The 2019 IFIP WG 9.4 Conference

The 15th International Conference on Social Implications of Computers in Developing Countries

THEME: STRENGTHENING SOUTHERN-DRIVEN COOPERATION AS A CATALYST FOR ICT4D

Conference Programme & Papers Abstracts

May 1st - 3rd, 2019
Ramada Resort Hotel
Dar es Salaam, Tanzania
The 2019 IFIP WG 9.4 Conference

The 15th International Conference on Social Implications of Computers in Developing Countries

Theme: Strengthening Southern-driven cooperation as a catalyst for ICT4D

Conference Programme & Papers Abstracts

May 1st-3rd, 2019
Ramada Resort Hotel
Dar es Salaam, Tanzania

Jointly hosted by:
University of Dar es Salaam, Tanzania & University of Oslo, Norway
# Conference Programme at a Glance

The 15th International Conference on Social Implications of Computers in Developing Countries

**DAY 1  May 1st, 2019**

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>Registration</td>
</tr>
<tr>
<td>09:00-09:30</td>
<td><strong>Main Hall: Opening ceremony</strong>&lt;br&gt;Introductions &amp; Welcoming Remarks</td>
</tr>
<tr>
<td></td>
<td>• Conference co-chairs&lt;br&gt;- <em>Prof. N. Mvungi/Prof S. Sahay</em></td>
</tr>
<tr>
<td></td>
<td>• Conference co-chairs&lt;br&gt;- <em>Prof R. Davison</em></td>
</tr>
<tr>
<td></td>
<td>• DVC Research, UDSM</td>
</tr>
<tr>
<td></td>
<td>• Guests of Honour</td>
</tr>
<tr>
<td>09:30-10:30</td>
<td><strong>Main Hall: Keynote speech 1</strong>&lt;br&gt;“South-South and Triangular Cooperation in ICT4D”</td>
</tr>
<tr>
<td></td>
<td>- <em>Geoff Walsham</em></td>
</tr>
<tr>
<td>10:30-10:45</td>
<td>Break</td>
</tr>
<tr>
<td>10:45-12:15</td>
<td>Parallel session 1: (3 papers)</td>
</tr>
<tr>
<td>12:15-13:15</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:15-14:45</td>
<td>Parallel session 2: (3 papers)</td>
</tr>
<tr>
<td>14:45-15:00</td>
<td>Break</td>
</tr>
</tbody>
</table>
15:00-16:30  **Main Hall: Panel 1**
“Cross-country generalization of context specific research on IT and development”
- Chair:
  - Chrisanthi Avgerou, London School of Economics, UK
- Panellists
  - M Lynne Markus, Bentley University, USA
  - Sundeep Sahay, University of Oslo, Norway
  - Geoff Walsham, Judge Business School, Cambridge University, UK

17:00-18:00  **Main Hall: Paper workshop**
Special issue in EJISDC & ISJ on Digital Platforms for Development.
- B. Nicholson, J. Sæbø and P. Nielsen

**Breakout room 1:**
Poster slam presentations

---

**DAY 2  May 2nd, 2019**

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:30</td>
<td>Parallel session 3: (3 papers)</td>
</tr>
</tbody>
</table>
| 09:30-10:30| **Main Hall: Keynote speech 2**
            | “Power of Home Grown ICT Solutions in Developing Countries”
<pre><code>        | - Jabiri Kuwe Bakari                          |
</code></pre>
<p>| 10:30-10:45| Break                                        |
| 10:45-12:45| Paper Sessions 4 (4 papers)                  |
| 12:45-13:45| Lunch                                        |</p>
<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:45-15:15</td>
<td>Main Hall: Panel 2</td>
</tr>
<tr>
<td></td>
<td>“Digital Equity”</td>
</tr>
<tr>
<td></td>
<td>- Robert Davison</td>
</tr>
<tr>
<td></td>
<td>Breakout Room 1:</td>
</tr>
<tr>
<td></td>
<td>“Gender equality issues in ICT”</td>
</tr>
<tr>
<td></td>
<td>- Brita Somerkoski</td>
</tr>
<tr>
<td></td>
<td>Breakout Room 2:</td>
</tr>
<tr>
<td></td>
<td>Poster slam presentations</td>
</tr>
<tr>
<td></td>
<td>Exhibition:</td>
</tr>
<tr>
<td></td>
<td>ICT4D Project</td>
</tr>
<tr>
<td>15:15-15:30</td>
<td>Break</td>
</tr>
<tr>
<td>15:30-17:30</td>
<td>Paper Sessions 5 (4 papers)</td>
</tr>
<tr>
<td>17:30-18:30</td>
<td>Main Hall:</td>
</tr>
<tr>
<td></td>
<td>Tanzania HMIS Strengthening Initiatives and Innovations</td>
</tr>
<tr>
<td></td>
<td>- Masoud Mahundi &amp; John Mukulu</td>
</tr>
<tr>
<td></td>
<td>Exhibition:</td>
</tr>
<tr>
<td></td>
<td>ICT4D Project</td>
</tr>
<tr>
<td>19:00</td>
<td>Trip to the Restaurant</td>
</tr>
<tr>
<td>19:30</td>
<td>Gala dinner</td>
</tr>
<tr>
<td>22:00</td>
<td>Return to the hotel</td>
</tr>
</tbody>
</table>

**DAY 3**  May 3rd, 2019

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-10:00</td>
<td>Paper Sessions 6 (4 papers)</td>
</tr>
<tr>
<td>10:00-10:15</td>
<td>Break</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>10:15-11:15</td>
<td><strong>Main Hall: Keynote speech 3</strong>&lt;br&gt;“Doing ICT4D and developing South-South Cooperation”&lt;br&gt;- <em>Maung Sein</em></td>
</tr>
<tr>
<td>11:15-12:45</td>
<td>Paper Sessions 7 (3 papers)</td>
</tr>
<tr>
<td>12:45-13:45</td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00-14:45</td>
<td><strong>Main Hall: Closing ceremony</strong>&lt;br&gt;- Programme co-chairs&lt;br&gt;- <em>Prof. P. Nielsen / Dr. H. Kimaro</em>&lt;br&gt;- Chair local Committee</td>
</tr>
<tr>
<td>15:00-16:00</td>
<td>Business meeting</td>
</tr>
</tbody>
</table>
This book is a collection of abstracts for papers presented at the 15th International Conference on Social Implications of Computers in Developing Countries (IFIP WG 9.4 2019 Conference) held in Dar es Salaam, Tanzania, May 1–3, 2019. The aim of this conference was to gather scholars and practitioners that deal with the issue on how Information and Communication Technology (ICT) affects social development. The theme of this conference, “Strengthening Southern-driven cooperation as a catalyst for ICT4D”, sought in particular to stimulate and encourage critical discussions on the different facets of Southern-driven cooperation, its promises, potential for creating a better world, and the challenges we face in achieving the promised potential.

With the proliferation of ICT related projects to support development, countries from the South are now emerging as important innovators and actors in the global development and adoption of ICT for community and economic growth. We find good examples of this in countries such as Kenya, becoming leading in the world with mobile payments. The mobile payment (such as Mpesa and Airtel money) has supported micro-financing services and transformed economic activities and lives within the local communities. Such effect offers an exciting setting for reverse innovation whereby lessons learned in ICT4D could offer rich insights for IS research in general. Furthermore, strengthening a southern-driven cooperation promotes ICT initiatives and research carried for, in and by developing countries. The conference, therefore, aimed at offering context-rich theories, methodologies and practical guidance on the use of ICTs to empower local communities.

Towards this goal, we issued a request for track proposal submissions. Based on the received proposals and set criteria, we accepted 12 tracks:

1. Digital Platforms for Development
2. FinTech and Development
3. ICT4D for the Indigenous, by the Indigenous and of the Indigenous
4. Recognizing African Expression of Tech
5. Harnessing Agriculture
6. Land Administration and Public Financial Management for ICT4D
7. ICT for Displaced Population: How it helps? How it hurts?
8. Communities, ICT-Enabled Networks, and Development
9. Pushing the Boundaries - New Research Methods, Theory and Philosophy in ICT4D
10. Southern-Driven Human-Computer Interaction
11. Locally Developed Process and Method Innovations in ICT4D

12. Sustainable ICT, Informatics, Education and Learning in a turbulent world - “doing the safari way”

We also arranged a particular track workshop for Early Career Researchers and PhD candidates.

The tracks received 185 papers from authors from 46 different countries. A rigorous double blind peer review process was followed with each paper receiving an average of two reviews. 99 papers were accepted and presented at the conference and are included in this collection.

For a large event like this conference to happen, a considerable effort by a number of individuals was required. We are indeed grateful and thanking all the Program Committee members, the local arrangements chairs, and 171 external reviewers for their efforts. We also express gratitude to all the sponsors: the IFIP WG 9.4 (ifipwg94.org), International Network for Postgraduate Students in the area of ICT4D (IPID, ipid.se), University of Oslo (UiO), College of Information and Communication Technologies (CoICT) of the University of Dar es Salaam (UDSM), Bank of Tanzania (BoT), UNICEF Tanzania and several others. It was a great pleasure to hold the IFIP WG 9.4 2019 Conference in Dar es Salaam, Tanzania.

May 2019
- Petter Nielsen
- Honest Christopher Kimaro
# Conference Organization

## General Chairs

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nerey H. Mvungi</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Sundeep Sahay</td>
<td>University of Oslo, Norway</td>
</tr>
</tbody>
</table>

## Program Committee Chairs

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petter Nielsen</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Honest C. Kimaro</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
</tbody>
</table>

## Steering Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mussa Kissaka</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Prosper Mafole</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Wilfred Senyoni</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Honest Kimaro</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Nerey Mvungi</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Abdulla Ally</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Joel Mtebe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Petter Nielsen</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Ellen Kalinga</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Kwame Ibwe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Libe Massawe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Abdi Abdalla</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Sundeep Sahay</td>
<td>University of Oslo, Norway</td>
</tr>
</tbody>
</table>

## Program Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Sören Pettersson</td>
<td>Karlstad University, Sweden</td>
</tr>
<tr>
<td>Brian Nicholson</td>
<td>Manchester Business School, UK</td>
</tr>
<tr>
<td>Prosper Mafole</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Petter Nielsen</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Johan Sæbø</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Wilfred Senyoni</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Nima Shidende</td>
<td>University of Dodoma, Tanzania</td>
</tr>
<tr>
<td>Devinder Thapa</td>
<td>University of Agder, Norway</td>
</tr>
<tr>
<td>Arunima Mukherjee</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Antonio Diaz Andrade</td>
<td>Auckland University of Technology, New Zealand</td>
</tr>
<tr>
<td>Ellen Kalinga</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Abdi Talib</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Suzana Brown</td>
<td>SUNY Korea</td>
</tr>
<tr>
<td>Terje Sanner</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>P.J. Wall</td>
<td>Trinity College Dublin, Ireland</td>
</tr>
<tr>
<td>Elizaphan Maina</td>
<td>Kenyatta University, Kenya</td>
</tr>
<tr>
<td>Mikko Ruohonen</td>
<td>Tampere University, Finland</td>
</tr>
<tr>
<td>Reima Suomi</td>
<td>University of Tuku, Estonia</td>
</tr>
<tr>
<td>Faheem Hussain</td>
<td>Arizona State University, USA</td>
</tr>
<tr>
<td>Rehema Baguma</td>
<td>Uganda Technology and Management University</td>
</tr>
<tr>
<td>Marita Turpin</td>
<td>University of Pretoria, South Africa</td>
</tr>
<tr>
<td>Harminder Singh</td>
<td>Auckland University of Technology, New Zealand</td>
</tr>
<tr>
<td>Amber Young</td>
<td>University of Arkansas, USA</td>
</tr>
<tr>
<td>Angsana Techatassanasoontorn</td>
<td>Auckland University of Technology, New Zealand</td>
</tr>
<tr>
<td>Richard Heeks</td>
<td>The University of Manchester, UK</td>
</tr>
<tr>
<td>Jose Abdelnour-Nocera</td>
<td>University of West London, UK</td>
</tr>
<tr>
<td>Javier Osorio</td>
<td>Las Palmas de Gran Canaria University, Spain</td>
</tr>
<tr>
<td>Nicholas Blessing Mavengere</td>
<td>Tampere University, Finland</td>
</tr>
<tr>
<td>Stan Karanasios</td>
<td>RMIT University, Australia</td>
</tr>
<tr>
<td>Gertjan Van Stam</td>
<td>Nelson Mandela Metropolitan University</td>
</tr>
<tr>
<td>Paul Van Asperen</td>
<td>University of Twente, Netherlands</td>
</tr>
<tr>
<td>Kirstin Krauss</td>
<td>University of South Africa, South Africa</td>
</tr>
<tr>
<td>Faraja Igira</td>
<td>Institute of Finance Management, Tanzania</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Emmanuel Eilu</td>
<td>Makerere University, Uganda</td>
</tr>
<tr>
<td>Machdel Matthee</td>
<td>University of Pretoria, South Africa</td>
</tr>
<tr>
<td>Rita Orji</td>
<td>Dalhousie University, Canada</td>
</tr>
<tr>
<td>Laura Hosman</td>
<td>Arizona State University, USA</td>
</tr>
<tr>
<td>Sandip Sarkar</td>
<td>University of Arkansas, USA</td>
</tr>
<tr>
<td>Ebenezer Laizer</td>
<td>University of Turku, Estonia</td>
</tr>
<tr>
<td>Rohan Bennett</td>
<td>Swinburne University, Australia</td>
</tr>
<tr>
<td>Tegawendé F. Bissyandé</td>
<td>University of Luxembourg, Luxembourg</td>
</tr>
<tr>
<td>Mussa Kissaka</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Honest Kimaro</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Nerey Mvungi</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Abdulla Ally</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Joel S. Mtebe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Kwame Ibwe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Libe Massawe</td>
<td>University of Dar es Salaam, Tanzania</td>
</tr>
<tr>
<td>Sundeep Sahay</td>
<td>University of Oslo, Norway</td>
</tr>
<tr>
<td>Omar Hamad</td>
<td>Zanzibar University, Tanzania</td>
</tr>
</tbody>
</table>
Detailed Conference Programme

