still keep to traditional weekday only hours. Most banks close at 15h30 hours, and have limited Saturday morning opening times. Muslim-owned businesses close at noon on Fridays and re-open at 13h00 hours.

TIPPING

Gratuities are expected in South Africa. A guideline for visitors is the following: Airport porters ZAR 5.00 per item, taxis 10%, waiters and waitresses in restaurants 10%.

TRAVELLER’S CHEQUES

Most international traveller’s cheques are accepted, provided they are in an acceptable currency and may be cashed at most banks. Many hotels and shops also provide this service.

VAT / TAX REFUNDS

VAT of 14% is levied on nearly all goods and services. Foreign tourists may claim back VAT paid on items that will be taken out of the country. Original tax invoices, foreign passport, plus all the items on which a refund is claimed, must be presented at the VAT Refund Administration Office or an appointed RSA Customs and Excise Official on departure, and the total VAT on these items will be refunded.

WEATHER

December in Cape Town is the beginning of summer. Dawn arrives just before 07h00 and the sunsets at around 19h30. The weather is generally fair but occasional rainy and windy days can occur. Mornings are cool in the early morning and moderate heat towards the afternoon, evenings can be cool especially if there is a breeze. Maximum daytime temperatures range from 20ºC to 33ºC.
## DAY 1 | 7 DEC

### OPEN SESSIONS | Kramer Building, UCT

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<thead>
<tr>
<th>VENUE</th>
<th>SESSION</th>
<th>TIME</th>
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<tbody>
<tr>
<td>Kramer LT2</td>
<td>SPECIAL INTEREST GROUP - ICTD African Researchers Network</td>
<td>9:00 - 10:45</td>
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<tr>
<td></td>
<td>Organiser: Ritse Erumi</td>
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<tr>
<td>New Economics Building 1A</td>
<td>WORKSHOP - The Impact of ICT4D Research on Policy and Practice: Lessons from International Development</td>
<td>11:15 - 13:00</td>
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<tr>
<td></td>
<td>Organiser: Roger Harris</td>
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<tr>
<td>Kramer 2B</td>
<td>WORKSHOP - Don’t forget the &quot;how&quot;. Tech for youth engagement at public libraries in Africa</td>
<td>14:00 - 15:30</td>
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<td>Organiser: Joel Turner</td>
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<tr>
<td>Kramer 4A</td>
<td>WORKSHOP - Open Session Fair</td>
<td>15:45 - 17:30</td>
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<td>Organiser: Claudia Flores Saviaga</td>
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<tr>
<td>Kramer 4B</td>
<td>PANEL / ROUNDTABLE - Digital jobs in Africa: The opportunity or neglect?</td>
<td>15:45 - 17:30</td>
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<tr>
<td></td>
<td>Organiser: Kathleen Diga</td>
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<tr>
<td>Kramer 5A</td>
<td>WORKSHOP - ICT4Ag: Opportunities and Challenges for Using Technology to Reach Rural Farmers in the Developing World</td>
<td>15:45 - 17:30</td>
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<td>Organiser: Charles Steinfeld</td>
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<tr>
<td>Kramer 5B</td>
<td>HANDS-ON INSTRUCTION / PANEL / ROUNDTABLE - Writing books in ICT4D research - why and how?</td>
<td>15:45 - 17:30</td>
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<tr>
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<td>Organiser: Dorothea Kleine</td>
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<tr>
<td>Kramer 5C</td>
<td>PANEL / ROUNDTABLE - Scaling mobile for development: the importance of partnerships to successful business models</td>
<td>15:45 - 17:30</td>
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<td>Organiser: Tim Hatt</td>
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<tr>
<td>Kramer 5G</td>
<td>WORKSHOP - Infusing Gender into ICT4D: Innovating Research, Practice and Policy</td>
<td>15:45 - 17:30</td>
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<td>Organiser: Ineke Buskens and Gloria Bonder</td>
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</table>

### DAILY PROGRAMME

18:00 Reception and Research Showcase | Jameson Hall, UCT Upper Campus
DAY 2 | 8 DEC
PLENARY SESSIONS | Baxter Theatre, UCT

08:30 Welcome
08:45 Introduction
09:00 Prof. O’Connel, University of the Western Cape
09:15 KEYNOTE
Dr. Bitange Ndemo
09:30
09:45
10:00
10:15 TEA
10:30
10:45
11:00 Note Madness
11:15
11:30 Local, Sustainable, Small-Scale Cellular Networks
12:00 Chale, How Much It Cost to Browse?: Results from a Mobile Data Price Transparency Trial in Ghana
12:15
12:30 LUNCH
12:45
13:00
13:15 Play and power: a ludic design proposal for ICTD
13:30
13:45 The Impact of Public Access to ICTs: Findings from a five-year, eight-country study
14:00
14:15 ICTD in the Popular Press: Media Discourse around Aakash, the ‘World’s Cheapest Tablet’
14:30
14:45 TEA
15:00
15:15 Revisiting the Fishers of Kerala, India
15:30
15:45 Paper Madness
16:00
16:15 Housekeeping
16:30
16:45
17:00
17:15
17:30
17:45

19:00 Conference Dinner | Moyo, V&A Waterfront (Transport provided)
## DAILY PROGRAMME

### DAY 3 | 9 DEC
PARALLEL SESSIONS | Kramer Bld, UCT

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<tr>
<th>Session A</th>
<th>Session B</th>
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<tr>
<td>08:30 Marginality, Aspiration and Accessibility in ICTD</td>
<td>Creating Machine Readable Men: Legitimizing the ‘Aadhaar’ Mega E-Infrastructure Project in India</td>
</tr>
<tr>
<td>09:00 Minding the Gaps: Cultural, Technical and Gender-based Barriers to Mobile Use in Oral Language Berber Communities in Morocco</td>
<td>Reconstructing the State through ICTs? A Case of State Level Computerization in the Indian Public Distribution System</td>
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<tr>
<td>09:30 Literacy acquisition, informal learning and mobile phones in a South African township</td>
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**NOTES** - POSTER SESSION

| 14:00 When Technology Doesn’t Fit: Information Sharing Practices among Farmers in Rural China | When There’s a Will, There Might be a Way: The Economic Impact of Mobile Phones and Entrepreneurial Motivation on Female owned Microenterprises |
| 14:15 TroTro: Web Browsing and User Interfaces in Rural Ghana | Software Support for Creating Digital Health Training Materials in the Field |
| 14:30 Like a hustler: Aligning Intervention Design with Informal Labor Practices | Benefits and Barriers of ICT Usage at Open University: A case study of Indonesian domestic workers in Singapore |
| 14:45 | |
| 15:00 | |
| 15:15 | |
| 15:30 | |
| 15:45 | |
| 16:00 Integrating ODK Scan into the Community Health Worker Supply Chain in Mozambique | The Evolving Braid: How an Organization in Uganda Achieved Reliable Communications |
| 16:15 | |
| 16:30 | |
| 16:45 | |
| 17:00 | |
| 17:15 | |
| 17:30 | |

**COFFEE**

**TOWN HALL MEETING**

**NOTES and DEMOS will be available throughout DAY 3 and exclusively during the 10:00 (for demos) and 12:00 (for notes) timeslots.**

**19:00 Party with live band | UCT Sports Club**
## DAY 4 | 10 DEC
OPEN SESSIONS | Kramer Building, UCT

<table>
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<tr>
<th>VENUE</th>
<th>TIME</th>
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<th>ORGANISER</th>
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<tbody>
<tr>
<td>Kramer LT1</td>
<td>09:00 - 10:45</td>
<td>Affordable Internet for All: Exploring key</td>
<td>Sonia Jorge</td>
</tr>
<tr>
<td>Kramer LT2</td>
<td>11:15 - 13:00</td>
<td>Open Data in Developing Countries: Assessing</td>
<td>Joe Mertz</td>
</tr>
<tr>
<td>New Economics</td>
<td>13:00 - 15:30</td>
<td>Teaching ICTD – Courses, Degree Programs,</td>
<td>Tim Davies</td>
</tr>
<tr>
<td>Kramer 2B</td>
<td>15:45 - 17:30</td>
<td>Data Science and Development: Scaling Human</td>
<td>Vanessa Frias-Martinez</td>
</tr>
<tr>
<td>Kramer 4A</td>
<td>09:00 - 10:45</td>
<td>Appropriating ICTs for Developing Critical</td>
<td>Sammia Poveda</td>
</tr>
<tr>
<td>Kramer 4B</td>
<td>11:15 - 13:00</td>
<td>ICT4D and Online Freedoms: Competing</td>
<td>Karina Brisby</td>
</tr>
<tr>
<td>Kramer 5A</td>
<td>13:00 - 15:30</td>
<td>Mobile Media and Development</td>
<td>Melissa Denmore</td>
</tr>
<tr>
<td>Kramer 5B</td>
<td>15:45 - 17:30</td>
<td>Accessible Technology in ICTD</td>
<td>Joyojeet Pal</td>
</tr>
<tr>
<td>Kramer 5C</td>
<td>09:00 - 10:45</td>
<td>Software sustainability: Benefits and</td>
<td>Caitlan Bentley</td>
</tr>
<tr>
<td>Kramer 5G</td>
<td>11:15 - 13:00</td>
<td>Open and Networked Science for Development:</td>
<td>Ahmed Tareq Rashid</td>
</tr>
<tr>
<td>Kramer 5H</td>
<td>13:00 - 15:30</td>
<td>ICT Project Sustainability: Convergences,</td>
<td>Ellen Witte Zegura</td>
</tr>
<tr>
<td>Kramer 5J</td>
<td>15:45 - 17:30</td>
<td>ICT4D and Online Freedoms: Competing</td>
<td>Karina Bliss</td>
</tr>
<tr>
<td>Kramer 5K</td>
<td>09:00 - 10:45</td>
<td>Interact and Researching ICT4D</td>
<td>Jacobus Renken</td>
</tr>
<tr>
<td>Kramer 5L</td>
<td>11:15 - 13:00</td>
<td>Understanding and Researching ICT4D</td>
<td>Laurent Elder</td>
</tr>
<tr>
<td>Kramer 5M</td>
<td>13:00 - 15:30</td>
<td>Software sustainability: Benefits and</td>
<td>Ahmad Tareq Rashid</td>
</tr>
<tr>
<td>Kramer 5N</td>
<td>15:45 - 17:30</td>
<td>ICT Project Sustainability: Convergences,</td>
<td>Joyojeet Pal</td>
</tr>
</tbody>
</table>

NOTES will be available throughout DAY 4.
Local, Sustainable, Small-Scale Cellular Networks  
Kurtis Heimerl, Shadi Hasan, Kashif Ali, Eric Brewer, Tapan Parikh  
University of California, Berkeley

Over five billion people are active cellular subscribers, spending over a trillion dollars a year on communications. Despite this, hundreds of millions of people are still not connected. Implicit in these networks is a top-down design, with large nation-scale telecommunication firms deciding when and where coverage will be available. This is enforced by the large capital investment required to run cellular systems; base stations can cost upwards of US$100,000 and require expensive related core infrastructure. Recent technological innovations have enabled much cheaper cellular equipment; a base station now costs around US$10,000 and requires none of the other related systems.

This reduction in cost is enabling new models of cellular telephony. Small organizations are suddenly capable of being service providers. In this work we ask, “How successful would bottom-up cellular networks be?” Essentially we argue for and demonstrate a local cellular network, utilizing existing infrastructure (e.g., power, network, and people) to operate at much lower cost, with less required capital, bringing coverage to areas not traditionally able to support cellular deployments. This network also provides sustainable employment and revenue to local entrepreneurs and services for the local community.