The 15th International Conference on Social Implications of Computers in Developing Countries.

Theme: Strengthening Southern-driven cooperation as a catalyst for ICT4D

DAY 1 May 1st, 2019

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>REGISTRATION</td>
</tr>
</tbody>
</table>
| 09:00-09:30 | **Main Hall: Opening ceremony**  
Introductions & Welcoming Remarks  
- Conference co-chairs  
  - Prof. N. Mvungi/Prof S. Sahay  
- Chair IFIP WG 9.4  
  - Prof R. Davison  
- DVC Research, UDSM  
- Guests of Honour |
| 09:30-10:30 | **Main Hall: Keynote speech 1**  
“South-South and Triangular Cooperation in ICT4D”  
- Geoff Walsham |
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-10:45</td>
<td>BREAK</td>
</tr>
<tr>
<td>10:45-12:15</td>
<td>Parallel session 1: Tracks</td>
</tr>
</tbody>
</table>

**Main Hall:**

**Track 01:** Digital Platforms for Development  
- *Chair: Petter Nielsen and Johan Sæbø*

**Breakout Room 1:**

**Track 03:** ICT4D for the Indigenous, by the Indigenous and of the Indigenous  
- *Chair: Antonio Díaz Andrade*

**Breakout Room 2:**

**Track 09:** Southern-Driven Human-Computer Interaction  
- *Chair: Jose Abdelnour-Nocera*

**Breakout Room 3:**

**Track 07:** Communities, ICT-Enabled Networks, and Development  
- *Chair: Arunima Mukherjee & Jens Kaasbøll*

<table>
<thead>
<tr>
<th>10:45-11:15</th>
<th>Parallel session 1: Papers</th>
</tr>
</thead>
</table>

**Main Hall:**

A Multi-Level Perspective on Digital Platform Implementation and Impact: The Case of EasyTaxi in Colombia  
- *Juan Erasmo Gomez-Morantes, Richard Heeks and Richard Duncombe*.

**Breakout Room 1:**

Nexus between country context and the role of external actors in the formulation of national Information and Communication Technology policies.  
- *Gregory Kunyenje and Wallace Chigona*.

**Breakout Room 2:**

Socio-technical HCI for Ethical Value Exchange: Lessons from India.  
- *Jose Abdelnour Nocera, Torkil Clemmensen, Morten Hertzum, Dineshkumar Singh and Dr. Veerendra Veer Sing.*
Breakout Room 3:
Contemporary Challenges in Street Trader-Customer Interaction Through Mobile Devices in Dodoma, Tanzania.
- Joel Rumanyika, Matti Tedre, Mikko Apiola, Solomon Oyelere and Nasibu Mramba.

11:15-11:45 Parallel session 1: Papers

Main Hall:
The Role of Digital Platforms in Disrupting Agricultural Value Chains in Developing Countries.
- Bookie Ezeomah and Richard Duncombe.

Breakout Room 1:
Research in Africa for Africa? Probing the Effect and Credibility of Research Done by Foreigners for Africa.
- Munyaradzi Mawere and Gertjan van Stam

Breakout Room 2:
Usability Problems and Obstacles to Addressing them in Health Information Software Implementations.
- Magnus Li.

Breakout Room 3:
An Inquiry into IT Governance in Healthcare Organizations in Uganda.
- Michael Kizito.

11:45-12:15 Parallel session 1: Papers

Main Hall:
Software Platforms for Inclusive Innovation.
- Terje Sanner and Petter Nielsen.

Breakout Room 1:
Decolonising Neo-Liberal Innovation: using the Andean philosophy of ’Buen Vivir’ to reimagine innovation hubs.
- Andrea Jimenez and Tony Roberts.
Breakout Room 2:
- Judy van Biljon and Karen Renaud.

Breakout Room 3:

12:15-13:15 LUNCH

13:15-14:45 Parallel session 2: Tracks

Main Hall:
Track 01: Digital Platforms for Development
- Chair: Petter Nielsen and Johan Sæbø

Breakout Room 1:
Track 03: ICT4D for the Indigenous, by the Indigenous and of the Indigenous
- Chair: Antonio Díaz Andrade

Breakout Room 2:
Track 08: Pushing the boundaries - New research methods, theory and philosophy in ICT4D
- Chair: Richard Heeks, and Devinder Thapa

Breakout Room 3:
Track 07: Communities, ICT-Enabled Networks, and Development
- Chair: Arunima Mukherjee

13:15-13:45 Parallel session 2: Papers

Main Hall:
Participatory Video, giving Voice and Respect to the Epistemic Sovereignty of communities in rural Zimbabwe.
- Peter Makamba, Chido Matewa, Janneke van Dijk, Gertjan van Stam and Peter Vhoko.
Breakout Room 1:
Incorporating indigenous perspectives in provision of e-government services: The case of Tanzania.
- Bakari Mashaka, Neil Mcbride and Kutoma Wakunuma. Luiz Antonio

Breakout Room 2:
Southern Theory in ICT4D.
- David Kreps and Julian Bass.

Breakout Room 3:
Investigating The Efficiency Of Ict Infrastructure Utilization : A Data Envelopment Analysis Approach
- ‘Yinka Oyerinde and Felix Bankole

13:45-14:15 Parallel session 2: Papers

Main Hall:
Strategies for Standardizing Health Information Analysis. Flexible Standards Revisited.
- Olav Poppe, Johan Sæbø and Jørn Braa.

Breakout Room 1:
Smart City for Development: A conceptual model for developing countries.
- Luiz A. Joia and Alexander Kuhl.

Breakout Room 2:
- Anna Bon and Hans Akkermans.

Breakout Room 3:
eHealth in Zimbabwe, a case of techno-social development.
- Trymore Chawurura, Ronald Manhibi, Janneke van Dijk and Gertjan van Stam.
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:15-14:45</td>
<td>Parallel session 2: Papers</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tracing the Impact of the City of Cape Town’s Open Data Initiative on Communities and Development.</td>
<td><em>Mbongeni Hlabano and Jean-Paul Van Belle.</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digital technology for preserving cultural heritage in Tonga.</td>
<td><em>‘Anau Mesui, Antonio Diaz Andrade and Lena Waizenegger.</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 2:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combining Pragmatism and Critical Realism in ICT4D Research:</td>
<td><em>Richard Heeks, Angelica Ospina and P.J. Wall.</em></td>
</tr>
<tr>
<td></td>
<td>An e-Resilience Case Example.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 3:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>System Use And User Satisfaction In The Adoption Of Electronic Medical Records Systems: A Case Of Dhis2 Tracker Implementation In Tanzania.</td>
<td><em>Immaculate Ayebazibwe, Honest Kimaro and Jens Kaasbøll.</em></td>
</tr>
<tr>
<td>14:45-15:00</td>
<td>BREAK</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall: Panel 1</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Cross-country generalization of context specific research on IT and development”</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Chair:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <em>Chrisanthis Avgerou, London School of Economics, UK</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Panellists:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <em>M Lynne Markus, Bentley University, USA</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <em>Sundeep Sahay, University of Oslo, Norway</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <em>Geoff Walsham, Judge Business School, Cambridge University, UK</em></td>
<td></td>
</tr>
<tr>
<td>17:00-18:00</td>
<td>Main Hall: Paper workshop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special issue in EJISDC &amp; ISJ on Digital Platforms for Development.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <em>B. Nicholson, J. Sæbø and P. Nielsen</em></td>
<td></td>
</tr>
</tbody>
</table>
Breakout room 1:
Poster slam presentations

DAY 2  May 2nd, 2019

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:30</td>
<td>Parallel session 3: Tracks</td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
</tr>
<tr>
<td></td>
<td><em>Track 01:</em> Digital Platforms for Development</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Brian Nicholson</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
</tr>
<tr>
<td></td>
<td><em>Track 08:</em> Pushing the boundaries - New research methods, theory and philosophy in ICT4D</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Richard Heeks, and Devinder Thapa</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout room 2:</strong></td>
</tr>
<tr>
<td></td>
<td><em>Track 11:</em> Sustainable ICT, Informatics, Education and Learning in a turbulent world - “doing the safari way”</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Mikko Ruohonen and Faraja Igira</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout room 3:</strong></td>
</tr>
<tr>
<td></td>
<td><em>Track 07:</em> Communities, ICT-Enabled Networks, and Development</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Nigussie Mengesha</em></td>
</tr>
<tr>
<td>08:00-08:30</td>
<td>Parallel session 3: Papers</td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
</tr>
<tr>
<td></td>
<td>Exploring Hybridity in Digital Social Entrepreneurship</td>
</tr>
<tr>
<td></td>
<td>- <em>Silvia Masiero and Mayasandra-Nagaraja Ravishankar.</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
</tr>
<tr>
<td></td>
<td>- <em>P.J. Wall, Dave Lewis and Lucy Hederman.</em></td>
</tr>
</tbody>
</table>
Breakout room 2:
Information Systems Education for Development: A typology of ICT4D pedagogies.
- Gwamaka Mwalembo.

Breakout room 3:
The ins and outs of participation in a weather information system.
- Bidisha Chaudhuri and Linus Kendall.

08:30-09:00 Parallel session 3: Papers

Main Hall:
What Motivates ICT4D Champions?
- Jaco Renken.

Breakout Room 1:
Capabilities and Affordances in ICT4D context: Similarities, Differences and Complementarity.
- Devinder Thapa and Yingqin Zheng.

Breakout room 2:
Data Science postgraduate education at University of Dar es Salaam in Tanzania: Current demands and opportunities.
- Betty Mbwilo, Honest Kimaro and Godfrey Justo.

Breakout room 3:
Value Co-creation in Design of mHealth Applications for Maternal Healthcare Service Delivery.
- Hawa Nyende.

09:00-09:30 Parallel session 3: Papers

Main Hall:
Co-creating an ICT Platform with Elderly Rural Women in Mafarafara: a Social Structuration Account.
- Ronel Smith, Marita Turpin and Marlien Herselman.
**Breakout Room 1:**  
- *Ibrahim Inuwa, Chidi Ononiwu, Muhammedou M. O. Kah and Ago Quaye.*

**Breakout room 2:**  
- *Calisto Kondowe and Wallace Chigona.*

**Breakout room 3:**  
E-commerce institutionalisation in Mozambique: enablers and barriers.  
- *Fernanda Matsinhe and Salah Kabanda.*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30-10:30</td>
<td><strong>Main Hall: Keynote speech 2</strong></td>
</tr>
<tr>
<td></td>
<td>“Power of Home Grown ICT Solutions in Developing Countries”</td>
</tr>
<tr>
<td></td>
<td>- <em>Jabiri Kuwe Bakari</em></td>
</tr>
<tr>
<td>10:30-10:45</td>
<td>BREAK</td>
</tr>
<tr>
<td>10:45-12:45</td>
<td><strong>Parallel session 4: Tracks</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Track 01:</strong> Digital Platforms for Development</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Brian Nicholson and Kristin Braa</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Track 13:</strong> Local Technical Papers</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Ellen Kalinga and Abdi T. Abdalla</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 2:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Track 11:</strong> Sustainable ICT, Informatics, Education and Learning in a turbulent world - “doing the safari way”</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Mikko Ruohonen and Faraja Igira</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 3:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Track 01:</strong> Digital Platforms for Development</td>
</tr>
<tr>
<td></td>
<td>- <em>Chair: Gertjan van Stam and Sara Vannini</em></td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10:45-11:15</td>
<td>Parallel session 4: Papers</td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
</tr>
<tr>
<td></td>
<td>- <em>Kari Koskinen, Carla Bonina and Ben Eaton.</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
</tr>
<tr>
<td></td>
<td>Rate Adaptive Congestion Control Scheme Using Lookup Table To Enhance</td>
</tr>
<tr>
<td></td>
<td>Quality Of Experience In Video Streaming.</td>
</tr>
<tr>
<td></td>
<td>- <em>Jane Lissah and Mercy Mbise.</em></td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 2:</strong></td>
</tr>
<tr>
<td></td>
<td>The Role of Human Centered Design (HCD) and Challenge Driven Education</td>
</tr>
<tr>
<td></td>
<td>in Enhancing the Innovation Capacity of Africa’s Young People: Case of</td>
</tr>
<tr>
<td></td>
<td>Youth for Children (Y4C) Innovation Hub in Tanzania.</td>
</tr>
<tr>
<td></td>
<td>- *Hellen Maziku, Joseph Cosmas, Norah Maki, Honest Kimaro and Charles</td>
</tr>
<tr>
<td></td>
<td>Otine.*</td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 3:</strong></td>
</tr>
<tr>
<td></td>
<td>Design Science Research Strengthened: Integrating Co-creation and</td>
</tr>
<tr>
<td></td>
<td>Co-design.</td>
</tr>
<tr>
<td></td>
<td>- <em>Calkin Suero Montero and Alsen Kapinga.</em></td>
</tr>
<tr>
<td>11:15-11:45</td>
<td>Parallel session 4: Papers</td>
</tr>
<tr>
<td></td>
<td><strong>Main Hall:</strong></td>
</tr>
<tr>
<td></td>
<td>Scaling across Functional Domains: A Case of Implementing an Electronic</td>
</tr>
<tr>
<td></td>
<td>HIV Patient Information System in Sierra Leone.</td>
</tr>
<tr>
<td></td>
<td>- *Eric Adu-Gyamfi, Petter Nielsen, Johan Ivar Sæbø and Zeferino</td>
</tr>
<tr>
<td></td>
<td>Saugene.*</td>
</tr>
<tr>
<td></td>
<td><strong>Breakout Room 1:</strong></td>
</tr>
<tr>
<td></td>
<td>Information Security Culture Assessment of Small and Medium-Sized</td>
</tr>
<tr>
<td></td>
<td>Enterprises in Tanzania.</td>
</tr>
<tr>
<td></td>
<td>- <em>Zainab Ruhwanya and Jacques Ophoff.</em></td>
</tr>
</tbody>
</table>
Breakout Room 2:
Towards Developing Interactive Content for Enhancing Life Skills Education in Tanzania: Possibilities and Pitfalls.
- Christian Misobi Budoya, Mussa M. Kissaka and Joel S. Mtebe.

Breakout Room 3:
Institutional shaping of affordances: implications on information use in global humanitarian organizations.
- Marta Maria Vila-Pozo and Sundeep Sahay.

11:45-12:15 Parallel session 4: Papers

Main Hall:
Mobile Phone Use for Empowerment and Well-Being of the Physically Challenged in Nigeria.
- Abdulrashid Iliya, Chidi Ononiwu, Muhammadou M.O Kah and Ago K.M Quaye.

Breakout Room 1:
Handover management in femtocell LTE networks under fast varying channels.
- Catherine Protas and Kwame Ibwe.

Breakout Room 2:
Community-centered, project-based ICT4D education in the Field.
- Anna Bon, Jaap Gordijn, Hans Akkermans, Victor de Boer, André Baart, Cheah Waishiang and Sze San Nah.

Breakout Room 3:
Towards Holistic Mobile Climate Services for Farmers in Tambuu, Tanzania.
- Ville Myllynpää, Ezra Misaki, Mikko Apiola, Jaakko Helminen, Moammar Dayoub, Tomi Westerlund and Erkki Sutinen.

12:15-12:45 Parallel session 4: Papers

Main Hall:
Amr Hamed and Julian Bass.
Breakout Room 1:
Khadija Mkocha, Mussa Kissaka and Omar Hamad.

Breakout Room 2:
Building Sustainable Collaborations and Academic Networks in Low Income Countries: Case of Master Programmes.
Jens Kaasbøll, Chipo Kanjo & Honest Kimaro.

Breakout Room 3:
Anti-corruption efforts in national ICT policies -A study of policy environments in Sub-Saharan Africa.
Cecilia Strand and Mathias Hatakka.

12:45-13:45 LUNCH

13:45-15:15
Main Hall: Panel 2
“Digital Equity”
Robert Davison

Breakout Room 1:
“Gender equality issues in ICT”
Brita Somerkoski

Breakout Room 2:
Poster slam presentations

Exhibition:
ICT4D Project

15:15-15:30 BREAK

15:30-17:30 Parallel session 5: Tracks

Main Hall:
Track 01: Digital Platforms for Development
Chair: Terje Aksel Sanner and Johan Sæbø
Breakout room 1:
Track 08: Pushing the boundaries - New research methods, theory and philosophy in ICT4D
Chair: Richard Heeks and Devinder Thapa

Breakout room 2:
Track 09: Southern-Driven Human-Computer Interaction
Chair: Jose Abdelnour-Nocera

Breakout Room 3:
Track 06: ICT for Displaced Population & Refugees. How it helps? How it hurts?
Chair: Faheem Hussain and Suzana Brown

<table>
<thead>
<tr>
<th>15:30-16:00</th>
<th>Parallel session 5: Papers</th>
</tr>
</thead>
</table>

Breakout room 1:
Understanding the Role of ICT for Human Development: Affordances and Capability Approach.
Mathias Hatakka, Øystein Sæbø and Devinder Thapa.

Breakout room 2:
A Local Perspective: Working an Agricultural Information Service into a Rural Community.
Lars Rune Christensen, Hasib Ahsan, Mamunur Rashid and Badal Kumar Das.

Breakout Room 3:
Humanitarian Organizations Information Practices: procedures and privacy concerns for serving the Undocumented.
Sara Vannini, Ricardo Gomez, Diane Lopez, Sigifredo Mora, Julia Clare Morrison, Julee Tanner, Lena Youkhana, Genoveva, Vergara and Maria Tafurt.

<table>
<thead>
<tr>
<th>16:00-16:30</th>
<th>Parallel session 5: Papers</th>
</tr>
</thead>
</table>
Main Hall:
IT and Government Corruption in Developing Countries: A Literature Review and Reframing.
Atta Addo.

Breakout room 1:
Method of Research in a We-Paradigm, lessons on Living Research in Africa.
Gertjan van Stam.

Breakout room 2:
Tanmay Joshi, Sharmistha Swasti Gupta and Nimmi Rangaswamy.

Breakout Room 3:
Shirin Madon and Emrys Schoemaker.

16:30-17:00 Parallel session 5: Papers

Main Hall:
Convergence of technical and policy processes: A study of Indonesia’s health information systems.
Taufiq Sitompul, Wilfred Senyoni, Jørn Braa and Yudianto Yudianto.

Breakout room 1:
Unpacking Empowerment in ICT4D Research.
Priyanka Pandey and Yingqin Zheng

Breakout room 2:
Research in Progress: Holistic Climate Service Prototypes for Farmers in Tambuu, Tanzania.
Ville Myllynpää, Jaakko Helminen, Ezra Misaki, Mikko Apiola, Jani Haakana, Tomi Westerlund and Erkki Sutinen.

Breakout Room 3:
When will you start teaching the REAL curriculum?- Challenges and Innovations in Education for Rohingya Refugees.
Azmina Karim and Faheem Hussain.
17:00-17:30  Parallel session 5: Papers

Main Hall:
How South African university information systems students are using social media.
Yazeed Seedat, Dr Sumarie Roodt and Samwel Mwapwele.

Breakout room 1:
Adopting Theory of Change for ICT4D Project Impact Assessment.
Yan Li and Manoj Thomas.

Breakout room 2:
Factors that Influence Workers’ Participation in Unhygienic Cyber Practices: A Pilot Study from Nigeria
Princely Ifinedo, Nigussie Mengesha and Olumide Longe.

Breakout Room 3:
Refugees and ICTs: Identifying the Key Trends and Gaps in Peer-reviewed Scholarship.
Suzana Brown, Faheem Hussain and Ali Masoumifar.

17:30-18:30  Parallel session 5: Papers

Main Hall:
Tanzania HMIS Strengthening Initiatives and Innovations
Masoud Mahundi & John Mukulu

Exhibition:
ICT4D Project

19:00  Trip to the Restaurant

19:30  Gala dinner

22:00  Return to the hotel
**DAY 3  May 3\textsuperscript{rd}, 2019**

<table>
<thead>
<tr>
<th>TIME</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-10:00</td>
<td>Parallel session 6: Tracks</td>
</tr>
</tbody>
</table>

**Main Hall:**

*Track 01:* Digital Platforms for Development  
*Chair:* Judy van Biljon and Marita Turpin

**Breakout Room 1:**

*Track 07:* Communities, ICT-Enabled Networks, and Development  
*Chair:* Arunima Mukherjee and Sara Vannini

**Breakout Room 2:**

*Track 01:* Digital Platforms for Development  
*Chair:* Wallace Chigona & Jens Kaasbøll

**Breakout Room 3:**

*Track 01:* Digital Platforms for Development  
*Chair:* Petter Nielsen and Johan Sæbø

| 08:00-08:30 | Parallel session 6: Papers                  |

**Main Hall:**

*Brian Nicholson, Petter Nielsen, Johan Saebo and Sundeep Sahay.*

**Breakout Room 1:**

A Framework for Understanding the Empowerment Effects of Telecentres on Rural Communities in Developing Countries.  
*Sellina Khumbo Kapondera, Roberta Benardi and Niki Panteli.*
Breakout Room 2:
A critical analysis of the implementation of health information systems for public healthcare service delivery in resource-constrained environments: A South African study.
- Mourine Achieng & Ephias Ruhode.

Breakout Room 3:
Ex-ante analysis of adoption of introduced chicken strains among smallholder farmers in selected areas of Tanzania.
- Rogers Andrew, Dr. Jeremia Makindara, Dr. Said H Mbaga and Dr. Roselyne Alphonce.

08:30-09:00 Parallel session 6: Papers

Main Hall:
Experiences from a Development Project in Kenya – Baselines for Future Climate Information Systems.
- Jaakko Helminen, Balozi Bekuta Kirongo, Ezra Misaki, Silvia Gaiani, Mikko Apiola and Erkki Sutinen.

Breakout Room 1:
Investigating The Implementation Of Ict Tool To Electoral Process In Nigeria.
- Aishatu Shuaibu, Salihu Dasuki and Muhammadou Kah.

Breakout Room 2:
Acceptability and Use of Mobile Health Applications in Health Information Systems: A case of eIDSR and DHIS2 Touch mobile applications in Tanzania.
- Jimmy Mbelwa, Honest Kimaro and Bernard Mussa.

Breakout Room 3:
Assessing user-designed dashboards: A case for developing data visualization competency.
- Aprisa Chrysantina and Johan Ivar Sæbø.