We demonstrate the value of this concept by conducting an ongoing six-month long field deployment in rural Papua, Indonesia, in partnership with local NGOs. This network is currently live, with 187 subscribers sustainably providing US$830 per month in revenue (US$368 in profit) for the operator and employment for three different credit sellers in the village. We also show that this network provides a valuable service to the community through usage logs and user interviews.

Chale, How Much it Cost to Browse? Results from a Mobile Data Price Transparency Trial in Ghana  
Nithya Sambasivan, Paul Lee, Greg Hecht, Paul M. Aoki, Maria-Ines Carrera, Jenny Chen, David Pablo Cohn†, Pete Kruskall†, Everett Wetchler†, Michael Yousefsmir, and Astrid Twenebowa Larssen*  
Google Inc.  
†Affiliated with Google at the time of the project *Affiliated with Halogen, Cort Adelers gt 30, Oslo, Norway

Mobile data usage is on the rise globally. In emerging regions, mobile data is particularly expensive and suffers from the lack of price and data usage transparency needed to make informed decisions about Internet use. To measure and address this problem, we designed SmartBrowse, an Internet proxy system that shows mobile data usage information and provides controls to avoid overspending. In this paper, we discuss the results of a 10-week study with SmartBrowse, involving 299 participants in Ghana. Half the users were given SmartBrowse, and the other half was given a regular Internet experience. Our findings suggest that, compared with the control group, using SmartBrowse led to a significant reduction in Internet credit spend and increased online activity among SmartBrowse users, while providing the same or better mobile Internet user experience. Additionally, SmartBrowse users who were prior mobile data non-users increased their webpage views while spending less money than control users. Our discussion contributes to the understanding of how forward-looking ICTD research in the wild can empower mobile data users, in this case, through increased price transparency.
Play and Power: a Ludic Design Proposal for ICTD
Padma Chirumamilla, Joyojeet Pal
School of Information University of Michigan 150 S. State St, Ann Arbor, MI, USA

This paper puts forth a notion of ludic design, drawing from work in HCI by Phoebe Sengers and Bill Gaver, as an avenue through which ICTD can begin to contend with the historical discourse of the developmental enterprise. This discourse, which we term the “developmental optic,” is one that envisions the subjects upon which it acts the primary user audience of ICTD projects and services as perpetually “backward,” perpetually in need of improvements decided upon by a (usually Western) other. Ludic design proposes that “non-productive” activities and desires—the need to have fun, the need for entertainment in one’s life—be taken up as central to ICTD projects, as they provide a means by which the developmental optic may be countered. We look at the approaches taken towards “fun” and the desire for entertainment by three ICTD projects—the community radio project Namma Dhwani, the agriculture extension project Digital Green, and the educational project MILLEE. We then discuss how approaches to affect and “fun” in the field of HCI may be of use to ICTD researchers in trying to reimagine the discursive frame in which their projects function.

The Impact of Public Access to ICTs: Findings from a Five-Year, Eight-Country Study
François Bar
Annenberg School for Communication and Journalismfbar@usc.edu

Chris Coward, Lucas Koepeke Chris Rothschild, Araba Sey
Technology & Social Change Group Information School University of Washington

George Sciadas
61 Townsend Drive Ottawa, Ontario Canada

This article summarizes the findings of a five-year study investigating the impacts of public access to information and communication technologies (ICTs). The research was conducted in eight low and medium income countries employing a range of survey, ethnographic, and experimental research approaches. The analysis revealed substantial first-order effects in terms of technology access, information access and ICT skills development. Second-order effects in domains such as health, education, employment and income varied considerably, though when public access users had a need in any of these areas they were generally successful in achieving their goals. The study also found significant impacts among non-users, a group that includes former users, a largely unexplored dimension of public access. These findings challenge a commonly held notion that public access is solely a stepping stone to private access.

ICTD in the Popular Press: Media Discourse around Aakash, the ‘World’s Cheapest Tablet’
Preeti Mudliar
University of Texas at Austin College of Communication

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The quest for the low-cost computer has been among the primal motivations of innovation and practice in the ICTD world from its very beginnings. We discuss continuing developments in case of the low-cost Indian tablet, Aakash, publicized as the world’s cheapest computer, and situate these within a history of India’s quest for development through technology in the past two decades. We analyze 212 articles on Aakash and find four dominant themes in the way the device has been discussed in the popular media. These include the cult of a technocratic leadership, the discourse of indigenous technology, the recreation of the Silicon Valley dream, and the face of the marginal user. We argue that Aakash has gone beyond being a technology artifact to a device that represents Indian aspirations at several levels—as a forward thinking state, an ingenious entrepreneurial class, and an energetic population that needs nothing but access to technology to succeed.
Revisiting the Fishers of Kerala, India
Janaki Srinivasan
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Jenna Burrell
School of Information University of California

In this paper, we revisit a study that has become canonical in ICTD, economist Robert Jensen’s study of mobile phone use in fishing markets in north Kerala. Jensen found that the use of mobile phones to share market price information made fish markets more efficient while also improving producer and consumer welfare. Based on our own ethnographic case study in the region, our goal is to understand the geographic and political-economic conditions in which Jensen’s findings hold and to examine questions of generalizability. We show that what makes the fish trade in north Kerala a special case is, in part, due to its coastal geography and prevalent credit relationships that provided fishers the flexibility to optimize profits by selling at different markets. However, we also found that those working in various roles in Kerala’s fishing industry emphasized more broadly the use of phones in maintaining trade relations, facilitating coordination, and protecting themselves during times of risk, vulnerability, or emergency. We suggest that parsimonious models, such as Jensen’s, can generate blind spots, which are problematic when such studies are used to draw broader conclusions about policy and technology design.

Marginality, Aspiration and Accessibility in ICTD
Joyojeet Pal1, Tawfiq Ammari1, Ramaswami Mahalingam1, Ana Maria Huaita Alfaro2, Meera Lakshmanan3
University of Michigan1; University College London2; Independent Scholar3

We present narratives around the use of Access Technology (AT) by 176 people with vision impairments in Peru, Jordan, and India. Respondents note changes in their economic and social aspirations following access to AT, but experience multiple forms of exclusion from the public sphere due to persistent negative social attitudes disability. We argue that building theoretical frames that examine the nature of marginality is an important direction for ICTD to better understand ways in which individuals appropriate technologies, and use them to change their social environment they exist in.

Minding the Gaps: Cultural, Technical and Gender-Based Barriers to Mobile Use in Oral-Language Berber Communities in Morocco
Leslie L. Dodson, S. Revi Sterling, John K. Bennet
University of Colorado

The proliferation of text-based applications in the Mobiles for Development (M4D) domain tends to privilege the conventional wisdom that texting is a ubiquitous skill among mobile phone users. This view obscures many real and present barriers to using SMS and mobile features, most critically where low literate and/or oral language-dependent communities cannot rely on text as a viable communications system. This paper investigates mobile “utility gaps”— the spaces between high rates of mobile phone ownership and low use of productive features on mobile phones. These gaps preclude the adoption of many text-based development initiatives, which in turn affects the potential impact of such initiatives. Working with low-literate Berber-Muslim women in a predominantly oral-language community in rural southwest Morocco, we have found that an overall lack of functional literacy and numeracy is a major contributor to a mobile utility gap in that community. Non-standard mobile phone interfaces, a complex language environment with both Arabic and Berber dialects and multiple alphabets and gender-specific cultural norms also present significant impediments to using mobile phones as a development strategy in the Berber communities studied. Furthermore, we explore the paradox of social networks where a reliance on others to assist with phone use is often coupled with surveillance and a loss of privacy. These results are potentially relevant to projects involving other indigenous communities in North Africa.
Literacy Acquisition, Informal Learning and Mobile Phones in a South African Township
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The uptake of mobile phones has been especially remarkable in the developing world. For the first time in history people at the bottom of the income pyramid can also take part in the telecommunication society. Mobile phones can play a unique role in reaching those who are outside the scope of formal or institutionalized schooling and open doors to out-of-school learning practices. Based on ethnographic fieldwork in Wesbank, an impoverished community in Cape Town, we look at the (informal) learning practices “illiterate” and “low literate” women engage in, in an attempt to gain voice in new communicative realities by learning how to become cell phone literate and at the different levels of competence this informal learning generates. The mobile phone has become a learning tool, nourishing learning practices in emerging “communities of practice” in which learning is a social activity in which anyone with any knowledge on mobile phones and mobile phone literacies becomes a potential tutor.

Machine Readable Men: Legitimizing the ‘Aadhaar’ Mega E-Infrastructure Project in India
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Mega infrastructure projects require considerable financial and human resources. Their costs are hard to justify, especially in low-income countries, and their sustenance depends to a large extent on their success in gaining political and public legitimacy. This paper examines one such project in India – ‘Aadhaar’ – developed to provide biometric-based identification for the 1.2 billion residents of India. Since its initiation in 2010, the project has issued more than 320 million identification numbers. Aadhaar is India’s first state-sponsored e-infrastructure mega project and is unique for its survival in the face of severe opposition. We argue that the project survived because its proponents were able to legitimize it by showcasing its promise of poverty reduction and financial inclusion, and by making it a metaphor for progress and development. We compare the project with two mega projects undertaken earlier in India – the railroad network and a dam project – and find that Aadhaar’s digital infrastructure made the use of symbolism harder, thereby requiring different strategies to gain legitimacy.

Reconstructing the State through ICTs? A Case of State-Level Computerization in the Indian Public Distribution System
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This study focuses on the role of public sector ICTs in reconstructing the image of the state, as conceived by developing country citizens. Drawing on contemporary readings of the Gramscian politics of the governed, I look at the Indian Public Distribution System (PDS), a food security net based on subsidization of foodgrains to the poor, as it is locally computerized in the state of Kerala. My results, derived through an in-depth case study, confirm and dismiss theory at the same time: on the one hand, the state uses new technologies for reshaping its image, and indeed the very nature of its service provision. On the other hand, though, the loci of image formation that are found in citizens (direct experience, social networks, and political circuits) systematically escape control by governmental action, and seem to be only marginally touched by the ICT-induced reinvention of government. It seems, therefore, that the capacity of the state to reconstruct its image, through the usage of new technologies, is limited by the nature of the spaces of image formation which citizens experience in their daily lives.
From Infomediaries to Infomediation at Public Access Venues: Lessons from a 3-Country Study
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Andrew Gordon
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This study investigated the role of infomediaries to understand the process of infomediation in shaping outcomes for users at public access venues (PAVs) in Bangladesh, Chile and Lithuania. We examined the extent to which technical skills and empathy are relevant to and appreciated by different types of users, and whether differences in infomediaries are evident across different types of PAVs. We asked whether particular infomediary behaviours were associated with outcome differences as reported by PAV users. We learned that infomediaries provide the human face for the information age by taking on the functions of facilitation, coaching, referral and teaching, and by assuming the role of a trusted gatekeeper. The process of infomediation turned out to be of prominence, within which the infomediary is a key component. In the absence of infomediaries, those left behind (or excluded due to their age, socio-economic status, level of education/literacy, gender, disability or caste) will face additional, perhaps insurmountable, barriers.