09:00-09:30 Parallel session 6: Papers
Main Hall:
Decent Work for Ride Hailing Workers in the Platform Economy in Cali, Colombia.
- Katherine Reilly and Luis Lozano Paredes.

Breakout Room 1:
The influence of telecentres on the economic empowerment of youth in disadvantaged communities of South Africa.
- Samkelo Lutho Booi, Wallace Chigona, Priscilla Maliwichi and Khaya Kunene.

Breakout Room 2:
Exploring the effect of mobile apps on SMEs in Nigeria: a critical realist study.
- Adedamola Tolani, Adebowale Owoseni and Hossana Twinomurinzi.

Breakout Room 3:
- Wenxiu Nan and M. Lynne Markus.

09:30-10:00 Parallel session 6: Papers

Main Hall:
- Salihu Dasuki and Naima Hafiz.

Breakout Room 1:
Evaluating mHealth Apps: From Front-End Usability to Three Front-Ends and one Back-End Affordance.
- Amrit Chhetri, Mari Iversen, Jens Kaasbøll and Chipo Kanjo.

Breakout Room 3:
Sinking under its own weight: Case of Aadhaar mediated entitlements in India.
- Arunima Sehgal Mukherjee and Sundeep Sahay.

10.00-10.15 BREAK
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Type</th>
<th>Location</th>
<th>Details</th>
</tr>
</thead>
</table>
| 10:15-11:15  | Keynote speech 3  | Main Hall         | *“Doing ICT4D and developing South-South Cooperation”*
|              |                   |                   | *Maung Sein*                                                           |
| 11:15-12:45  | Parallel session 7: Tracks | Main Hall & Breakout Rooms | **Track 01:** Digital Platforms for Development  
|              |                   |                   | *Chair: Chrisanthi Avgerou and Richard Heeks*                          |
|              |                   |                   | **Track 13:** Local Technical Papers  
|              |                   |                   | *Chair: Ellen Kalinga and Abdi T. Abdalla*                            |
|              |                   |                   | **Track 11:** Sustainable ICT, Informatics, Education and Learning in a turbulent world - “doing the safari way”  
|              |                   |                   | *Chair: Mikko Ruohonen and Faraja Igira*                              |
|              | Mixed Track       |                   | *Chair: Jose Abdelnour-Nocera and Arunima Mukherjee*                   |
| 11:15-11:45  | Parallel session 7: Papers | Main Hall & Breakout Rooms | **Integrating Electronic Medical Records Data into National Health Reporting System to Enhance Health Data Reporting and Use at The Facility Level.**  
|              |                   |                   | *Bigten Kikoba, Dr. Ellen Kalinga and Dr. Juma Lungo.*                 |
|              |                   |                   | **Exploring the Impacts of Intrinsic Variables on Security Compliance Efficiency using DEA & MARS.**  
|              |                   |                   | *Charlette Donalds, Kweku-Muata Osei-Bryson and Sergey Samoilenko.*   |
Breakout Room 2:
Information and Communication Technology in Mathematics Education - Integration Readiness in Tanzania Higher Education Institutions.
- Mzomwe Mazana, Calkin Montero and Solomon Oyelere.

Breakout Room 3:
Using PESTELMO to Examine Digital Services Contexts in Developing Countries.
- Catherine G. Mkude and Maria A. Wimmer.

11:45-12:15 Parallel session 7: Papers

Main Hall:
The Experience of Chamwino Small-Scale Farmers on the use of Smartphone in Farming Business, Tanzania.
- Ezra Misaki.

Breakout Room 1:
Enhancing Faults Monitoring in Secondary Electrical Distribution Network.
- Yona Andegelile, Godfrey Chugulu, Ally Bitebo, Hadija Mbembati and Herald Kundaeli.

Breakout Room 2:
eLearning in an African Place: How ‘alien’ eLearning models are failing many in Africa.
- Munyaradzi Mawere and Gertjan van Stam.

Breakout Room 3:
Investigating the Adoption of an Integrated Hospital Information System in Rural Uganda: A Case of Kisiizi Hospital.
- Amos Baryashaba, Angella Musimenta, Samuel Mugisha and Leonard Peter Binamungu.

12:15-12:45 Parallel session 7: Papers
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:45-13:45</td>
<td>LUNCH</td>
</tr>
<tr>
<td>14:00-14:45</td>
<td><strong>Main Hall: Closing ceremony</strong></td>
</tr>
<tr>
<td></td>
<td>Prof. P. Nielsen/ Dr. H. Kimaro Programme co-chairs</td>
</tr>
<tr>
<td></td>
<td>Chair local Committee</td>
</tr>
<tr>
<td>15:00-16:00</td>
<td>Business meeting</td>
</tr>
</tbody>
</table>

**Main Hall:**
Recommendations for M-Government Implementation in Developing Countries: Lessons Learned from the Designers.
- **Tupokigwe Isagah and Maria A. Wimmer.**

**Breakout Room 1:**
A critical Review of Edge and Fog Computing for Smart Grid Applications.
- **Gilbert Mapunda Gilbert, Shiliilandumi Naiman, Honest Kimaro and Burchard Bagile.**

**Breakout Room 2:**
Developing Multimedia Enhanced Content To Raise Hiv/AIDS Awareness To Children.
- **Patricia Makuru, Fatuma Simba and Ellen Kalinga**

**Breakout Room 3:**
ICT enabled peace network: Case study of conflict early warning system in Kenya.
- **Arunima Mukherjee and Festus Mukoya.**
Keynote Speakers

Prof. Geoff Walsham
Professor Emeritus of Management Studies (Information Systems)

Geoff Walsham is an Emeritus Professor of Management Studies (Information Systems) at Judge Business School, University of Cambridge. In addition to Cambridge, he has held academic posts at the University of Lancaster in the UK, the University of Nairobi in Kenya, and Mindanao State University in the Philippines. His research is focused on the question: are we making a better world with information and communication technologies? He was one the early pioneers of interpretive approaches to research on information systems.

Keynote Title: South-South and Triangular Cooperation in ICT4D

Abstract: This talk will explore the issue of South-South and Triangular Cooperation (SSTrC) and some ICT4D opportunities in this area will be identified. Some challenges will also be outlined including who is doing the driving, who benefits from the work, and why Southern-based research is not well represented in the ‘top’ journals. An exemplar case study will be introduced and five ways forward for the ICT4D field will be discussed.

Dr. Jabiri Kuwe Bakari
CEO - e-Government Agency, Tanzania

Dr Jabiri Kuwe Bakari is a Tanzanian pracademic: his experience spans both the academic and practical realms. He is a researcher, trainer, analyst and advisor of repute with over twenty years of experience in ICT Planning, Management and ICT Security Management. He is the CEO of the e-Government Agency, Tanzania, since its inception in 2012. Dr. Bakari holds a Ph.D in Computer and Systems Sciences from Stockholm University in Sweden (2007), a MSc. (Eng.) Data Communication Degree from Sheffield University in UK (1999), and a BSc in Computer Science from the University of Dar-es-Salaam Tanzania (1996).

Keynote Title: Power of Home Grown ICT Solutions in Developing Countries
Abstract: This talk will explore how Developing countries are realizing the power that home-grown ICT solutions have in solving many existing challenges of these countries. Particularly in ICT sector, these solutions are revolutionizing how we think and undertake delivery of public services, commercial, agricultural and managerial (governance) activities. For a long time developing countries have been relying on ICT solutions from developed counties to carry out their business functions. This high dependence has compounded challenges of the developing countries since our problems are not the same as the problems of developed countries. Due to modest automations in developing countries, our problems are not so complex and don’t need complex solutions either, but we have been complicating them by using solutions that were not made with our requirements in mind. We are therefore, forced to spend a lot of resources such as money, time, human capital, and even unnecessary high capacity infrastructure to adapt and fit these solutions to our requirements and environments, for solutions which are vendor driven instead of our demand/requirement driven. Unfortunately, when we are about to complete this painful and long customisation process, another version with quite incompatible requirements comes around and the support for the previous version we have been trying to customise is being phased out. Therefore, we end up stuck being in a cycle of adapting foreign solutions necessitated by technological advancements, which could barely address challenges of our socio-economic environment, leave alone, high ownership cost incurred on such solutions.

The talk is expected to raise awareness for the policy makers, researchers, innovators, implementers and even consumers of ICT solutions on the potential that home-grown ICT solutions have in solving the challenges of developing countries, by using internally developed human capital capacities and novelties propounded by research and innovation in ICT field. I will also share my thoughts on the implications of these solutions on south-south development, and finally will show with examples, how the home grown ICT solutions are the best for addressing developing countries challenges and that they may be used as tools for advancing southern-driven cooperation, since their socio-economic environments have a lot of similarities. We can’t afford to be left behind in this race, in particular during this fourth Industrial Revolution era, in which the main driver is the brain power.

Prof. Maung K. Sein
Professor of Information Systems

Maung K. Sein is a Professor of Information Systems at the University of Agder, Norway. Since earning his PhD from Indiana University, USA, he has led a nomadic existence: working in some
capacity or other and for varying durations in Asia, Europe, North America and Africa, in academia and practice, in research orientation (positivist, interpretivist and currently action and design) and in research focus (from end-user training, to systems development and data-modelling to e-Government and ICT4D). He is a former chair of International Federation of Information Processing (IFIP) Working Group 9.4.

**Keynote Title:** *Doing ICT4D and developing South-South Cooperation*

Abstract: The conference theme Strengthening Southern-driven cooperation as a catalyst for ICT4D is timely and a strong reminder that innovations do not come only from the North to the South, but the reverse can be equally, perhaps more strongly, the case. Countries in the so-called South are increasingly showing progressions from being recipient of ideas and ICT initiatives from mostly donor-driven North, but also developing ideas and initiatives on their own. These initiatives trickle “up” to the North, a phenomenon termed “reverse innovation”. Examples include ICT-based M-Pesa and microfinance. While the North has learnt from the South, there is little evidence of South-South learning. In my talk, I will give examples of some noteworthy and exciting indigenous projects in the South and explore how these diverse and fragmented efforts can learn from each other. I will also argue that South-South issues are more general and go beyond ICT4D. Through an example of a project that examines South-South migration, I will place ICT4D in the broader landscape of development issues.
# Table of Content

1. Track: Digital Platforms for Development .............................................................. 2
4. Track: Communities, ICT-Enabled Networks, and Development ......................... 33
5. Track: Pushing the boundaries - New research methods, theory and philosophy in ICT4D ................................................................................................................ 40
6. Track: Southern-Driven Human-Computer Interaction ........................................ 47
7. Track: Sustainable ICT, Informatics, Education and Learning in a turbulent world - “doing the safari way” ................................................................. 53
8. Track: Local Technical Papers .............................................................................. 61
IT and Government Corruption in Developing Countries: A Literature Review and Reframing

Atta Addo

London School of Economics, United Kingdom

Abstract

Corruption is a significant challenge confronting government administration in developing countries with adverse implications for information technologies implemented to stamp it out. ICT4D, information systems and related studies of government corruption continue to shed light on the phenomena but have an under theorized view of corruption, its relationship with IT, as well as the role of IT in curbing corruption. Research underemphasizes the socially embedded nature of corruption by treating corruption as a problem of individuals who act corruptly out of rational self-interest or internalized social structures. Drawing on a review of relevant literature, this article suggests a reframing to better align research on IT and government corruption with a socially embedded perspective that considers the formative organizational and broader contexts of developing countries to improve explanations of the complex and seemingly intractable phenomena.

The Role of Digital Platforms in Disrupting Agricultural Value Chains in Developing Countries

Bookie Ezeomah and Richard Duncombe

Global Development Institute, United Kingdom

Abstract

Mobile devices and the platforms they support are increasingly being mainstreamed into agricultural value chains. While the extant literature on the use of mobile devices for agriculture has focused on their use for the provision of m-services through short messaging services (SMS), unstructured supplementary service data (USSD) and voice calls, there is growing evidence of the adoption and use of other digital platforms (mobile apps, web apps and online databases) on agricultural value chains in developing regions. As debates on the disruptive potential of digital platforms in agriculture are still at a nascent stage, this scoping review investigates the current research landscape on the use of digital platforms on agricultural value chains in developing regions. An assessment of the radical functionality, technicality and ownership models of the 26 digital platforms identified through the review show their potential to cause disruptive impact. However,
the review reveals certain methodological shortcomings and a dearth of empirical evidence to support claims of the actual impact.

The Contributions of WhatsApp to Social Inclusion: A Case of Internally Displaced Persons in Nigeria

Salihu Dasuki: Sheffield Hallam University, United Kingdom
Naima Hafiz: American University of Nigeria, Nigeria

Abstract

This paper addresses the topic on how WhatsApp can improve the lives of internally displaced persons (IDPs) affected by conflict. To theorize the complex relationship between mobile technologies and social inclusion, Sen’s five distinct instrumental freedoms was drawn upon to understand the use of WhatsApp by IDPs affected by Boko Haram insurgency in Nigeria and its impact on their social inclusion. Based on a one-week fieldwork of an ongoing research, the case narrative presented both the freedom outcomes afforded the IDPs by the use of WhatsApp and also the impediments that hinder the developmental impact. Finally, we conclude by providing some implications for research and practice.

Integrating Electronic Medical Records Data into National Health Reporting System to Enhance Health Data Reporting and Use at The Facility Level

Bigten Kikoba, Dr. Ellen Kalinga and Dr. Juma Lungo
University of Dar es Salaam, Tanzania

Abstract

A well organized and coordinated health reporting system is critical for improved health system and health care services delivery. For a long time, the Tanzanian Government has been committed to support global efforts to improve the quality of health data for increased accountability and evidence-based decision-making by introducing electronic medical records (EMR) systems at facility level and computerize a national reporting system (district health information system (DHIS2)). It is also committed to ensure decision makers have access to high quality routine data from providers of services at health facilities to those responsible for running health programmes at the health ministry.
However, data collection and reporting at facility level is error prone and task demanding due to the manual processes of collecting, aggregating, and sharing data, as a result rarely data are used to monitor programmes and make decisions beyond individual patient care. With the introduction of electronic medical records system, the goal of the paper is to ensure decision-makers have access to high-quality health data that are generated at the facilities, and they value and routinely use the data for decision-making. In doing so, the paper envisages improved practices around data collection, reporting and use and institutionalization of data through integrations of EMR and DHIS2.

Investigating the Efficiency of ICT Infrastructure Utilization : A Data Envelopment Analysis Approach

Yinka Oyerinde and Felix Bankole

University of South Africa, South Africa

Abstract

A lot of research has been done in the field of Information and Communication Technology for Development (ICT4D) investigating and measuring the impact of Information and Communication Technology (ICT) investments on Human Development. Education is a major component of the Human Development Index (HDI) which affects the core of Human Development. This research investigates the Impact these investments made previously, now have on the educational component of the HDI. The research assumes that previous investments made are now being utilized and can no longer be regarded as ICT Investments, but rather as ICT Infrastructure. A Novel conceptual model was proposed and the Data Envelopment Analysis methodology used to measure the relative efficiency of the components of ICT Infra-structure (Inputs) and the components of Education (Outputs). Results show a strong impact of ICT Infrastructure on Educational Attainment and Adult Literacy rates, a strong correlation between this Infrastructure and Literacy rates as well as provide a theoretical support for the argument of increasing ICT infrastructure to provide an increase in Human Development especially within the educational context.
Decent Work for Ride Hailing Workers in the Platform Economy in Cali, Colombia

Katherine Reilly: Simon Fraser University, Canada
Luis Lozano Paredes: Universidad Torcuato di Tella, Colombia

Abstract

The disruptions created by the digital platform economy have caused both policy makers and workers to generate adaptations to a rapidly changing context. These disruptions are challenging existing definitions of informality and precarity, as well as standard policy responses to worker rights and protections. While preventing precarity is still very much the goal of policy interventions, the idea that ‘informality’ is the cause of precarity has come to be questioned. In this article we introduce the decent work standard developed by Richard Heeks for digital online labour markets like Freelancer, Upwork or Amazon Mechanical Turk. We use a literature review of empirical research about ride-hailing to adapt this framework to the ‘location-based service delivery’ market. This new framework is then tested against an in-depth analysis of informality and precarity in the ride-hailing sector in Cali-Colombia. Findings from this research show that platform workers lack many of the protections recommended by Heeks’ decent work framework. However, the case study also demonstrates that workers are evolving some creative ways to grapple with specific aspects of precarity within the ride-hailing sector. Based on this analysis, we argue that policy analysis and worker innovations need to ‘meet in the middle’ and suggest some specific policy reforms that will be appropriate to the Colombian and Latin American context.

A Multi-Level Perspective on Digital Platform Implementation and Impact: The Case of EasyTaxi in Colombia

Juan Erasmo Gomez-Morantes: Pontificia Universidad Javeriana
Richard Heeks and Richard Duncombe: The University of Manchester, United Kingdom

Abstract

Growth of digital platforms in developing countries has yet to see equivalent growth in research. This paper presents one of the first conceptualised analyses of platform implementation and impact. Using the “multi-level perspective”, it analyses a successful ride-hailing platform: EasyTaxi in Bogotá, Colombia. This was originally a niche innovation
but has effected a socio-technical transition to a dominant position within Bogotá’s taxi regime. Speed of transition is explained in terms of tensions within that regime and from wider demographic change, combined with specific utility of the platform to drivers and passengers who faced a prior context of exploitation, mistrust and insecurity. Though the new regime is a hybrid of platform and non-platform features, its impacts can already be seen: datafication, formalisation, and shift in power away from old taxi operating companies and towards passengers and, in particular, towards the platform itself. Alongside case-specific insights, the paper demonstrates the utility of the multi-level perspective as a means to analyse the enactment of digital platforms.

Ex -Ante analysis of adoption of introduced chicken strains among smallholder farmers in selected areas of Tanzania

Rogers Andrew, Jeremia Makindara, Said H Mbaga and Dr. Roselyne Alphonce:
Sokoine University of Agriculture, Tanzania

Abstract

Keeping local chickens is an integral part of Tanzania’s rural economy although it suffers low genetic potential. To address the problem, the Africa Chicken Genetic Gains (ACGG) project introduced and tested improved strains of chicken viz. Sasso and Kuroiler in Tanzania. The paper aimed to predict the rate of adoption of Sasso and Kuroiler chicken strains by using the Adoption and Diffusion Out-come Prediction Tool (ADOPT). Developmental research design involving provision of 25 six weeks old chicks to farmers was adopted. Data were obtained from a questionnaire survey and Focus Group Discussion in three regions of Tanzania. The results indicate that the peak for adoption is likely to be 34, 29 and 38% after 8, 7 and 9 years in Bahi, Ifakara and Wanging’ombe sites respectively. The sensitivity report indicates that the adoption rate may increase to reach 59, 49 and 57% and may decline to about 17, 16 and 21% in Bahi, Ifakara and Wanging’ombe respectively. Extension efforts to facilitate availability of the strains, feeds, treatment and reducing upfront and operating costs are main factors affecting change in the adoption rate to optimize the inherent genetic potential. It is recommended to facilitate extension efforts for adoption rate improvement by upgrading local chicken value chain to enable farmers to access the strains, feeds, medication and market.
Scaling across Functional Domains: A Case of Implementing an Electronic HIV Patient Information System in Sierra Leone

Eric Adu-Gyamfi, Petter Nielsen, Johan Ivar Sæbø: University of Oslo, Norway
Zeferino Saugene: Eduardo Mondlane University, Mozambique

Abstract

With adherence to treatment, HIV positives can live a normal life. Accordingly, investments are made and health systems are expanded to reach those at risk in developing countries, where HIV is reported to be most endemic. At the same time, many developing countries still rely heavily on paper-based tools which are found to be inefficient when large numbers of patients are involved and of limited use to support follow ups and assure adherence to treatment. In this paper, as we move from an existing paper base and to a digital and online information management system, we focus on improving our understanding of how to use an existing system made for collecting, aggregating and presenting population based routine data to support individual follow-up of HIV positives and their adherence to treatment. We approach this through an action research project in Sierra Leone where we have piloted a HIV patient information management system. We contribute insights on health information system scaling with emphasis on building on existing systems in developing new functionalities rather than introducing entirely new systems. Within this approach we observe the need for technological flexibility and organizational collaboration in utilizing existing resources for efficiency gains.

Anti-corruption efforts in national ICT policies - A study of policy environments in Sub-Saharan Africa

Cecilia Strand: Uppsala University, Sweden
Mathias Hatakka: Örebro University, Sweden

Abstract

Many countries in sub-Saharan Africa suffer from endemic corruption, which disrupts development efforts. Although ICTs is no magic wand, sever-al studies indicate that ICT can serve as an important tool for combatting corruption by increasing transparency, and
enable citizens to hold public officials accountable. Anti-corruption efforts are however dependent on strong political will and rule of law to be successful. A policy typically contains description of government intentions formulated into concrete objectives, as well as the rationale behind government targets. Furthermore, policies guide programmatic responses. The aim of this study is to explore how ICTs’ anti-corruption potential have been understood at the policy level over time in ICT policies from nine Sub-Saharan African countries between 2000 and 2018. The study concludes that although there are signs of a growing understanding of ICTs as a multi-purpose tool for anti-corruption towards the end of the period, most policies fail to produce a comprehensive and explicit narratives as well as statements affirming political will. The policy environment’s development trajectory, albeit positive, thus leaves room for improvement in terms highlighting ICTs potential contributions.

The Experience of Chamwino Small-Scale Farmers on the use of Smartphone in Farming Business, Tanzania

Ezra Misaki

College of Business Education, Tanzania

Abstract

The pervasive use of smartphones to acquire diverse information among small-scale farmers has received little attention in studies. This study, therefore, explored the experience of Chamwino's small-scale farmers of the usage of the smartphone to address ownership pattern, farming practices, information needs, encountered challenges and training needs for future technological alterations. The study employed qualitative design for data collection and thematic analysis was used. The findings revealed that the longer the distance from Dodoma city center, the fewer the number of smartphones owners. That, less than half of farmers in Mvumi and Makangwa owned smartphones while, less than a quarter in Itiso, Mpwayungu, and Chilonwa Divisions. That youth owned more smartphones than elders, and mostly second-hand that were inadequately used for farming business. This was because there was no special farming enabled information system to disseminate agricultural information. Accordingly, the frequently used features were SMS and voice calls. Consequently, farmers need information on inputs, weather, market, and finance among others. Alternatively, there was no official training on the use of the device thus the new technology was therefore underutilized. Furthermore, challenges identified were farmers’ lack of expertise of utilizing the device, uncomfortable large size and the interface of smartphones. Accordingly, farmers were interested in capacity building as many features
A critical analysis of the implementation of health information systems for public healthcare service delivery in resource-constrained environments: A South African study

Mourine Achieng and Ephias Ruhode

*Cape Peninsula University of Technology, South Africa*

**Abstract**

The use of technological solutions is argued to offer quality enhancing efficiencies in the delivery process of healthcare services. For this to be realized certain objectives of these technological solutions have to be achieved. The public health system in South Africa faces various challenges such as poor coordination of most technological solutions therefore fragmented; a lack of interoperability between different systems, haphazard procurement processes and poor information management capabilities. The argument in this study establishes that the causes are not purely logistical but also linked to gaps in the adequacy of the health information systems (HISs) and the implementation process of these technological solutions. A case study strategy, whose empirical home is rural South Africa, was employed using qualitative methodology. Activity Analysis and Development (ActAD) framework was used as a theoretical lens within critical realist paradigm. The study was conducted in a public healthcare facility within a resource-constrained environment. Semi-structured interviews was used as data collection method and analysis of data was through narrative and explanatory analyses, employing thematic analysis tool. The paper intends to come up with a framework that can be used to inform the implementation process of HIS(s) across board. With a focus on the context of a divergent national service delivery reality that impacts the right to healthcare service in under-served communities.
Exploring the effect of mobile apps on SMEs in Nigeria: a critical realist study

Adedamola Tolani, Adebowale Owoseni and Hossana Twinomurinzi

University of South Africa, Nigeria

Abstract

An organization’s dynamic capabilities illustrate how the organization renews its competences in response to the evolving environment. This study explores the effect of mobile apps usage on the Dynamic Capabilities (DC) of SMEs in Nigeria from a critical realist viewpoint. Although, literature suggests that mobile apps are used by SMEs, the elusiveness of mobile app usage in developing country contexts requires the investigation of the underlying mechanisms that explains how mobile apps enhance the DCs of SMEs. Using content analysis and retroduction, the study evaluates interview responses from 16 SMEs covering 5 states in Nigeria. The study revealed that mobile apps are used in SMEs in Nigeria (in the real domain) to carry out business processes (in the actual domain) using their dynamic capabilities (in the empirical domain) for sensing business opportunities. The study suggests that despite the existence of government support for SMEs across Nigeria, these programmes are generally inaccessible and do not include the important ICT, nor mobile app element. The study recommends the need for a contextual mobile app that is suited for SMEs in developing country contexts such as Nigeria.