Tweet to Trust: Social Media and Elections in West Africa
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Sassafras Tech Collective
Michael L. Best
Sam Nunn School of International Affairs, School of Interactive Computing, Georgia Institute of Technology

Today is an exciting time to be a political activist in sub-Saharan Africa, particularly for the technically inclined. Online social media and other digital technologies are increasingly being used for political purposes. But this phenomenon raises the question of how, if at all, these new media actually perturb the political landscape. These questions have been well-studied in Western contexts, but remain relatively underexplored in developing regions where traditional media are often scarcer, democracies are younger, and the effect of social media on politics has the potential to be quite distinct. This paper explores these questions through a qualitative dual case study of social media use during general elections in Nigeria and Liberia in 2011. Participants suggested that social media helps to overcome previous scarcity of information during the electoral process, leading to increased transparency and reduced tension. Furthermore, social media-based monitoring shows encouraging signs of robustness concerning information quality and mobility. Together, these findings suggest that given sufficient civil-society coordination, social media can be an effective tool for electoral scrutiny and can help build public trust in the electoral process.
Understanding Barriers to Information Access and Disclosure for HIV+ Women
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ICTD researchers have employed several technology interventions to help combat the HIV/AIDS epidemic in developing regions. These interventions address medication compliance, decision-making support for health care workers, and awareness campaigns. A majority of these interventions focus on dissemination of information on HIV prevention, testing and treatment. Our research surfaces the situated knowledge of HIV positive women to examine how heterosexual married couples in Chennai (India) manage knowledge of an HIV-positive status, illustrating why dissemination models often fail to lead to safer health practices. Timely disclosure to sexual partners is critical for preventing transmission and ensuring effective treatment. However, voluntary disclosure between married couples can take up to eight years. Patients often valued maintenance of social connections over longer life spans and health. We describe these sites of dissonance and articulate the conflicting needs and conditions that determine concealment of HIV status. We discuss how socio-cultural factors such as gender structures in intimate relationships determine access, understanding and use of information critical to prevention of the HIV/AIDS epidemic. We ask how the ICTD prioritization of efficiency, standardization and measurement neglect the affective and relational experiences that determine the spread of the largest global health crisis. Finally, we provide a set of design considerations and provocations for ICTD researchers to begin addressing the underlying socio-cultural factors that could ensure greater use of beneficial health information by individuals at risk.

Using Automated Voice Calls to Improve Adherence to Iron Supplements during Pregnancy: A Pilot Study
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For years, researchers have explored the use of mobile phone reminders to improve adherence to medication. However, few studies have measured the direct medical benefit of those reminders, especially for low-literate populations in the developing world. This paper describes the use of automated voice calls to promote adherence to iron supplements among pregnant women in urban India. Unlike prior studies, we assess impact via a direct measurement of hemoglobin (Hb) levels in the blood. We enrolled 130 pregnant women from a low-income area of Mumbai, India and randomly assigned them to control and treatment groups. Both groups received a counseling session and a free supply of medication. The treatment group also received short audio messages, three times per week for a period of three months, encouraging them to take iron supplements. Results suggest that automated calls positively impacted Hb levels. However, because we could only recover 79 women for follow-up, and the effect size was small, our results lack statistical power (average change in Hb = 0.43 g/dL, 95% CI = -0.13 0.98 g/dL, p=0.13). We conclude that automated calls deserve further consideration for reducing maternal anemia, and we share our lessons learned for the benefit of future interventions.

When Technology Doesn’t Fit: Information Sharing Practices among Farmers in Rural China
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Mobile phones and the Internet are increasingly available in rural China, and used by people of all ages and educational levels. But despite the significant investments made by the Chinese State to “informatize” rural areas in order to help local residents improve their lives and economic opportunities, ICT do not seem to find a place in the one activity that still dominates the countryside: farming. This paper draws from ethnographic findings to show how the gathering and sharing of agricultural information is organized in rural China. By using a Community of Practice framework, it argues that ICT are not (yet) used by farmers because farming is a distributed social activity, where the individual farmer makes individual decisions, but these decisions are shaped by the decisions, expectations, examples and judgment of the community as a whole, a body of increasingly older people who are not always interested in maximizing their income and/or changing their practices to increase efficiency—through ICT or other means. Moreover, the rich and layered local knowledge built within the community is mostly based on oral exchanges and face-to-face encounters, and often relies on family ties and clan networks to evaluate the trustworthiness of communication. These patterns of communication are still not well supported by informatization projects and have proven resistant to such efforts.
Like a Hustler: Aligning Intervention Design with Informal Labor Practices
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Pennsylvania State University

In this paper, we describe the findings from fieldwork conducted with low income youth in Nairobi in the context of a mobile phone based solution for employment in the informal sector. We utilize a narratives based approach to analyzing the lived experiences of our target demographic and present our findings in the form of design cues. In particular, we focus on the identity work conducted by our respondents, the barriers they face in accruing their livelihood, and the aspect of discontinuity in their employment, housing, and support systems. We present a set of design cues which are concerned with generating physical artifacts based on virtual activity, co-opting group dynamics, integration with government and civil society actors, and empowering the voice of informal workers. Our hope is to better align program priorities and delivery systems in accordance with patterns evinced from oral accounts of the intended beneficiaries.

TroTro: Web Browsing and User Interfaces in Rural Ghana
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The quality of Internet connections around the world is extremely varied and very poor in rural areas despite high enthusiasm and investment of resources in computers. This study focuses on Internet users at schools and Internet cafés in rural Ghana. We wished to explore whether there were challenges to Internet use in addition to the poor connection quality itself. In our study we found that beyond connectivity, the lack of computer knowledge, poor usability of web interfaces, and “foreignization” of technology compounded the problem. To improve web access in these contexts, we designed TroTro, a browsing system that maintains a usable experience despite fluctuating connectivity and a wide range of user expertise. We followed web usability heuristics in our design and our results show evidence that our system allows both novice and expert computer users to enhance their individual web experience, explore content across different kinds of network conditions, and share resources within their community.

When There’s a Will, There Might be a Way: The Economic Impact of Mobile Phones and Entrepreneurial Motivation on Female-owned Microenterprises
Han Ei Chew
United Nations University
P. Vigneswara Ilavarasan
Indian Institute of Technology
Mark R. Levy
Michigan State University

Based on a survey of 598 urban microentrepreneurs in Chennai, India, we contend that access to mobile phones is a necessary but not sufficient condition for achieving certain development goals. We explicate an innovative concept, entrepreneurial expectations, and explore its linkage with mobile phones and microenterprise growth. We found that among high-expectation microentrepreneurs (14 percent of the sample) business use of mobile phones amplified the impact of entrepreneurial expectations and was associated with greater microenterprise growth.
Software Support for Creating Digital Health Training Materials in the Field
Maletsabisa Molapo, Gary Marsden
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In this paper, we present the design, implementation, and deployment of a tool developed to help rural health trainers to create digital training content for low-literate Community Health Workers (CHWs) in Lesotho; the digital content being mobile videos created from combining images, voice-over, and/or video clips. Our results show that when health professionals who are based in rural areas were empowered by the tool to create their own content, they were able to supplement nationally and globally produced health training materials with more locally relevant content that addresses unique information needs within their communities. We discuss other lessons learned from an eight-months deployment of this tool in Lesotho, and conclude with recommendations on how a similar project can be implemented in other developing regions.

Benefits and Barriers of Learning and Using ICTs at Open University: A Case Study of Indonesian Domestic Workers in Singapore
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ICT's biggest impact in higher education has been to facilitate distance learning, and open universities around the world have extended education to marginalized groups for whom it would usually be beyond reach. The conditions particular to migrant domestic workers warrant further investigation. Using Banuri et al.'s [2005] value-of-ICTs-to-education framework and adapting Chib et al.'s [2008] ICTs for healthcare development model for education, the present study employed a qualitative method to examine the benefits of using ICTs as an opportunity producer, capacity enhancer, knowledge producer and social enabler, as well as the economic, technological, infrastructural and socio-cultural barriers to effective ICT use. In-depth interviews (N = 20) were conducted with Indonesian domestic workers enrolled in the Open University. The findings suggested that the women see value and gain various benefits from using ICTs for their learning process, in their current role as a domestic worker and professional orientation. However, multiple barriers need to be overcome, including the negotiation of multiple roles as their family's breadwinner, domestic worker and student. Implications and direction for future research are discussed.

Integrating ODK Scan into the Community Health Worker Supply Chain in Mozambique
Nicola Dell, Jessica Crawford, Nathan Breit, Timóteo Chaluco, Aida Coelho, Joseph McCord, Gaetano Borriello
University of Washington; VillageReach; John Snow, Inc., USAID | DELIVER PROJECT

We describe our experiences integrating ODK Scan into the community health worker (CHW) supply chain in Mozambique. ODK Scan is a mobile application that uses computer vision techniques to digitize data from paper forms. The application automatically classifies machine-readable data types, like bubbles and checkboxes, and assists users with the manual entry of handwritten text and numbers. We designed an intervention that uses paper forms in conjunction with ODK Scan to monitor CHW usage of essential health commodities, finding that the application is capable of providing supervisors and stakeholders with important information regarding health commodity availability in the field. Specifically, we (1) detail our experiences integrating ODK Scan into the health worker supply chain in Mozambique, with particular emphasis on the critical (and often under-reported) role of practitioners; (2) evaluate the impact of the technology at multiple levels of the information hierarchy, providing quantitative and qualitative data that exposes the benefits, challenges and limitations of the technology; and (3) share lessons learned and provide actionable guidance to researchers and practitioners interested in ODK Scan or other systems that bridge the gap between paper-based and digital data collection.
Instituting Credibility, Accountability and Transparency in Local Service Delivery? Helpline and Aasthi in Karnataka, India
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Edward Cutrell
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While e-governance is acclaimed as a means to decentralisation, and an efficiency and accountability enhancing mechanism, it can be implemented in different ways. In a strong centralized state like the Indian state, decentralization is often pursued in a centralized manner through top-down interventions. This paper, traces the implementation of two centrally driven e-governance interventions in the state of Karnataka, India i.e. Helpline and Aasthi to argue that while ‘centralized decentralization’ may be justified on grounds of standardization, it can have divergent outcomes, many of which are often contrary to the objectives of decentralization. The experience of Helpline and Aasthi belies the claim of e-governance being an efficiency and accountability enhancing mechanism. On the contrary, the centralized approach to decentralization in implementing Helpline and Aasthi has weakened the accountability of the state and limited the efficiency gains of urban decentralization.

Dealing with the Digital Panopticon: The Use and Subversion of ICT in an Indian Bureaucracy
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To what extent can information technology be used to eliminate government corruption? In this paper, I examine an ambitious experiment by a South Indian state in the use of Information and Communication Technologies (ICT) within a bureaucracy to reduce corruption. In this initiative, the senior bureaucrats built a digital network to remotely control the implementation of a public rural employment scheme. Focusing on the technology-based implementation for this paper, I show that centralization of implementation that the technology enabled could significantly overcome the endemic corruption that tends to happen in the local “last mile” of such schemes. I also find how technology designed for control can be subverted at the local level. My work suggests that the future of such government programs lies in incrementally resolving the conflicting forces and interests involved and that the move towards technical is as much a political project.

The Evolving Braid: How an Organization in Uganda Achieved Reliable Communications
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Eric Brewer
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When engaged in ICTD research, it is often simpler to focus efforts on a single specific technology, whether that entails computers for telecenters, mobile phones for data collection, or text messages for public health education. In practice, however, people and organizations use a variety of technologies together, smoothly interweaving them as they navigate their lives. In this paper we analyze the ways in which a health financing organization in Uganda integrates a variety of communications technologies together to achieve reliable communications with their partnering health facilities distributed throughout Southwest Uganda. Based on four years of participant observation, we describe two communication scenarios in this organization to illustrate braided communications at work. We find that stakeholders work together to develop and maintain effective relationships using many different communications channels together in parallel, a combined channel we describe as braided communications. Braided communications have three primary characteristics. Firstly, they use co-existing channels, employing each as best suits a given set of goals. Secondly, they are co-dependent, or co-reinforcing, with strengths of individual channels reinforcing weaknesses of other channels. Finally, they are co-evolving; as available technologies and the ways in which they are used change, the nature of the braided use changes as well.
Value of Mobile Monitoring for Diabetes in Developing Countries

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Mobile phones are becoming a new platform to offer health services throughout the world, particularly in developing countries where the health sector experiences serious shortages. Diabetes is a metabolic disorder that refers to the condition created by the body’s inability to regulate glucose levels. It has been labeled the “silent epidemic” for its insidious and chronic nature. The medical profession has postulated that patients could benefit from a system providing continuous glucose readings and that the predicted explosion of diabetes in the developing parts of the world could be averted using mobile health solutions. In remote areas where healthcare workers are scarce and patients have high travel cost it might be the only way to monitor the condition. We define a model that evaluates a mobile health solution to monitor diabetes and explore the influence of two factors on the model: the discount rate and the cost of a telecom service. We test the model on data from three countries with a considerable health-care burden associated with the disease: the USA, Brazil and India.