Tracing the Impact of the City of Cape Town’s Open Data Initiative on Communities and Development

Mbongeni Hlabano and Jean-Paul Van Belle

University of Cape Town, South Africa

Abstract

This paper attempts to measure the extent of impact of the City of Cape Town’s open government data initiative, which has been operational since 2013. Given the relative scarcity of impact measurement frameworks, a framework is adapted from that of Verhulst and Young (2017), as well as the Social Return on Investment (SROI) framework suggested by Stuermer and Dapp (2016). The idea is to trace the developments resultant from the use of open data from various sources, mainly the City of Cape Town’s open data portal. Several activities and developments are identified and classified under a classification scheme adapted from development pathways relevant to a developing country context.
The development pathways are identified from literature. After the developments are traced, critical impact analysis is carried out using the SROI framework. The findings suggest that although there are some indications of impact, such impact is only confined to groups with specialised and specific interest in various types of open data. Additionally, awareness of the existence of open data-sets is also minimal, which significantly decreases the likelihood of use, ergo, impact. Policy suggestions to increase likelihood of use and impact are then presented.

Design Science Research Strengthened: Integrating Co-creation and Co-design

Calkin Suero Montero: University of Eastern Finland, Finland
Alsen Kapinga: Colleague of Business Education, Tanzania

Abstract

Design science research (DSR) is a well-known methodology that uses design as a tool for the development of both practical research resulting in an artefact solution, and theoretical scientific knowledge resulting in improved design processes. In this paper, we advocate strengthening the DSR methodology by including elements of co-creation and co-design in order to produce meaningfully contextualised solutions and to foster a stronger sense of ownership and social acceptance of a developed technological artefact solution within ICT4D. In our work, the inclusion of co-creation and co-design within DSR takes place in all of the stages of the design cycle, influencing also the relevance and rigour cycles as well as the impact of the artefact in the broader socio-technical context. Here we illustrate the practical implementation of these ideas through the involvement of women entrepreneurs from rural Tanzania in the development of a mobile application. This paper contributes to the body of research on the meaningful application of DSR processes to ICT4D.
Software Platforms for Inclusive Innovation

Terje Sanner and Petter Nielsen

University of Oslo, Norway

Abstract

Software platforms present novel opportunities for innovation across heterogeneous settings, users and areas of use. We report from the case of the Health Information System Programme (HISP) that started out in post-apartheid South Africa more than two decades ago. The programme centres on the development of an open source software - called DHIS2 - primarily for decentralized public health management. Today, DHIS2 is a software platform with a significant global footprint. We contribute to literature on innovation for development, by identifying and examining processes of inclusive innovation pertaining to the longitudinal development of DHIS2. We find that a combination of long-term capacity building and knowledge sharing, consensus-based decision-making, and a modular platform architecture facilitates inclusive innovation. However, short term and project-oriented funding limits the sharing and scale-up of local innovations while the size of the venture and the heterogeneity of actors moderates inclusion in the development of core components of the platform.

Experiences from a Development Project in Kenya - Baselines for Future Climate Information Systems

Jaakko Helminen, Mikko Apiola and Erkki Sutinen:

Balozi Bekuta Kirongo: University of Eldoret, Department of Forestry and Wood Science, Kenya

Silvia Gaiani: University of Bologna, Italy

Ezra Misaki: College of Business Education, Dar es Salaam Campus, Tanzania

Abstract

As a part of a larger effort to design holistic climate services, on our exploration we worked with the Marigat District in Baringo County, Kenya, where we first intended to help the farmers to replace the invasive Prosopis juliflora deep-root species by another deep-root species easier to keep under control. Data was collected through questionnaires with open-ended and closed-ended questions to find a baseline of community challenges and technology use. The lessons learned in the project inspired us to analyse the data by using the lens of Heeks’ [3] design theories. The main outcome of this study is a holistic
evaluation and its discussion with future implications for future climate services.

Mobile Phone Use for Empowerment and Well-Being of the Physically Challenged in Nigeria

Abdulrashid Iliya, Chidi Ononiwu, Muhammadou M.O Kah and Ago K.M Quaye

American University of Nigeria, Nigeria

Abstract

National and economic benefits of mobile phone use in developing countries has been a well-articulated research domain over an extended period. This can be attributed to the ubiquitous nature of mobile phones and their increased penetration in developing nations. However, the potential benefits of mobile phones for empowerment and well-being of people with disability (PWD) has been ignored. This paper focuses on the well-being of the physically challenged in Nigeria and how mobile phones can be employed to empower them. The link between ICT and human development has been well researched, but minimal research has attempted to link ICT, mobile phone and disability using the Capability Approach as a theoretical lens. The critical realist ethnographic study approach is employed in this study to show how mobile phones can be used to empower and impact on the well-being of the physically challenged. Data were collected from the Adamawa Skill Acquisition Center for persons with disability, Nigeria. It is argued that mobile phones have the capabilities to empower and impact on the well-being of the physically challenged. Thus, the findings illustrate that mobile phones play significant roles in the well-being and empowerment of the physically challenged.

Exploring Hybridity in Digital Social Entrepreneurship

Silvia Masiero and Mayasandra-Nagaraja Ravishankar

Loughborough University, United Kingdom

Abstract

Social enterprises, stemming from the combination of charity and business identities, are framed as an ideal setting for the study of hybrid organising. In this paper we introduce the concept of Digital Social Entrepreneurship (DSE), which refers to the entrepreneurial work of social ventures centred on digital technologies. While characterised by the coexistence
of social and commercial goals, DSE presents one more form of hybridity, related to the need to blend digital and non-digital capabilities in the same organisational unit. To understand how such capabilities come together we draw on a qualitative case study of Rang De, an Indian digital platform providing microloans to vulnerable borrowers. Using concepts from the literature on organisational hybridity, we identify three mechanisms - respectively centred on activity integration, selective coupling, and enactment of new operational practices - through which digital and non-digital capabilities are combined in DSE. The paper contributes to the emerging theorisation of the role of the digital in social entrepreneurship and draws practical implications for it to contribute to tackling global poverty and vulnerability.

Acceptability and Use of Mobile Health Applications in Health Information Systems: A case of eIDSR and DHIS2 Touch mobile applications in Tanzania

Jimmy Mbelwa, Honest Kimaro and Bernard Mussa

University of Dar es Salaam, Tanzania

Abstract

The use of modern information and communication technology plays a significant role in healthcare services improvement. In the recent years, various mobile application systems have been deployed in the health sectors of different developing countries to facilitate remote data collection and transmission so as to improve its quality and availability. Consequently, understanding the factors contributing to mobile technology acceptance is imperative. The purpose of this study was to adopt a modified UTAUT theoretical model to understand the factors influence acceptance and use of mobile health applications by health workers at health facilities in Tanzania. Questionnaires were used to collect data from health facilities workers. Out of 150 health facilities workers, only 108 return, a 72% return rate whose data was statistically analyzed using SPSS tool. The findings show that effort expectancy and facilitating conditions significantly influence the users located in the urban area on behavioral intention to use mobile health applications. Furthermore, the study shows that the constructs such as social influence, training adequacy, and voluntariness of use do not have a significant influence on the use of mobile health applications.
Towards Holistic Mobile Climate Services for Farmers in Tambuu, Tanzania

Ville Myllynpää, Mikko Apiola, Jaakko Helminen, Moammar Dayoub, Tomi Westerlund and Erkki Sutinen: University of Turku, Finland
Ezra Misaki: College for Business Education, Tanzania

Abstract

Climate change and changing climate variability are pressing problems that need urgent solutions, now! Climate change has global consequences, and is already being experienced, mainly by the most vulnerable groups of people in the global south. Research shows that farming activities in the global south are being complicated by added uncertainties in weather. To mitigate the effect of weather uncertainties, there is a need for holistic mobile climate services. We have taken the first step towards the service by finding out the local information needs and current mobile usage patterns in Tambuu village, Tanzania. The results show that climate change is already complicating farmers lives and they have several other information needs, too. From the technology perspective, the domination of voice calls and short messages in the current mobile usage limits the adoption of new services. However, modern uses of smart devices for farming activities were also found. Building on this ground, we propose designing technology prototypes together with local farmers and other relevant stakeholders.

Leveraging Digital Health Platforms in Developing Countries: The Role of Boundary Resources

Brown Msiska: University of Malawi, Malawi
Petter Nielsen and Jens Kaasbøll: Telenor & University of Oslo, Norway

Abstract

The pervasiveness of digital platforms has resulted in the emergence of digital health platforms addressing various health care needs globally. Digital platforms, typically, bring about an international division of labor between platform owners in developed countries where they are usually developed and platform consumers in developing countries leveraging them. In this relationship, boundary resources, such as documentation and application programming interfaces, are critical elements in the efforts to leverage digital health platforms in developing countries. This paper uses the case of the digital health platform DHIS2 in Malawi to elucidate and discuss the enabling and restricting roles played by
boundary resources towards the leveraging of digital health platforms in developing countries. Boundary resources are part and parcel of the process of turning a platform as designed to a platform in use.

**Evaluating mHealth Apps: From Front-End Usability to Three Front-Ends and one Back-End Affordance**

Amrit Chhetri, Mari Iversen and Jens Kaasbøll: *University of Oslo, Norway*

Chipo Kanjo: *University of Malawi, Malawi*

**Abstract**

CommCare is a software tailored to community health workers, while DHIS2 is general software for hierarchical organisations. Both packages can be configured to useful end-user apps. Since CommCare is more specific, DHIS2 might learn from CommCare when developing Android apps to be used offline, hence useful for community health workers also when there is not internet connection. Apps for home visits were developed in both softwares and community health workers in Malawi were recruited to use test both systems and compare them. The advantage of CommCare was its ability to display images which could be used for health promotion. During the evaluation, other usability issues turned out to be relevant in a comparison. The configuration process in CommCare was quicker than in DHIS2. DHIS2, however, could produce reports summarizing health indicators to the community health workers, and also compare with data collected outside the app. Also, a non-functional quality was noted, the cost of licensing for CommCare versus the free DHIS2. Cost could not be captured in a usability evaluation. To capture all the properties of the system, we used the concept Affordance, and made the sub-categories End-User Affordance (may be more End-User groups with differing affordances), Platform Affordance (for the configurer), and Organisational Affordances (for cost and other non-functional qualities). While Platform Affordance has been used before, we believe that the three subsets constitute a comprehensive characteristic of IS built on a software platform.
How South African university information systems students are using social media

Yazeed Seedat, Sumarie Roodt, and Samwel Mwapwele
University of Cape Town, South Africa

Abstract

Social media is a term used to combine social networking, media sharing and microblogging systems. Social media assists students to improve their academic studies, allows collaboration and sharing of information with each other, and affords students to know what is happening in the world, acquire pictures and videos in support of such information. Information Systems (IS) students are the next generation of technology experts and their exposure to using social media as alternative source of information and for collaboration might affect features included in systems. This research was conducted following a positivist approach which used quantitative method to investigate the usage of social media in higher education. An online questionnaire was distributed to undergraduate Information Systems students via email with a link to the questions provided. Statistical inference was performed to test the usage of social media in higher education through the Unified Theory of Acceptance and Use of Technology (UTAUT). As a result, students viewed social media as a learning tool since it allowed them to enhance their academic performance and ability to explore knowledge. Social media also allowed students to communicate, share and collaborate. Research model confirmed that there’s a positive relationship between social media and the behaviors of undergraduate students and regarded social media as a learning tool.