The PartoPen in Practice: Evaluating the Impact of Digital Pen Technology on Maternal Health in Kenya

Heather Underwood, S. Revi Sterling, John K. Bennett  
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This paper critically examines the use of digital pen technology at two key points in the healthcare system in Kenya: nursing student training and patient care in public labor wards. The PartoPen system – a digital pen software designed to enhance the paper labor monitoring tool known as the partograph – was evaluated with 95 nursing students at the University of Nairobi (UoN), and with 50 nurses in the labor ward at Kenyatta National Hospital (KNH). Students using the PartoPen had significantly higher scores on partograph worksheets than students using a silent PartoPen, especially on challenging and high-risk labor cases and on difficult sections of the partograph. In the maternity ward study, nurses unanimously reported positive improvements in the number of partographs they were able to complete, but these qualitative responses were not supported by the quantitative data. We discuss the results of both studies, and what these results suggest about the potential value of the PartoPen at different levels of the healthcare delivery and training hierarchy.
Understanding mHealth Impact among Aponjon (MAMA Bangladesh) Subscribers through a Phone Survey in Bangladesh

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The aim of the phone survey was to understand whether any mHealth can make any significant contribution to public health or not. The survey results show that almost two-thirds (63%) of Aponjon primary clients who have completed the Aponjon service cycle from the time of registration up to the delivery of a child attended at least four antenatal care (ANC) visits. This represents a 37% increase over a 2011 national baseline of 26% attending four ANC visits. It is also important to note that 45% of the Aponjon subscribers went to a facility for delivery and 32% chose safe delivery at home. The survey results were also encouraging for subscribers in the ‘new mother’ category. 56% of new mothers did a postnatal care visit, 91% of new mothers fed colostrum after delivery, and 83% of new mothers practiced exclusive breastfeeding. The immunization rate of BCG was 96%, and immunization rate of Pentavalet was 100%. The phone survey revealed that overall 93% of subscribers were satisfied with the service.

MVoice - A Mobile Based Generic ICT Tool

Siddhartha Asthana, Pushpendra Singh

Abundance of mobile phones in developing nations makes them an effective tool to spread information and communication technology. Currently different mobile based platforms are being used in a variety of ICT contexts in developing nations. These systems have been built with different features according to the context in which they are used. After studying existing tools, we have developed a generic mobile based ICT tool, named MVoice, which can serve in multiple contexts with minimal configuration changes. Our tool can also be extended easily to satisfy new requirements. In this paper, we present our experience and results from four real-world deployments, each in a different context, of MVoice.

Psychological Dynamics in ICTD Projects

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In this paper we categorize the types and prevalence of psychological factors that were present in ICTD interventions described in the ICTD2012 proceedings. With an eye towards recommendations for better understanding and addressing these dynamics, we then interpret and discuss these findings. We conclude that psychological dynamics on an individual level of analysis are either more prominent or tend to be identified more often by ICTD practitioners/researchers than dynamics on dyad/team and organizational levels. In addition, instances where psychological dynamics impede the success of ICTD interventions feature more prominently than dynamics which facilitate the success of those interventions. We argue for a greater appreciation and enhancement of positive psychological dynamics on higher levels of analysis through a more robust application of theory relating to organizational behavior.
The Ability of Video Training to Reduce Agricultural Knowledge Gaps Between Men and Women in Rural Uganda

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This study explored the effectiveness of video training delivered by portable battery-operated projectors to narrow the gap in agricultural knowledge between men and women in rural Uganda. Through the pre-post quasi-experiments, this study found that both video and traditional lecture-demonstration training approaches could significantly improve knowledge scores for both men and women. The method that combined video and lecture demonstration was significantly more effective in narrowing the gender knowledge gap. Use of video alone improved women’s knowledge scores as much as men but did not reduce the preexisting knowledge gap between them.

Doctor-Patient Interaction in Telemedicine: Linking the Structurational Aspects to Institutionalization

Rajesh Chandwani, Rahul De

This paper focuses on telemedicine implementation and use, which can be used to extend modern medical knowledge to remote areas in developing countries. By examining doctor patient interactions in two different contexts of telemedicine programs in India, we posit how the actors interacting over virtual media reinforce and shape the structures, which in turn, are determined by the institutional logics of the context. This process determines the adaption and evolution of a new technology. The paper draws on the tenets of structuration theory and institutional logics to extend the theoretical understanding of the process of evolution of a new technology and emphasizes the essential role of considering the existing institutional logics in the design and implementation process.

Voice-Based Marketing for Agricultural Products: A Case Study in Rural Northern Ghana

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We present a study conducted in rural Northern Ghana about issues around the marketing of agricultural products and the need of mobile-based ICT solutions. The need for the spread of information and web access to communities in developing countries has given rise to the design and development of numerous ICT solutions, many of which have focused on the recent increase of mobile usage in developing countries. The contributions of this paper are: 1) Empirical results from a field survey run in Northern Ghana, which points to issues of a lack of buyers, low price offers and lack of transportation to sale points as the main issues in marketing of agricultural products and also points to the potential for mobile-based ICT solutions to mitigate the pertinent issues within the case study, but also in other areas. 2) The development of a voice-based prototype that allows medium to large-scale farmers in rural areas to place advertisements on the World Wide Web. The prototype was evaluated based on functionality and feasibility, including financial sustainability.
NOTE ABSTRACTS

InfoMe @ Teen Design Days: A Multi-Disciplinary, Design Thinking Approach to Community Development
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Despite advances in science and technology, improving the lives of people worldwide is a continuous challenge. Our mixed-method, action-oriented research focuses on youth and the powerful roles they play as information and technology mediaries within their communities, particularly among elders. In this paper, we report on findings from Teen Design Days, an experimental multi-disciplinary framework that uses design thinking combined with perspectives from ICTD, computer science, and information behavior in information science. Teen Design Days enable investigators to explore concepts, test ideas and build ICTD solutions with youth while meeting youths’ developmental needs in safe settings and in culturally and gender appropriate ways. Our early findings suggest that teens often assist with situations of daily living ranging from employment and healthcare to education, childcare, social cohesion, navigation, and more that circumvent linguistic, technological and other barriers. Moreover, we are finding that youth are competent partners in designing community-based systems. Findings—to date, we have worked primarily with teens from East African countries, Vietnam and Nepal—are relevant to researchers, designers and policy makers working with youth in development settings worldwide.

Mobile4D: Crowdsourced Disaster Alerting and Reporting
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Small and large-scale disasters are a major factor for poverty. When information is sent out at an early stage and directly to people affected, impact on environment, people, livestock, crop, and belongings can be minimized. We present Mobile4D, an integrated mobile crowdsourcing-based disaster alerting and reporting system tested in Lao PDR. With Mobile4D it is possible to gather information from affected people, to establish direct communication channels between affected people and administrative units, and to rapidly distribute information to regions and people struck by disasters.

The Agent in a Transformational M-Banking Ecosystem – Interface or Intermediary?
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The bank-led branchless banking model in India was born out of a national financial inclusion mandate that seeks to connect unbanked populations to formal financial services. This is implemented through a transformational, hybrid infrastructure that extends outreach via low-scale banking structures. These low-scale banking structures take banking services out of the brick-and-mortar bank branches and into the hands of non-bank agents (or business correspondents) that can now drive uptake in unserved regions on the branchless banking platform. This note demonstrates the results of a study that looked at Eko, one of the prominent mobile banking business correspondents in India, in its collaboration with the largest public sector bank in the country. In particular, this note will focus on the role of their retail agent network and how certain informal, frequently unstipulated, practices on their part may help in acquiring and retaining customers on the platform. In this way, the retail agent network may indeed help in sustaining the transformational mobile banking ecosystem.
Assessment of Community Wellness Outcomes to Measure ICT Impact
Ricardo Gomez, Philip Reed, Hwa Young Chae
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Measuring the development impacts of ICTD interventions continues to be an unresolved problem, especially when trying to include non-traditional development measures beyond economic growth, such as empowerment and social capital. A growing body of work shows that the impact of ICTD programs is more frequently related to capabilities and other non-material notions of wellness, and that these aspects are easily missed when looking only at traditional tangible outcomes such as income or economic growth, education and health. We argue for an alternate approach that measures non-material impacts of ICTD, which we term Community Wellness Outcomes (CWO). We suggest measurement instruments (qualitative and quantitative) to assess CWO related to self-efficacy/self-esteem, expressions of aspirations, personal relations, and civic engagement. Through testing in community settings in Brazil (LAN Houses) and in Colombia (public libraries) we will refine and validate the measurement of CWO as a way to understand non-material impacts of ICTD from the perspective of human capabilities and community wellness, offering a more complete picture of the contributions of ICT to community development than those that rely solely on traditional economic development measures.

Ila Dhageyso: An Interactive Voice Forum to Foster Transparent Governance in Somaliland
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University of Michigan1; University of Washington2
* This work was conducted while the author was at MSR India

In many developing countries, it is challenging for remote communities to access reliable and accurate sources of news. This paper examines the case of Somaliland, where there is a fragmented media landscape that is subject to tribal biases and manipulations. Often, exaggeration or misrepresentation of facts prompts conflicts and hostility towards authorities, especially in remote areas. To foster more transparent communications between governmental institutions and the public, we built and deployed an interactive voice forum, accessible to anyone with a basic mobile handset. Called Ila Dhageyso, this forum enables callers to listen and respond to official recordings from the Presidential Ministry, as well as to the responses of other callers. Audio messages are also threaded and posted on YouTube to involve Somaliland people in diaspora. From December 2012 to April 2013, Ila Dhageyso logged 4,300 posts from callers. This paper reviews the media climate and geopolitical circumstances in Somaliland that motivated the formation of Ila Dhageyso. It also describes the design, implementation, and experiences gained in the first exploratory deployment of the service.

Simplifying and Improving Mobile Based Data Collection
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IIIT-Delhi, India1; Stanford University, USA2; Independent Researcher3

Social programs often require collection of demographic and program related information. Pen-paper surveys have been the most favorable way of collecting such information. However, with proliferation of smartphones, low cost mobile connectivity with good coverage and availability of several data collection applications that can even work around the connectivity concerns, pen-paper surveys are now being replaced by mobile based data collection. In this work, we discuss the enhancement of Open Data Kit (ODK), an existing mobile based data collection application, with features such as pre-filling and validation SMS. The additional features were motivated from the real world requirements of reducing the data collection effort and minimizing the discrepancies in records for a project requiring information dissemination to beneficiaries of National Rural Employment Guarantee Scheme (NREGS), a government of India scheme. Data collection exercise, using our extended tool, is currently ongoing in two districts across two different states in India. Preliminary results from one deployment indicate that even with 8% of pre-filled fields in a form, there was a 16.1% decrease in the errors. Additionally, time per survey reduced with the pre-filling option. Preliminary results from another deployment indicate that 35% of the pre-filled forms had mismatched or changed information when compared with the data available in government records.
NOTE ABSTRACTS

Participate, Collaborate, and Decide: Defining Design Problems in a Syrian Community
Ammar Halabi1, Basile Zimmermann2, Michele Courant1
University of Fribourg1; University of Geneva2
This paper discusses an exploratory approach for identifying potential ICT design problems in a local community through collaboration with its members. We are currently participating in the activities of a volunteer community in Syria, where members appropriate Facebook and other online tools to collaborate and organize. In such context, conducting participatory design is not straightforward and needs to be problematized. For instance, what is the desired outcome of participation? Who participates in what? And what are the suitable tools? Here we focus on the value of participation in defining relevant design problems in collaboration with the community. We present our research process where we adopt an ethnographic approach guided by the works of sociologists Howard Becker, Juliet Corbin, and Anselm Strauss. We finally describe how this approach also allows us to move from participant observation towards participatory design.

Computer Science Research Capacity as a Driver of ICTD Innovation: Institutional Factors in Kenya and Uganda
Matthew Harsh1, G. Pascal Zachary2
Concordia University1; Arizona State University2
Computer science (CS) is a core component of the Information and Communication Technologies for Development (ICTD) field, providing the technical underpinning of ICT innovations that aim to improve the livelihoods of members of poor and marginalized communities. Previous studies of ICTD research capabilities in Africa have begun to describe the current state of CS research, mostly through bibliometric analyses. However, there have been few studies that explore, in detail, the factors that influence how CS capabilities are being constructed in Africa, especially studies based on in-depth interviews and surveys. This note introduces a research project and presents preliminary findings that address this important gap in our understanding of ICTD innovation ecosystem. Based on over 20 semi-structured interviews with CS researchers; government policymakers; and representatives from donors, private companies and innovation hubs, we discuss our emergent findings that focus on how structural and institutional issues are linked to building CS capacity. We argue that structural and institutional factors – such as the relationship between CS departments and their parent universities, and the relationship between universities and the private sector – can be as large of roadblocks to building CS capacity as technical barriers. Because this note represents research work in progress, we conclude with a reflection on how the project will proceed as the research enters its main phase next year.

Impact of the Introduction of IC Card Transport Fare Collection System and Anti-corruption: Case Study of a Pilot Project for a Government Bus Corporation in Bangladesh
Tsuyoshi Kano
Japan International Cooperation Agency (JICA)
Japan International Cooperation Agency (JICA) led a pilot project for the introduction of a bus fare collection system through integrated circuit (IC) card in Bangladesh. The project resulted in not only improved efficiency through systemization and customer satisfaction, but also an unintentional rise in sales and a high evaluation from women. Based on these results, this paper discusses the necessity of an incentive mechanism for employees in addition to anti-corruption measures through systemization, both of which are factors in the success of the introduction of the IC transport card and increased accessibility to women.
A Connective Massive Open Online Course for K-12 Science, Technology, Engineering, and Mathematics Teachers in New Mexico Pueblo Schools
Josephine Kilde1, John K. Bennett 2, Lorenzo Gonzales3, S. Revi Sterling1
ATLAS Institute1; John Dept. of Computer Science2; Univ. of Colorado Boulder, Math & Science Academy3

This note describes preliminary work directed toward developing a teacher-training project that is intended to increase Science, Technology, Engineering, and Mathematics (STEM) proficiency among elementary and high school teachers in Northern New Mexico Pueblo schools. This project builds upon prior work that trained K-8 teachers to use investigative teaching, which in turn had a significant positive impact on the math and science proficiency of Native-American and Hispanic students. The current project seeks to use Massive Open Online Course (MOOC) technology to capture and scale this professional development through the use of video, imagery, and community building in order to integrate Native-American learning processes. The overall objective is to enable Pueblo teachers to more effectively teach STEM subject matter, as measured by an increase in both teacher and student content knowledge scores. If successful, the use of MOOC technology should facilitate rapid expansion of the program across New Mexico and elsewhere.

An Ethnographic Assessment of Electronic Cash Transfers in Ghana’s Remote Rural North
E.F.M. Krah, J.G. de Kruijf
Utrecht University

The study concerns the qualitative assessment of three e-payment methods that are tested to optimize cash transfers for the sake of social protection and poverty alleviation throughout Ghana. These methods include: (e-Zwich) smartcards with biometric identification; e-wallets using mobile phones; and cards with PIN to access a bank count ‘in the cloud’. The pilot is joint venture of the government of Ghana, the United Kingdom’s Department For International Development (DFID) and UNICEF. Besides the innovative use of technology, a unique trait of the project is the initiators acknowledgement of the crucial importance of a thorough and holistic understanding of the context and conditions of implementation. As a result, ethnographic fieldwork is conducted to maximize chances of success. Our presentation in Cape Town involves some reflections on the fieldwork as well as a contemplation of the potential of such applied anthropology in the field of ICTD, both contextualized by means of the ethnographic depiction of the complex transition from unbanked to e-banked in northern Ghana.

Lean e-Integration for Development: The Case of the National Licensing Center in Albania
Endrit Kromidha
Royal Holloway University of London

E-government services have transformed public services for citizens and organizations. Yet, the challenge remains to integrate the increasing number of projects and systems not only according to budgetary or political agendas, but based on what end-users expect from the new services.

This study analyzes how lean management referring to increased value and reduction of waste could be applied to e-integration reforms for development. The findings are based on the new National Licensing Center in Albania, a developing country in South-East Europe. They suggest that integrated change takes time and there is significant resistance from old practices and structures, regardless of the information technology solutions. One-stop-shop agencies have the potential to enact lean management in practice by providing more standardized and efficient services for end-users. However, continuous improvements for integrated services require more attention than temporary projects for sustainable development.
Mobiles and Migration: Global Data on Immigrant Population and Mobile Subscriptions
Melissa Loudon
University of Southern California

Expanding on recent findings on mobile phones as enablers of domestic labor mobility, this paper considers the relationship between immigrant population and mobile cellular subscriptions. Regression analysis shows that the immigrant proportion of a country’s population significantly predicts mobile cellular subscriptions per 100 people, controlling for GDP (p < .01). Further, the model explains 24% of the variance in the dependent variable, compared to only 15% for GDP alone.

Maps, Politics and Data Sharing: A Palestinian Puzzle
Carleen Maitland
College of Info Sciences & Technology, Penn State University

Palestinian towns and cities are being left out of the online mapping revolution. The puzzle of why this is occurring, despite formal street names, GIS expertise and a lack of obvious political/security factors, is likely to be solved by increased sharing by Palestinian governments, international organizations and map makers. An analysis of data collected through interviews, emails and media reports, provides the basis for recommendations to enhance data sharing in support of improving development and accessibility of online maps.

Survivability to Sustainability of Biodiversity: What do ICTs and Indigenous Knowledge Have to do with it?
Muthoni Masinde
Central University of Technology, Free State

Literature is awash with the term ‘sustainability’; sustainable development, sustainable education, sustainable eco-system, sustainable this, sustainable that but, it all boil down “the balance among nature (ecology), people (community of social networks) and the economy which transcends one generation”. Sustainability is driven by the thirst to improve quality of life through sustained economic growth; however, with the world’s population growing exponentially, and an equal measure of world’s resource decline, maintaining this has become a mountainous task. This has led to the ‘survival-for-the-fittest’ kind of scenario where many people are left pushing so hard to survive; for them, sustainability has slowly given way to survivability. Sustainable use of biodiversity is one area where African has lagged behind. Rampant biodiversity degradation and the inability to cope with the resultant changes are some of the reasons why the Continent tops the list of climate change vulnerability victims. As researchers develop solutions to ensure Africa’s survivability amidst these changes, they must avoid “transferring of Northern designs to Southern realities”. No one knows Africa’s biodiversity more that the local people themselves; they are host to rich indigenous knowledge on biodiversity degradation and mitigation practices; they have observed and experienced the changes over the years. However, this knowledge is facing threats from various circles and on its own, it may not deliver Africa’s survivability tool. Information and telecommunications technology (ICT) provides the missing puzzle; integrating this with the indigenous knowledge (IK) is a sure way of improving survivability. In this paper, the design of such an integrated system for tracking biodiversity degradation is described and the link between the system and survivability demonstrated.
A Mobile Scaffolding Application to Support Novice Learners of Computer Programming
Chao Mbogo, Edwin Blake, Hussein Suleman
Computer Science Department University of Cape Town

Support for novice learners of computer programming can be provided by scaffolding the construction of programs. The ubiquity of mobile phones allows us to support learners whenever they wish to work on a program outside the classroom. This paper describes the development of an application that scaffolds the construction of programs on a mobile phone. The application was designed based on a five-level scaffolding framework and implemented on the Android platform. The application scaffolds the construction of programs on a mobile device by: (i) representing a program in parts; (ii) restricting a learner to complete the program in a certain order; (iii) enabling construction of a program one part at a time; (iv) providing instructions, steps, default code to be edited, hints, and error prompts where appropriate; and (v) fading the scaffolds as the learner progresses from one successfully completed and compiled program, to the next. Experiments are currently ongoing to test and evaluate the mobile application.

Towards Operationalizing Outlier Detection in Community Health Programs
Ted McCarthy¹, Brian De Renzi¹, Joshua Blumenstock¹, Emma Brunskill²
University of Washington¹; Carnegie Mellon University²

Efficient health systems require reliable data. In developing countries the need for accurate data is particularly acute, as organizations are often forced to make decisions on a tight budget with limited capacity for data collection. In this note, we describe recent progress toward developing a set of algorithms that can help detect and classify anomalies in health worker data. Building on recent efforts to use unsupervised multinomial techniques for outlier detection, we outline the steps required to turn a set of statistical tests into a framework that can be implemented by health organizations, and calibrate these algorithms on a large dataset from a partner health organization. Here, we describe the core methods, present results from ongoing analyses, and outline our plan for future work, including plans to obtain labeled training data that will allow us to detect and classify different types of outlier in community health worker data.

Investigating the Potentials of Social Media to Support Women Entrepreneurship in Indonesian Urban Areas
Ezmieralda Melissa, Muninggar S. Saraswati, Anis Hamidati, Alexander G. Flor
Swiss German University

This note aims to highlight results of a research conducted on the use of social media by women entrepreneurs in managing micro businesses in Indonesian urban areas. The outputs of this study identify the perceptions, beliefs, opinions, and lived experiences of women entrepreneurs on the use of social media as a business tool and the benefits that these businesses bring to their personal, social, and professional lives. This information is insightful in understanding the opportunities given by this type of business and the challenges faced by women entrepreneurs to open and manage such business. At the same time, the study is also able to provide business strategies for other women who want to start social media business as a mode of empowerment.
Pretesting an mHealth Intervention for At-Risk Adolescent Girls in Soweto, South Africa: Studying the Additive Effects of SMSs on Improving Sexual Reproductive Health & Rights Outcomes

Jamison Merrill, Rebecca Hershow, Katherine Gannett, Chris Barkley
Grassroot Soccer

Grassroot Soccer (GRS) is exploring the effectiveness of a two-way SMS campaign delivered through a single-sex, soccer-based HIV prevention programme. The campaign aims to enhance reproductive health and rights outcomes among at-risk adolescent South African girls ages 11-14. To test and refine the SMS campaign prior to piloting, GRS employed a participatory process in building a prototype of an Unstructured Supplementary Service Data (USSD) line using Open Data Kit (ODK), an open-source application for building, collecting, and managing data on Android-enabled phones and tablets. The USSD prototype was delivered to 72 female participants and coaches in July 2013. All participants also completed a 10-item questionnaire on ODK. Focus group discussions were conducted with coaches (N=1 group) and parents (N=1 group). Results demonstrate that 55% of participants reported owning a mobile phone; a majority reported being “very interested” in the USSD prototype (68%) and “very comfortable” interacting with the USSD prototype (62%). Findings suggest that two-way SMSs could offer an acceptable service for reaching at-risk adolescent girls in South Africa with health-related messaging, particularly on sensitive issues. Results will inform delivery of a USSD line in a programmatic pilot and assessment to be carried out in six primary schools (approximately 600 participants) in Soweto, separated between control and intervention groups, beginning in September 2013.