Institutional shaping of affordances: implications on information use in global humanitarian organizations

Marta Maria Vila-Pozo and Sundeep Sahay
University of Oslo, Norway

Abstract

In humanitarian interventions, information is needed that is situationally relevant and timely. Humanitarian organizations are making systematic efforts to strengthen their supporting information systems, but these benefits have not always really materialized in practice. The macro-level formal and informal institutional conditions shape the design and content of the Humanitarian Health Management Information Systems. We use an ensemble view of the information system to analyse how they also shape the actualization
of affordances. We identify through our empirical analysis three key affordances relevant to the use of data - operationability, accountability and contextuability. Particularly relevant to a humanitarian setting given the challenge of and remote and dynamic nature of the constantly changing setting. We later analyse, from an ensemble view of the system how the actualization of these individual affordances inter-act with each other. In some cases, the easy access to paper-based data discourages users from using the computer-based system, in other cases the paper printouts are used in conjunction with the computer reports of aggregate data. We later study how the four key institutional influences identified, both formal - the technical features and limited availability of information, and informal - existing maturity in the use of information and the unique features of the humanitarian setting - shape the actualization of affordances towards data use. Keeping the lens of the ensemble view, we see that these formal and informal institutions have influences that are both enabling and constraining for the actualization of the identified affordances.

Sinking under its own weight: Case of Aadhaar mediated entitlements in India

Arunima Sehgal Mukherjee and Sundeep Sahay
University of Oslo, Norway

Abstract

In this paper, we analyse through a largely conceptual analysis the application of the Aadhaar biometrics identification system in India, now assuming complex proportions, and how that facilitates or not citizen’s entitlement of welfare benefits. The conceptual analysis is informed by the works of James Scott’s Seeing like a State which cautions against such large scale state sponsored schemes ending up as disasters. Amartya Sen’s analysis of famines informs how it is important to focus on the access to the entitlement rather than the entitlement itself which potentially can lead to entitlement failures. The conceptual analysis developed helps to critically analyse two case vignettes related to two welfare programmes of the Midday Meal and the Public Distribution System. The paper concludes by arguing for the need to critically discussing how Aadhaar can be made to work in practice while supporting broader development objectives, rather than arguing whether Aadhaar is inherently good or bad.
Agile Software Development Practices in Egypt: A Grounded Theory Investigation

Amr Hamed and Julian Bass
University of Salford, United Kingdom

Abstract

Agile information system development methods have been adopted by most software development organizations due to their proven benefits in terms of flexibility, reliability, and responsiveness. However, companies face significant challenges in adopting these approaches. Specifically, this research investigates challenges faced by software development companies in Egypt while transitioning to Agile. As little previous research is available targeting their concerns, we have built a model that will help to identify, evaluate, and potentially mitigate their problems. A grounded theory investigation was conducted to collect data from agile development practitioners in Egypt. Key problem areas were found including lack of cadence in sprints planning, inadequate use of effort estimation and product quality issues. Based on our data collection and a literature review, a model was developed to reflect the agile practices and artefacts used. After further data collection, the model was extended to reflect on the problem areas found. The artefact model can be used by software development practitioners adopting agile methods in Egypt or similar developing countries. The artefact model sets an outline for the common problem areas they are expected to find and how to mitigate them.

Strategies for Standardizing Health Information Analysis. Flexible Standards Revisited.

Olav Poppe, Johan Sæbø and Jørn Braa
University of Oslo, Norway

Abstract

Purpose: This paper analyses an initiative led by WHO within the health information domain to standardise analysis of health information through the use of analytical dashboards, using the concept of flexible standards. We focus on the implementation of these standards within existing, working information systems, analysing the implementation strategies used, and how these are enabled by the flexibility of the standards. Design/methodology/approach: The study follows an action research approach, where the authors have been involved in the development and implementation of the initiative being discussed.
Findings: By analyzing the approaches taken by several countries to implement these standards we show how these different approaches are enabled by the flexibility of the standards. Practical implications: This paper demonstrates the potential importance of flexibility in standardisation initiatives around health information, with particular relevance to voluntary standardisation efforts involving independent actors, in this case Ministries of Health. Originality/value: The flexible standards concept is employed to study a multi-country initiative involving WHO and several national governments. We contribute to the literature on flexible standards by showing that beyond flexibility in the standards, flexibility in the software platform in which the standards are implemented, and the variation allowed in the standardisation process at an organisational level, are important factors that facilitate standards implementations.

**Recommendations for M-Government Implementation in Developing Countries: Lessons Learned from the Designers**

Tupokigwe Isagah and Maria A. Wimmer

*University of Koblenz-Landau, Germany*

**Abstract**

Researchers argue the potential of mobile technologies to bridge the existing challenges of e-government implementation in developing countries. Despite the demand, research on the design and implementation of m-government is still scarce. The current literature hardly provides comprehensive recommendations for implementing such services in developing countries. This paper aims to bridge the gap by examining the challenges of m-government services from the m-government practitioners of developing countries. Also, it explores the solutions applied by the practitioners to address the challenges. To achieve these goals, online questionnaire and interviews techniques were used to collect data from the practitioners. MAXQDA tool was used to analyze the gathered raw data, and we applied the PESTELMO method to categorize the challenges. Results show that designers are facing problems related to requirement engineering, stakeholder management, the budget allocated and technology standards. We provide recommendations to improve the designs in the future, and which contribute to accessibility and sustainability of the services. The recommendations apply to government organizations and practitioners of mobile public services.
What Motivates ICT4D Champions?

Jaco Renken

The University of Manchester

Abstract

The paper seeks to identify the factors that motivate a person who champions ICT4D initiatives. Given the important contributions of ICT4D champions to initiative success, better understanding of their motivations holds the potential to identify, develop and deploy such individuals more effectively, harnessing their potential positive contributions to ICT4D initiative success. A multiple case study strategy is used to explore the motivational factors of three successful ICT4D champions in the South African context. The Work Preference Inventory (WPI) of personal motivations was used to design in-depth interviews with the champions and semi-structured interviews with 29 other stakeholders. It found ICT4D champions are motivated by the need for personal actualization, business success and to address social concerns — origins of these motives could be traced to various internal and environmental stimuli. Practical implications drawn from the research are that profiling of stakeholder motivations in an ICT4D initiative is feasible and that organizations can use such information to create a conducive environment for grooming and empower new and existing champions to function more effectively. This first investigation of ICT4D champion motivations shows its importance and the potential thereof towards improving initiative success and emphasizes the need for further research of this nature.


Wenxiu Nan and M. Lynne Markus

Bentley University, United States

Abstract

Inclusive digital innovations are IT-enabled innovations with the potential to promote inclusive socioeconomic development for the poor and underserved inhabitants of developing countries. This paper inquires about the extent to which this worthy objective has actually been achieved. Specifically, the paper focuses on M-Shwari, the Kenyan mobile savings and credit service. Although members of the development community and other stakeholders might hope M-Shwari to serve poor, rural, and financially underserved Kenyans, the research findings show that M-Shwari primarily reaches wealthier urban
inhabitants who are already financially served. These results call for greater scholarly attention to excluded groups when evaluating the impacts of digital innovations in developing countries.

Co-creating an ICT Platform with Elderly Rural Women in Mafarafara: a Social Structuration Account

Ronel Smith and Marita Turpin: University of Pretoria, South Africa
Marlien Herselman: CSIR, South Africa

Abstract

In South Africa, elderly rural women is the most socio-economically disadvantaged population group: their age, gender and rural location all contribute to their disempowerment. For this reason, an ICT4D project was undertaken by the CSIR with the aim of supporting elderly rural women in their livelihood activities. An ICT platform was established and implemented in a women’s Community Centre in Mafarafara, a remote rural village in the Limpopo province of South Africa. The ICT platform was a rugged information kiosk based on Digital Doorway technology, and was populated with information to assist the women in their farming activities. As part of the women’s empowerment, they were involved as co-creators of the ICT platform and its contents. The study employed a Design Science Research Methodology (DSRM). However, it was soon realized that the social dynamics were influencing the design of the artefact more so than the DSRM. To this end, Giddens’ structuration theory was incorporated in the study, to make visible the social dynamics that influenced and in turn were influenced by the design process. In this paper, concepts from structuration theory are applied to qualitative data from the Mafarafara interviews and site visit reports. The value of using structuration theory alongside DSRM to acknowledge the social nature of design is demonstrated.
An Institutional Perspective on Adoption of Open Dashboard for Health Information Systems in Tanzania

Wilfred Senyoni and Honest Kimaro: University of Dar es Salaam, Tanzania
Jørn Braa: University of Oslo, Norway
Claud Kumalija: Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDEC), Tanzania

Abstract

This article attempts to understand the adoption and institutionalization of open dashboards in the health information system in Tanzania as part of the national initiative in strengthening the routine health information systems. Using an institutional perspective, specifically the concept of institutional work, the article analyses the efforts of a group of actors aimed at disrupting existing structures, thereby creating new ones and diffusing them within and across organizations. We argue that for the institutionalization of open dashboards in health information systems, serendipity moments are necessary and should be met with actors capable of mobilizing others within the network. Furthermore, we argue that the use of participatory approach has the potential to align interests from diverse stakeholders hence providing a mechanism for transforming rooted organizational routines.

Exploring Tensions of Global Public Good Platforms for Development: the Case of DHIS2

Brian Nicholson, Petter Nielsen, Johan Saebo and Sundeep Sahay
University of Oslo, Norway

Abstract

The purpose of this paper is to explore tensions in global public goods (GPG), based on the case of digital platforms for innovation. GPG designs promise normative ideals of non-rivalry and non-exclusivity, which in practice are challenged in reality and fraught with tensions. This paper draws on theory of contradictions to illustrate some of these tensions, which confronts simplistic and linear views that implementing GPG health management platforms will translate unproblematically to efficiency gains. The paper explores field data collected by the authors in the Health Information Systems (HISP) research programme around the digital platform (DHIS2) installed in over 80 countries globally, primarily in the health sector. Episodes are taken from action research undertaken by the authors drawn
from experiences of multiple implementations in various countries. This paper furthers the theoretical understanding of contradictions inherent arising from the espoused ideals of GPGs and the realities of their implementation and use. The implications focus on the need to move away from simple deterministic visions of GPG towards acknowledging the contested nature of their outcomes.

Digital Platforms in the Global South: Foundations and Research Agenda

Kari Koskinen: London School of Economics and Political Science, United Kingdom
Carla Bonina and Ben Eaton: University of Surrey, United Kingdom

Abstract

Digital platforms have become integral to many of the everyday activities that people across the globe encounter in areas like transportation, commerce and social interactions. Research on the topic has largely concentrated on the general functioning of these platforms in terms of platform governance, business strategies and consumer behaviour. Despite their significant presence in the global South, the developmental implications of digital platforms remain largely understudied. In part, this is because digital platforms are a challenging research object due to their lack of conceptual definition, their spread across different regions and industries, and their intertwined nature with institutions, actors and digital technologies. The aim of this paper is therefore twofold: to provide a conceptual definition of digital platforms, and to identify research strands in international development contexts. To do so, we draw from digital platforms literature, differentiate between transaction and innovation platforms and expose their main characteristics. We the present four strands in the form of research questions, illustrated with concrete examples, that can assist to pursue relevant studies on digital platforms and international development in the future.
Assessing user-designed dashboards: A case for developing data visualization competency

Aprisa Chrysantina and Johan Ivar Sæbø

University of Oslo, Norway

Abstract

Health information dashboards, which are collections of relevant indicator visualizations for management, have become a common feature and strategy for improved information use in the health sector. They should provide any manager with quality information in a format that points out the performance of health service provision, and thus necessitate good knowledge of visualization techniques to both develop and interpret. Since health management is a dispersed and decentralized activity, dash-boards need to be relevant to varied users, and various administrative levels of the health services. This can be achieved by enabling all users to make their own dash-boards, based on the indicators they need, and presented in a suitable manner to track the local priority activities. In this study we examine user-defined dashboards in Indonesia, which has implemented a flexible and open source platform for health management (DHIS2). While the technical flexibility of the platform has been taken advantage of by providing platform customization training, the study finds that the quality of the dashboards created face numerous challenges. These challenges point to poor visualization competence. We conclude by calling for such competence to be addressed by the training curricula, as well as by utilizing existing “best practice” dashboards from WHO now available for the same platform.