How ICT Hubs Models Have Impacted on the Technology Entrepreneurship Development

Hilda Moraa, Duncan Gathege
iHub Research

iHub Research is conducting an on-going research to understand the unique factors that make up ICT Hub models across Africa. The objectives of the research are 2-fold: First to understand the factors that makes up the Hubs model. Secondly, to understand its entrepreneurs and how the hubs have positively impacted on their development be it skills or the growth of their innovations. So far, iHub has conducted 7 studies of various hubs across Africa and they include: (iHub-Kenya; KLab-Rwanda; MEST-Ghana, BongoHive hub-Zambia, KINU hub-Tanzania; Activspaces-Cameroon and Hive Colab-Uganda. This paper provides an overview of some of the key findings. Lessons learnt, challenges and proposed recommendations. Thus this paper in subsequent chapters, discusses how these selected hubs have impacted on Social economic development in Africa and various roles that they are playing to meet the aforementioned objectives including their challenges, lessons learnt and recommendations in catalyzing socioeconomic development.

Outside Looking In: Shaping Access and Use of PCCs

Preeti Mudliar, Sharon Strover, Kenneth Flamm
University of Texas

We examine factors that mediate the access and use of public computing centers (PCCs) that are part of a United States government policy initiative to bridge the digital divide. Drawing on in-depth interviews and field observations conducted in the state of Texas, we interrogate how the social settings in which the sites are embedded, influence the way marginalized users approach and use the Internet resources inside the PCCs. Through our analysis, we demonstrate that access and use of PCCs is mediated by factors beyond the mere availability of computing infrastructure and include conditions such as fulfillment of routine life needs, geo-spatial characteristics of sites, availability of transport, and access to alternative sites of Internet access.
Materializing Digital Inequalities: the Digital Artifacts of the Marginalized in Brazil

David Nemer1, Shad Gross1, Nic True2
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As a predominantly social phenomenon, many examinations around issues caused by digital inequalities appropriately focus on the policies, attitudes, and other cultural elements that pertain to the adoption, use, and proliferation of digital technology. As a compliment to these analyses, this paper will examine the materiality as a component of the digital inequalities in Brazil’s urban poor areas, known as favelas. We specifically look at the material aspects of the digital artifacts used in LAN Houses and state-supported Telecenters located inside the favelas in the city of Vitoria, Brazil. This study is driven by qualitative exploration – using critical ethnographic methods such as observation and interviews – designed to focus on the perspective of the local users of LAN Houses and Telecenters. We apply critical ethnography to give voices to the locals and allow them to understand the material issues and conflicts on their terms. Through examples from keyboard layout to power unit supplies, we will describe how the materiality of digital artifacts contributes to digital inequalities and how unique social conventions are formed in this context. Shedding light on people’s experiences with such materials broadens our view of different ways that technology and internet is used, and perhaps thereby do a better job of developing appropriate technologies for these people.

Questioning Feedback: Improving Public Health Messaging

Trevor Perrier, Abhigyan Kaustubh, Abhishek Gupta, Richard Anderson
University of Washington

This note explores methods of analyzing questions asked during public health video showings. The goal is to provide feedback to content creators and session facilitators based a limited subset of the audience’s questions. We analyze five videos produced in the first year of Digital Public Health focused on maternal health issues in rural India. We demonstrate a prototype web based tool to collaborate on the qualitative analysis of questions and propose mechanisms for systematically improving future videos based on this analysis. Initial results show that it is possible to extract useful information on how the target audience perceives the messaging in a video exclusively from questions asked. Based on these results we explain how Digital Public Health can integrate this feedback into an iterative review process for quality assurance of messaging.

Improving ICT Support for Aboriginal Land Councils in New South Wales

Peter Radoll1, Sebastian Fleissner2, Duncan Stevenson3, Henry Gardner2
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A pilot case-study of the ICT systems of two self-managed Aboriginal councils in the Australian state of New South Wales has been undertaken in order to assess the nature and potential of software interventions. Our study indicates that the development of task-driven software interfaces could significantly support the processes and activities of Aboriginal council management and could contribute to alleviating the stress associated with current systems. Our vision is to develop these interfaces together with networking support for peer-to-peer collaboration between councils, compliance agencies and trusted advisers. The workflows themselves would be built and refined in a collaborative fashion between users together with some automated support.

Understanding Jugaad: ICTD and the Tensions of Appropriation, Innovation and Utility

Nimmi Rangaswamy1, Melissa Densmore2
Indian Institute of Technology1; Microsoft Research2

This paper seeks to bring scrutiny to ‘Jugaad’ as concept of user driven innovation in the context of ICTD research. We collate and organize a variety of definitions denoting adoption and innovation of technology in constrained eco systems. We attempt to bring a nuanced understanding of contextual processes supporting or hindering use adoption and innovation of ICTs by probing the multi-meanings of Jugaad as ground-up processes of technology adoption.
**NOTE ABSTRACTS**

**Drop Drop – Prototyping a Mobile Application Educating on the Water System through Private Meter Readings**  
Patrick Rein\(^1\), Michael Champanis\(^2\), Ulrike Rivett\(^2\)  
Hasso-Plattner-Institute\(^1\); University of Cape Town\(^2\)

Under-resourced urban communities regularly struggle with their municipalities about water. To empower citizens in their position in the water system, we propose a mobile application called “Drop Drop” which allows users to track their own water usage by reading their meter. We developed an initial prototype iteratively and evaluated it in a two week field study in the community of Makhaza in Cape Town. We found that the concept is generally feasible and useful for citizens to understand their water usage and their water meter. However a major challenge is to find an effective way how the application can provide training on reading a meter and on entering the reading.

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**Conceptualising ICT4D Project Champions**  
Jaco Renken, Richard Heeks  
University of Manchester

In this paper attention is drawn to key actors who make a substantial difference to ICT4D projects by putting themselves on the line in order to drive projects forward. We advance the notion of ‘ICT4D project champions’ as a descriptive reference to these visionary individuals and provide a definition. An initial conceptualisation is offered characterising them in terms of their orientation to results, relationships and resources. In view of the ongoing challenges with ICT4D projects, we argue that this is an important, yet under-researched area. Drawing on theories of stakeholders, leadership and social capital, a model for understanding and researching ICT4D project champions is presented.

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**Community-based Solar Power Revenue Alternative to Improve Sustainability of a Rural Wireless Mesh Network**  
C. Rey-Moreno\(^1\), Z. Roro\(^1\), W. D. Tucker\(^1\), M. J. Siya\(^2\)  
Computer Science, University of Western Cape\(^1\); TransCape Mankosi\(^2\)

Given needs for a clean and easy way to maintain and secure powering rural wireless networks and to generate revenue to guarantee the sustainability of its intended goals, an approach to leverage solar power to address both needs simultaneously is presented herein. Results comprise empowered locals trained to ensure local maintenance and appropriation, local usage and maintenance data; and a costing of the solution and its maintenance after a year of operation. It is shown that the solution presented can be locally maintained and provide additional revenue for a rural wireless network to continue providing intended communication goals.

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**Changing Mindsets: The Attitude of Pre-service Teachers on Technology for Teaching**  
Amalia Sabiescu\(^1\), Izak van Zyl\(^1,2\), Marta Pucciarelli\(^3\), Lorenzo Cantoni\(^1\), Andy Bytheway\(^1\), Wallace Chigona\(^1\), Stefano Tardini\(^1\)  
Università della Svizzera italiana\(^1\); Cape Peninsula University of Technology\(^2\); University of Cape Town\(^1\)

In a context where there has only been limited success with Information and Communication Technologies (ICTs) in education, this paper explores attitudes towards the use of ICTs in South African pre-service teacher education. In particular, it looks at how cognitive and affective attitudes towards technology determine visions and scenarios of technology integration into teaching and learning practice. This note presents the results of an in-depth qualitative study involving exceptionally motivated pre-service teachers from two higher education institutions. Findings indicate strong intentions to integrate ICT in future teaching and the constant inclination to keep updated with technological evolution. Pre-service teachers view themselves as users of technology in order to keep up with what they perceive to be a technologisation of life and education. The integration scenarios envisioned by participants demonstrate a changing mindset where technology is not only an additional tool, but enables the advancement of new teaching and learning models centred on the active role of the student. A critical look at the study findings compels us to give accrued importance to how living and learning in a developing area determines meaningful articulations of pro-technology attitudes.
Balancing Burden and Benefit: Non-Prescribed Use of Employer-Issued Mobile Devices
Ariel Schwartz1,2, Mohini Bhavsar3, Edward Cutrell2, Jonathan Donner2, Melissa Densmore2
University of Texas at Austin1; Microsoft Research, India2; Dimagi, Inc., India3

Mobile devices are increasingly powerful and flexible tools for computing and communication. When ICTD workers are given a mobile phone “for work”, what else do they do? And to what extent can or should an employer shape that use? This note presents research in progress, focused on rules that development projects impose to govern use of mobile devices. This work maps these rules against actual instrumental (work-related, non-prescribed) and non-instrumental (personal) device use, and enforcement of these rules, in eight projects using a popular mobile-based job aid, CommCare. We present early insights from qualitative analysis of two such deployments in India identifying a range of often conflicting policy choices that affect device use for project mission and/or professional and personal empowerment. We explore tradeoffs for morale, work quality, mission, and device integrity. We identify user remote availability, soft intimidation, and validation as mechanisms to shift authority and credibility of information sources. The implications of our findings are increasingly important as governments and NGOs arm frontline workers with mobile devices as tools to improve service delivery.

Exploring New Perspectives for Digital Inclusion Projects in Rural Areas: a View from Complexity Science
Arturo Serrano-Santoyo1, Veronica Rojas-Mendizabal1, Cristian Castillo-Olea2
CICESE Research Center Carretera Ensenada1; Autonomous University of Baja California Tijuana2

The emergence of digital convergence and the explosive growth of wireless communications in conjunction with learning experiences regarding the provision of internet services in rural communities all over the world make necessary to rethinking the strategies and methods employed by governments, development agencies and private sectors to detonate socioeconomic development through the adoption of Information and Communication Technologies (ICT) in rural communities. We start our analysis from experiences in our participation in digital inclusion projects as well as from reports and research papers recently published that show that the availability of broadband infrastructure, convergent devices for Internet access and associated content, though necessary, it is not enough to accomplish sustainable social and economic development in rural communities. We suggest that it is necessary to explore new perspectives, which in conjunction with the cyber-infrastructure, consider two complementary programs; a social action program to incorporate strategies for community participation, technology adoption, usability and capacity building and a program for social innovation to encourage entrepreneurship and organizational development in the rural context. We pose that the cyber-infrastructure and associated programs constitute a socio-technical system interacting with the rural context, which in turn we characterize as a socio-environmental system. We argue that the project objectives should arise as a result of the stakeholders’ interaction of both systems in the operational, tactic and strategic levels.

The SMS-Text Adherence Support (StAR) Study – Hardware and Software Infrastructure
David B. Springer1, Kirsten L. Bobrow1, Naomi Levitt1, Andrew Farmer1, Lionel Tarassenko1
University of Oxford1; University of Cape Town1

This paper details the hardware and software infrastructure used to collect data and deliver a novel intervention in an on-going individually randomised three-arm parallel group trial in a resource-limited setting. The SMS-text Adherence support trial (StAR) tests the efficacy of a behavioural intervention delivered by SMS-text to support hypertension treatment adherence compared to usual care. The intervention is a structured program of clinic appointment and medication pick-up reminders, medication adherence support and hypertension-related education delivered remotely using an automated system of semi-tailored informational or interactive SMS-text messages delivered to the 1372 recruited participants. The technical infrastructure includes mobile device-based electronic data collection at the point of care with secure remote upload of the data; the intervention delivery system; real-time query identification for screening, enrolment and participant management procedures; and monitoring and evaluation of trial processes. We are using several open-source software platforms in conjunction with off-the-shelf hardware to set-up and run a randomised clinical trial of a novel intervention in a low-resource setting.
**Airavat: An Automated System to Increase Transparency and Accountability in Social Welfare Schemes in India**

Vivek Srinivasan¹, Vibhore Vardhan¹, Snigdha Kar², Siddhartha Asthana³, Rajendran Narayanan¹, Pushpendra Singh³, Dipanjan Chakraborty⁴, Amarjeet Singh³, Aaditeshwar Seth²

Stanford University¹; IIT Delhi²; IIIT Delhi³

Activist groups have taken up information dissemination and feedback collection as a means of rights advocacy in India. However, it is not easy given the difficulty in procuring and disseminating information at a large scale. Beneficiaries are often not able to help themselves as information systems are administration facing, because of poor literacy and the inability to access the Internet. Further, beneficiaries are not well informed of their rights and entitlements under different government schemes to know how and when to file grievances. We aim to solve these problems by designing and testing prototypes for information dissemination and feedback collection in various contexts. In our current prototype we describe an automated tool that sifts through the data on an MIS and conveys personalised information to the beneficiaries through voice calls. This is a work in progress, and our first exercise on providing MIS-extracted information to people through phone calls led to 70% of the beneficiaries who noticed a discrepancy in the data to agree to file a grievance on their behalf. We are continuing to scale the work, make it more automated, and run qualitative interviews with all stakeholders to understand causality linkages with transparency led grievance filing, assisted by appropriate ICTs, to increase accountability.

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**Rural Communities Crowdsource Technology Development – A Namibian Expedition**

Colin Stanley, Heike Winschiers-Theophilus, Michel Onwordi, Gereon K. Kapuire

Polytechnic of Namibia, School of Information Technology

In this paper, we describe our newest project endeavor in which we conceptualize crowdsourcing technology development for and with rural communities in Namibia. The project is based on design work which was carried out over a longer period of time with a single rural pilot community in Namibia and its transferability of technology and concepts into other rural communities. In an attempt to overcome expensive technology adaptations we explore the possibility of having rural communities’ crowdsource their defined and specified technology needs. We describe the concept and our current implementation with a first user evaluation in two rural communities. We also discuss the next phase of the project.

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**Designing for Trauma: the Roles of ICTD in Combating Violence against Women (VAW)**

S. Revi Sterling

ATLAS Institute University of Colorado Boulder

It is a development axiom that women’s empowerment is a critical key to successful, sustainable development. While great strides have been made in recognizing women’s needs, both as participants and beneficiaries of development efforts, Violence against Women (VAW) continues to rob women of the agency and opportunity that empowerment strategies aim to offer. Information and Communication Technology for Development (ICTD) interventions have been adopted as mechanisms to support VAW prevention, protection at the point of violence, and post-VAW treatment. This short paper explores these efforts from both a survey and critical lens.

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**Participatory Action Research & Inclusive Information and Knowledge Management for Empowerment**

Larry Stillman, PhD

Centre for Social and Community Informatics Caulfield School of IT Monash University, Australia

This Note discusses current and prospective research into understandings of Participatory Action Research (PAR) and its relationship to the development of inclusive and pluralistic forms of Information and Knowledge Management (IKM) in ICT4D/ICTD contexts through the Oxfam Australia-Monash University Partnership. It is intended that an innovative demonstration project to trial new ways of implementing PAR & pluralistic IKM will be then be undertaken with international development NGOs with an aim to more widespread adoption of these techniques.
SMS-based Accountability to Beneficiaries Mechanisms in Humanitarian Aid and Development
Laura Walker Hudson
Social Impact Lab
This paper examines the use of SMS, or text messaging. It seeks to lay out the potential for use of SMS not only for beneficiary feedback mechanisms, but also for the critical work to carry out participatory planning and evaluation, and inform communities about program aims and activities. The paper will also outline the learning coming out of documented pilots, identify key challenges, and suggest some next steps for the future.

Community Building for Capacity Building: Case Study of Liberia’s iLab
Ellen W. Zegura
School of Computer Science, Georgia Tech
Technology hubs—labs committed to fostering local technology and entrepreneurship communities—are newcomers in local African ICT ecosystems. While research has focused on the organizational structure of labs, the degree to which they fuel start ups, and surrounding institutional contexts in which they operate, less is understood about how each operates as a Community of Practice (CoP) from social learning theory. And yet, the creation of such a community of practice seems central to building local ICT capacity. Drawing on data from Liberia’s iLab, we describe how it functions as a CoP and identify some next steps for supporting its community.

TV White Spaces, I Presume? The Quest for TVWS in Malawi and Zambia
Marco Zennaro1, Ermanno Pietrosemoli1, Andrés Arcia-Moret1, Chomora Mikeka2, Jonathan Pinifolo1, Chris Wang4, Steve Song5
The Abdus Salam International Centre for Theoretical Physics Trieste1; University of Malawi2; MACRA3; reakLabs and Tokyo Hackerspace4; University of Oregon5
TV White Spaces (TVWS) technology and regulation has the potential to make connectivity both technically and economically feasible in rural Africa where affordable access remains a challenge. The superior propagation characteristics of TVWS technology make it particularly well suited to connecting remote communities. Evidence collected from our measurements in Malawi and Zambia suggest that most UHF spectrum is already available both in urban as well as in rural areas and could be used to provide Internet connectivity. In this paper we present the findings of a TVWS spectrum measurement initiative in Malawi and Zambia. We introduce an open hardware device that geo-tags spectrum measurements and saves the results on a micro SD card. The device can also be used to record the use of spectrum over long periods of time.

Bringing Visibility to Rural Users in Cote d’Ivoire
Mariya Zheleva, Paul Schmitt, Morgan Vigil and Elizabeth Belding
University of California
Cellular networks are often the first telecommunications infrastructure in developing regions. By studying cellular net- work traffic, researchers gain insight into how technologies can be used to access services critical to further development. In this work, we approach a cellular traffic dataset provided by Orange in Cote d’Ivoire with the goal of identifying distinctions between urban and rural use of cellular infrastructure. We report on a number of interesting differences between urban and rural usage of cellular infrastructure. For instance, 70% of calls that originate in rural areas occur within the vicinity of the same antenna, whereas the same is true for only 23% of calls with urban origin. We are compelled to conclude that development efforts for rural areas might be implemented differently from development efforts in urban areas based on divergent use of current cellular infrastructure.
Community Detection in Cellular Network Traces
Mariya Zheleva, Paul Schmitt, Morgan Vigil and Elizabeth Belding
University of California, Santa Barbara

Studies of user behavior in cellular networks have served as a knowledge base for development of critical applications and services catered to specific user needs. In this paper we examine community persistence in egocentric social graphs extracted from cellular network traces in the Cote d’Ivoire provided by Orange. The goal of our study is to inform mechanisms for improved dissemination of information by identifying subscribers or groups that can serve as information relays. We find that communities that persist in an egocentric network are independent of one another. Thus, multiple information relays can be selected from each independent community, to increase the probability that information will flow to the ego.
Dr. Bitange Ndemo is regarded as the father of Broadband in Kenya, having championed the development of Fibre Optic cables and other supporting infrastructure to the Eastern Africa region making Kenya one of the most wired countries in the World. It was during his tenure as Permanent Secretary that Information and Communications Technologies (ICTs) became to be regarded as a critical component to the country's economic development. His works, such as Open Data, incubation of start-ups, Konza Technology Park, etc, propelled him to the global stage. Today Kenya is regarded as the regional ICT hub.

Currently, he teaches Entrepreneurship and Research Methods at the University of Nairobi’s Business School and conducts research on social entrepreneurship. Dr Ndemo is now focusing his energies on the demand side of IT through aggressive local content development.

He holds a Bachelor’s degree in Finance and Accounting from University of Minnesota, an MBA from University of St. Thomas, St. Paul, Minnesota and a PhD degree in Industrial Economics from the University of Sheffield, England. He also serves on the Board of Better than Cash Alliance, a global initiative to digitize payment systems worldwide.

**KEYNOTE ABSTRACT**

**Driving Affordability Via Policy Reform**

Despite double-digit growth in penetration rates over the last decade, only 31 percent of people living in developing countries will have access to the internet by the end of 2013. Whilst much of the focus in recent years has been on enhancing infrastructure and developing technical solutions, a growing body of evidence suggests a strong correlation between national and regional policies and internet affordability.

In this address, Dr Bitange Ndemo, honorary chairperson of the Alliance for Affordable Internet (A4AI) and immediate former Permanent Secretary, Ministry of Information and Communications, Kenya will unveil A4AI’s first annual ‘Affordability Report’.

His address will:

- Present a league table of countries ranked by affordability, particularly focused on those individuals living under the poverty line;
- Demonstrate how the successful implementation of certain policies can dramatically lower access costs;
- Argue for the simultaneous prioritisation of demand generation strategies;
- Conclude with a set of concrete policy recommendations and advice on implementation.
7 DEC

SPECIAL INTEREST GROUP - ICTD African Researchers Network
Organiser: Ritse Erumi
The ICTD African Researchers Network is a growing group of African and Africa-based researchers interested in improving ICTD scholarship on the continent. This session will provide a space to consider research theories that are relevant to our work and collaborate practically on research ideas with the goal of producing short papers for future publication.

WORKSHOP - Imagining futures of open development
Organisers: Caitlan Bentley & Ineke Buskens
Progress in open development depends on how diverse knowledge and understandings of development shape practice and participation in the area. This session combines a panel discussion followed by a workshop intended to debate and then create narratives of open development.

WORKSHOP - The Impact of ICT4D Research on Policy and Practice: Lessons from International Development
Organiser: Roger Harris
Little is known about what impact, if any, ICT4D research has on development practice and policy. With funders demanding more practical knowledge from their research spending, the session reviews what is known in the field of international development about how research influences practice and policy and it assesses the implications for ICT4D research.

PANEL / ROUNDTABLE - SIRCA II Showcase
Organiser: Arul Chib
The SIRCA network supports opportunities for emerging scholars to work closely with senior researchers in Information Society and ICTD research. This session will provide an opportunity for further collaborations with the SIRCA emerging scholars whose recently completed research work will be shared on topics around ICTs and economics, agriculture, education and gender.

ICTD Township Tour to Langa
Organiser: SIRCA
The SIRCA showcase session will continue with a tour of the Langa Township. SIRCA is working with a local, community-based organization that has customized the tour to showcase communication networks and ICTD use. All expenses related to the trip are covered by SIRCA.

WORKSHOP - Don’t forget the “how”: Tech for youth engagement at public libraries in Africa
Organiser: Joel Turner
While libraries are powerful engines for youth engagement, they are largely isolated from the international development discourse. This session brings together librarians, ICTD practitioners, and local government representatives to discuss unique challenges faced by youth in Africa and how libraries can better leverage technology, space, and partnerships to address these challenges.
PANEL / ROUNDTABLE - One laptop per child project revisited: The Kenyan case
Organiser: Christopher Chepken
This session will share experiences and perspectives from researchers and practitioners with the principal objective of sharing ideas relevant to making the OLPC project a success in Kenya. The driving factors are the magnitude of the numbers (1.4 million laptops) projected for Kenya and a host of other education inputs.

WORKSHOP - Open Session Fair
Organiser: Claudia Flores Saviaga
This workshop offers attendees, who will not formally present a paper, a note or a demo, a forum to introduce and discuss the projects or initiatives in which they are currently involved in their country in a fast track way. This platform will allow presenters and attendees to have a different perspective and understanding of the realities of ICTD in different countries.

WORKSHOP - A storybook for ICTD ethics
Organiser: Andrew Dearden
ICTD generates distinctive ethical challenges for practitioners and researchers, but there are few resources that are specifically designed to help prepare them, or to assist with ethical decision-making in practice. This session will explore (real) experiences and develop (fictional) stories to be used in training and reflective practice.

PANEL / ROUNDTABLE - Digital Jobs in Africa: The opportunity or neglect?
Organiser: Kathleen Diga
This session will focus in labour, especially amongst youth, and the status of digital jobs in Africa. Digital work can impact youth when various interventions consider their employment implications within agricultural and informal communities. This session hopes to attract researchers on discussing the meaning of digital employment with African societies.

WORKSHOP - ICT4Ag: Opportunities and Challenges for Using Technology to Reach Rural Farmers in the Developing World
Organiser: Charles Steinfeld
This session will bring together leading scholars and practitioners to discuss the opportunities the digital revolution offers to smallholder farmers in developing countries and how to overcome challenges that hinder widespread adoption.

WORKSHOP - Lets make radio more interactive: A showcase and hands on session with Farm Radio International & Telerivet’s android platform
Organiser: Bartholomew Sullivan
This session will showcase how Farm Radio’s used Telerivet SMS gateway in partnership with nine radio stations across Tanzania to boost the interactivity of radio campaigns and engage directly with listeners. The session will give attendees a chance to build their own interactive radio toolkits for their projects.
OPEN SESSION SUMMARIES

HANDS-ON INSTRUCTION / PANEL / ROUNDTABLE - Writing books in ICT4D research – why and how?
Organiser: Dorothea Kleine

Books offer many advantages for publishing research. They allow for situating research and exploring important topics in depth. Drawing on the experiences of leading ICT4D authors and publishers, this interactive session will show how the writing and publication process works and considers specific challenges of producing books for an ICT4D audience.

PANEL / ROUNDTABLE - Starting an academic research career in ICTD
Organiser: Joyojeet Pal

This session will discuss the merits and challenges of an academic research career in ICTD from the perspective of faculty members and PhD students engaged in ICTD. It is aimed both at existing and prospective PhD students and at junior faculty considering long-term careers in this space.

PANEL / ROUNDTABLE - Scaling mobile for development: the importance of partnerships to successful business models
Organiser: Tim Hatt

Mobile for Development (M4D) is a rapidly growing sector with immense potential. However, to realise that potential there is a need for scalable and commercially viable business models. This session will focus on the value of innovative partnerships in overcoming the barriers to achieving M4D success at scale.

SPECIAL INTEREST GROUP - Mobiles & Money and Everything In Between
Organiser: Ishita Ghosh

This session will focus on mobile phones and money, while endeavoring to take the conversation beyond mobile banking ventures in the developing world. It will span three specific aspects of the same, namely livelihoods and mobile phones; money practices and mobile phones; and mobile banking and mobile phones.

PANEL / ROUNDTABLE - Interactive Voice Response (IVR) Platforms in the Developing World
Organiser: Aditya Vashistha

The session will explore the role of IVR systems to collect data from, provide information to and create knowledge communities for marginalized communities. Panelists and the audience will discuss specific ICTD application areas for IVR platforms, success and failure stories of deployments in the developing world, lessons learnt and future challenges.

PANEL / ROUNDTABLE - Launch of Feminist Africa 18 – ‘Feminist e-technologies’ and facilitated discussion on feminist practice and politics of technology in African contexts
Organiser: Jenny Radloff

The Feminist Africa journal provides a forum for progressive, cutting-edge gender research and feminist dialogue focused on the continent. Feminist Africa 18 explores the transformative capacities new technologies have for women’s rights mobilising, scholarship and activism. Articles interrogate the tools, experiences, the creative and strategic applications of ICTs to transform unequal gender relations on the continent.
WORKSHOP - Software sustainability: Benefits and challenges for ICTD researchers
Caitlan Bentley

This session will bring together researchers in ICTD to discuss the significance of software sustainability within the ICTD community. What does software sustainability mean for ICTD researchers? Why is software sustainability important for those that create and use software in ICTD research?

WORKSHOP - Infusing Gender into ICT4D: Innovating Research, Practice and Policy
Organiser: Ineke Buskens and Gloria Bonder

This session seeks to explore how a gender perspective grounded in equality, in the recognition of diversity and the imperative for sustainable development interfaces with questions of vision, research, planning, policy and practice, pertaining to the Information Society and the use of ICT tools and spaces.

PANEL / ROUNDTABLE - Addressing the X-factor: Psychological and interpersonal factors affecting ICTD success – a perspective from the organizational and management sciences
Organiser: Tara Behrend

Psychological and interpersonal factors like motivation, leadership, teamwork and organizational culture are often key to ICTD success. This session will bring together experts from the ICTD field and the organizational/management sciences, engage around case studies, and discuss interdisciplinary solutions to the human dynamics that often make or break ICTD interventions.

PANEL / ROUNDTABLE - ICT4kids - Collective learning experiences
Organiser: Dorothea Kleine

This session will highlight the need to consider children and adolescents as a specific user/participant group in ICT4D work. It will present anonymised quotes from an ongoing UNICEF commissioned study among practitioners and other experts on successes, failures and lessons learnt to initiate a constructive discussion on future opportunities for appropriate ICT4children.
OPEN SESSION SUMMARIES

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Affordable Internet for All: Exploring key policy and regulatory drivers for change
Organiser: Sonia Jorge
The session will focus on the increasingly important issue of affordable Internet access for all, with the emphasis on the policy and regulatory interventions required to achieve this objective.

PANEL / ROUNDTABLE - Teaching ICTD – Courses, Degree Programs, and Student Field Experiences
Organiser: Joe Mertz
This session will reflect on teaching effective ICTD to interested students and future practitioners. In the spirit of Ubuntu, join other ICTD educators to share what is working in your courses and field experiences; identify great resources, explore collaboration opportunities, and further develop the ICTD “academic practitioner” discipline.

PANEL / ROUNDTABLE - Open Data in Developing Countries: Assessing The Impacts Of Open Data on Governance and Development
Organiser: Tim Davies
Drawing on case studies varying from the use of open data in the extractive industries to the use of open data in education, this session will present preliminary findings from a World Wide Web Foundation supported project in five African countries; highlighting the methodologies and tools developed as part of the project.

PANEL / ROUNDTABLE - Open and Networked Science for Development: Towards a Research Agenda
Organiser: Ellie Osir
This session aims to stimulate debate about the implications of open and collaborative science norms and practices in the context of developing countries, and to identify a possible research agenda. Participants will participate in developing potential research project ideas that IDRC might support.

WORKSHOP - Data Science and Development: Scaling Human Behavior Studies into the Millions
Organiser: Vanessa Frias-Martinez
The pervasiveness of mobile technologies, social media, and digital sensors is quickly generating vast quantities of digital traces that reveal a wide range of human behavior. This session will focus on understanding how the information extracted from such large-scale datasets can be used by researchers, policy-makers, and organisations working for social development.

PANEL / ROUNDTABLE - Appropriating ICTs for Developing Critical Consciousness and Structural Social Change
Organiser: Sammia Poveda
Can ICTs contribute to transforming the fundamental relationships of power and privilege that constrain development? What changes to development practice are required to enable the effective use of ICT by marginalised people in authoring and actualising their own development? Can people use ICTs to build critical consciousness and political agency?
WORKSHOP - Mobile Media and Development  
Organiser: Melissa Denmore  
This session will bring together various practitioners and researchers leveraging videos and multimedia on mobile phones and other devices for development, and will discuss strategies for addressing questions around content creation, mediating use of the video, design factors, and training.

WORKSHOP - ICT4D and Online Freedoms: Competing Paradigms or Converging Agendas?  
Organiser: Karina Brisby  
Until recently, advocates for freedom on the Internet have tended to operate in relative isolation from practitioners of ICT for Development. This session will critically examine a number of recent trends (both in the academic literature and in the real world) that suggest arguments and modalities for convergence, and look at practical ways in which practitioners in both fields can support one another.

WORKSHOP - ICT Project Sustainability: Conversations, Challenges and Opportunities in a Development Context  
Organiser: Ellen Witte Zegura  
ICTD projects frequently include development, deployment, ownership and on-going maintenance of technical artifacts. ICT in a development context has challenges that are importantly different from those encountered in a traditional technology company. This session will explore the issues that arise in ICT sustainability and produce appropriate deliverables to carry the conversation forward.

HANDS-ON INSTRUCTION - ACYOD: App Creation on Your Own Device  
Organiser: Judith Bishop  
This session will enable participants to learn about developing software apps directly on their own mobile devices with TouchDevelop, which is freely available via the web on PC, Mac, iOS, and Android devices. It is ideal for teaching programming concepts and for developing powerful apps that make use of sensors and data on mobile devices.

HANDS-ON INSTRUCTION - Free and Open Source Software to Support Community Knowledge Mobilization: An Introduction to Rapid Prototyping and Evaluation  
Organiser: Gordon Gow  
The session will provide participants with an introduction to and experience with a rapid prototyping methodology to support community-based innovation through the use of user-friendly free and open source software (FOSS) and low cost ICTs to support communications, information collection, knowledge sharing, data visualization, and interactive mapping.

WORKSHOP - ICTD: Intercultural Communication Technologies for Development  
Organiser: Amalia Sabiescu  
This session will encourage participants to problematize the multi-layered nature of culture and deconstruct critical incidents in ICTD projects. It will use game-based interaction to trigger critical reflection, leveraging participants experiences to distil effective strategies.
OPEN SESSION SUMMARIES

WORKSHOP - Accessible Technology in ICTD
Organiser: Joyojeet Pal
This session will introduce participants to accessibility and assistive technology and their role in ICTD. A lecture and interactive form workshop will introduce concepts of disability studies, international law related to accessibility and various assistive technologies.

WORKSHOP - Understanding and Researching ICT4D Project Champions
Organiser: Jacobus Renken
ICT4D project champions are often encountered, but insufficiently understood. This session will introduce the concept from both a theoretical perspective, and from practical experiences. This will be followed by stimulating participant discussions of their role in projects leading into development of a research agenda and network to chart future ICT4D project champion research.

PANEL / ROUNDTABLE - Book Launch: “Information Lives of the Poor”
Organiser: Ahmed Tareq Rashid
ICTs, especially mobile phones, are increasingly affordable across the globe. How do the poor access, use and benefit from these technologies? To what extent is the networked world “inclusive”? What does the future hold for the poor connected to Internet? This session will launch a book entitled, “The information Lives of the Poor”, that documents and compares findings from Asia, Africa and Latin America to address these pressing questions.

Video: VOTO Mobile
Organiser: Leah Farmer
This video will highlight the impact of VOTO Mobile which helps governments, aid organisations, and businesses to better serve their citizens through powerful communication tools.

PANEL / ROUNDTABLE - Book Launch: “Connecting ICTs to Development: The IDRC Experience”
Organiser: Laurent Elder
Over the past two decades, IDRC-supported projects have critically examined the ways in which ICTs can be used to improve learning, empower the disenfranchised, generate income opportunities for the poor, and facilitate access to healthcare in Africa, Asia, Latin America and the Caribbean. Each chapter in this book analyses how IDRC-supported projects have contributed to an evolution of thinking, and successes and challenges, in using ICTs as tools to address development issues.
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