Convergence of technical and policy processes: A study of Indonesia’s health information systems

Taufiq Sitompul, Wilfred Senyoni and Jørn Braa: University of Oslo, Norway

Yudianto Yudianto: Data and Information Center of Ministry of Health-Indonesia, Indonesia

Abstract

This paper discusses the process of implementing a district dashboard as the means for integrating health information systems (HIS) in Indonesia. The project involved two processes: a bottom-up one with iterative design and implementation process and a top-down one involving data policies. Using moments of translation, we discuss the complex processes of aligning actors’ interests necessary for the implementation of HIS in
developing countries. The paper contributes to the existing discussions of HIS integration and information sharing in developing countries by providing a better understanding of translation processes and thereby of ways to handle fragmented HISs.

**Nexus between country context and the role of external actors in the formulation of national Information and Communication Technology policies**

Gregory Kunyenje and Wallace Chigona

*University of Cape Town, South Africa*

**Abstract**

This paper examines the nexus between the context of a developing country and external actors’ influence in the formulation of a national Information and Communication Technology (ICT) policy. It questions whether context of a developing country affects the way external actors influence formulation of a national ICT policy following that external actors have mostly influenced policy formulation in Africa. The study adopted Bourdieu’s concepts of field, habitus, capital and practice to analyse the nexus between the context of Malawi as the case and external actors’ influences. Eighteen (18) interview transcripts, 3 draft policy documents, 4 copies of minutes of policy meetings and 3 reports were used in the study. The paper finds that developing countries with traits such as high poverty levels, over-dependence on foreign aid and limited knowledge and skills in public policy making are overtly affected by external actors’ influence in the formulation of a national ICT policy. This finding offers stakeholders of public policy and government important insights into how they can effectively manage external actors during the policy process in developing countries.
Smart City for Development: A conceptual model for developing countries

Luiz Antonio Joia and Alexander Kuhl

Getulio Vargas Foundation, Brazil

Abstract

The present article addresses how smart city initiatives can positively impact development, with a special emphasis on developing countries. Extant definitions and maturity models on smart cities have a very strong focus on the mere use of Information and Communication Technology (ICT), thereby ignoring the special needs and factors to be considered in developing countries. Thus, by using the extant literature on Smart Cities and Information and Communication Technology for Development (ICT4D), a comprehensive Smart City for Development (SC4D) model is introduced. The article argues that a favorable ecosystem for SC4D is one that is backed by both national and local sustainability, infrastructure, human capital, services, apps, and data. Moreover, successful SC4D initiatives include bottom-up approaches, citizen participation, a fit with both the national and the local culture, as well as a fit with the United Nations’ Sustainable Development Goals and the Capability Approach.

Decolonising Neo-Liberal Innovation: using the Andean philosophy of ‘Buen Vivir’ to reimagine innovation hubs

Andrea Jimenez: The University of Sheffield, United Kingdom

Tony Roberts: Institute of Development Studies

Abstract

Innovation is increasingly portrayed as central to social and economic development. Models of innovation from the global North are often applied un-critically in the global South. Doing so may unwittingly silence indigenous knowledge, ways of knowing, and cultural values. From an ethical perspective this can be considered to be ‘cultural invasion’ (Freire 1970) or ‘epistemic vio-lence’ (Spivak 1988). From a political and ecological perspective importing neo-liberal growth-focused approaches to innovation may be considered to be both neo-colonial as well as environmentally unsustainable. Santos (2014) has argued that epistemic violence is committed when actors from the global North are in-sufficiently mindful of ‘Epistemologies of the South’. Neither Santos nor the au-thors of this paper believe that there is nothing of value to be learned from the global North - only that
there is as much to be learned from the global South - and everything to be gained from a skillful combination of different ways of knowing. This theoretical paper proposes a future line of research to examine in what ways Epistemologies of the South might inform innovation processes to produce different outcomes. We use the example of innovation hubs and although we might have used the philosophies of Ubuntu from Southern Africa or Swaraj from India, in this paper we use the lens of Buen Vivir (living well) from Andean communities in South America to suggest that another innovation is possible.

Incorporating indigenous perspectives in provision of e-government services: The case of Tanzania

Bakari Mashaka: Institute of Accountancy Arusha, Tanzania
Neil Mcbride and Kutoma Wakunuma: De Montfort University, United Kingdom

Abstract

This paper reports on the gap on perceptions of e-government for indigenous inclusion in Tanzania. E-government provisions in developing countries are linked with the use of ICT4D to support development plans. Literature indicates that development issues, cultural context and consideration of local communities’ requirements play a crucial role in facilitating adoption of e-government systems. Use of mobile phones in local communities and sharing mobile device facilities presents a unique phenomenon on utilizing e-government services in Tanzania. Drawing from in-depth interviews from government officials and citizens, the paper argue that perceived gap between central government and local communities is caused by a number of issues. The results indicate that even with few available e-government services, citizens are still keen to use them. It also emerged that there is a gap on computing facilities, central government was found to have all required minimum devices and support to access e-government services and the same was missing to the local communities. Among citizens, mobile phones were preferred way of accessing e-government services as compared to other means since they are convenient and are more personal and hence providing feeling of ownership. For the e-government services to benefits indigenous communities there is a need to address problems associated with the lack of available key e-government services in rural areas, lack of skills among government officials on public administration and development issues as well as under-utilization of mobile phone for e-government services.
Digital technology for preserving cultural heritage in Tonga

Anau Mesui, Antonio Diaz Andrade and Lena Waizenegger

AUT University, New Zealand

Abstract

Cultural heritage embodies and carries the stories and values of our ancestors that define our understanding of who we are today. A society’s heritage serves an important purpose for educating people about their own culture and aiding in understanding their traditional values. In Tonga, where this research has been conducted, the historical knowledge and cultural values have been usually transferred orally from generation to generation. However, due to the pressures of globalisation, westernisation and migration, cultural heritage is under threat. These threats can potentially impede the transferring of societies’ idiosyncratic identity to future generations and erode cultural life. ICT as an option to preserve cultural heritage offers opportunities to not only capture and immortalise tangible and intangible cultural artefacts, but also enables the accessibility of those artefacts to a wider audience through the internet. It is against this background that we explore how digital technologies are implicated in the process of preserving cultural heritage.
Humanitarian Organizations Information Practices: procedures and privacy concerns for serving the Undocumented

Sara Vannini, Ricardo Gomez, Diane Lopez, Sigifredo Mora, Julia Clare Morrison, Julee Tanner and Lena Youkhana: University of Washington, United States
Genoveva Vergara: Iberoamericana University, Mexico
Maria Del Mar Moreno Tafurt: ICESI University, Colombia

Abstract

Many humanitarian organizations in the United States work with the information of undocumented migrants to help them secure services that might otherwise be unattainable to them. Information and Communication Technologies can help their work, but can also significantly exacerbate the risks that undocumented individuals are facing, and expose them to security breakages, leaks, hacks, inadvertent disclosure, and courts requests. This study aims to provide a preliminary understanding of the information practices and systems that US humanitarian organizations employ to protect the privacy of the undocumented individuals they serve. To do so, we conducted interviews and an analysis of organizations’ working documents within humanitarian organizations on the US West Coast, including advocacy groups and organizations with ties to higher education. Our outcomes show gaps between current legal standards, technology best practices, and the day-to-day functioning of the organizations. We contend the necessity of support to humanitarian organizations in further developing standards and training for digital privacy.

Refugees and ICTs: Identifying the Key Trends and Gaps in Peer-reviewed Scholarship

Suzana Brown and Ali Masoumifar: Stony Brook University (at SUNY Korea), South Korea
Faheem Hussain: Arizona State University, United States

Abstract

The goal of this paper is to identify existing literature in the field that encompasses one contemporary crisis and one prevailing developmental implement: refugees, and the use of ICT in the development arena. A total of 35 research studies were identified that address these two topics. In the process, several main themes that dominate the field are identified. These themes are the assessment of refugee status and position, education, empowerment and identity, health, and risk of ICT for refugees. Subsequently, a discussion of the missing
areas in this research domain is presented. In the authors’ opinion, the missing themes that are urgently needed are ethics of ICT for refugees, longitudinal studies, engendering of ICT, comparative research, and entrepreneurial aspect of refugees. This missing research would help humanity to get a better understanding of this immense challenge and to design appropriate solutions that leverage ICT to alleviate the current refugee crisis.

**Reimagining Refugee Identity Systems: A sociological approach**

Shirin Madon: *London School of Economics and Political Science (LSE), United Kingdom*

Emrys Schoemaker: *Caribou Digital, United Kingdom*

**Abstract**

This paper explores how the social identity of refugees shapes and is shaped through the process of registering with humanitarian organizations. Building on the recent advance of critical studies on digital identity systems for refugee management, we show how the lens of social identity is helpful in understanding the relationship between refugee information systems and refugee experiences of registration and accessing services. Identity is a key issue related to contemporary information systems which hold data about people yet remains an under-theorised area of investigation from a sociological perspective in the field of information systems, international development and refugee studies. Using qualitative data from 75 refugees in Bidi Bidi refugee camp in Northern Uganda, this paper shows how central the social identity of refugees is in determining the quality of service provision to vulnerable individuals focusing on three key dimensions. First, how social identities related to home and family were carried over to refugees’ new location in Uganda and were later transformed through the process of registration. Second, how work and career aspirations shape social identity, and how the absence of education credentials limits the realisation of personal goals. Third, how interactions between institutions and refugees is both shaped by and shapes refugee identity. Finally, we point to important policy implications of our study for improving the experience of refugee communities.
When will you start teaching the REAL curriculum? - Challenges and Innovations in Education for Rohingya Refugees

Azmina Karim: Connect Her, Bangladesh
Faheem Hussain: Arizona State University, Stony Brook University, United States

Abstract

This paper explores key problems faced by different humanitarian agencies in educating Rohingya refugees from Myanmar seeking asylum in Bangladesh. The first half this research provides an overview of the challenges faced by different refugee communities globally in the Education sector, followed by the relevant ICT interventions. Then, based on our interviews and FGDs with Rohingya refugees, we highlight the major challenges faced by them while accessing education services in their camps. The absence of a coherent curriculum, challenges with language, lack of qualified teachers, and non-acceptance of ICTs as primary education tools for children are identified as some of the primary obstacles faced by Rohingyas. Based on our research, we recommend that enabling policies and an inclusive hybrid knowledge network, emboldened by pre and in-service teacher training, inclusive religious education, standardized curriculum, and tangible employment opportunities can pave the path for a better and an educated future for the persecuted Rohingyas.
Value Co-creation in Design of mHealth Applications for Maternal Healthcare Service Delivery

Hawa Nyende

University of Gothenburg, Sweden

Abstract

mHealth has potential to improve maternal healthcare in low resource contexts. Several mHealth applications have been developed but are not implemented nor can they be scaled up partly due to their methodological quality. Although mHealth applications have been designed to improve maternal healthcare service delivery, it is still unclear on how to design mHealth applications for maternal healthcare that drive value co-creation from a service dominant (S-D) logic perspective. In this paper, a case study approach is used to investigate designs of four mHealth applications from Uganda and Cameroon. Interviews were held with developers and health workers involved in the design process of the applications. Results were analyzed using S-D value co-creation model. Overall findings show that designs of existing mHealth applications for maternal healthcare include some aspects of value co-creation but still lack design guidelines that would better support value co-creation. Guidelines for designing mHealth applications that co-create value in maternal healthcare are proposed. Future investigations on how proposed guidelines influence the use of mHealth applications to trigger value co-creation in maternal healthcare are suggested.

An inquiry into IT Governance in healthcare organizations in Uganda

Michael Kizito

University of Gothenburg, Sweden

Abstract

Looking at the world today, various organizations have taken up IT to support most of their work processes. IT can no longer be considered only a support component but has become strategic. Given that IT is ubiquitous, it requires proper governance in order
for organizations to derive value and achieve organizational objectives from its use. IT governance is therefore advocated as a necessary means for ensuring the effective and efficient use of IT. Previous literature does not say much about IT governance adoption and enactment in healthcare organizations. In this study, resource orchestration is used as a framework for understanding management strategies for IT governance adoption in healthcare organizations. The study answers the re-search question, “How do managerial strategies aid the adoption of IT governance in healthcare organizations”. This is done through an interview study of managers, IT workers and policy makers in a selection of Ugandan organizations. The participants in the study were from both the private and public healthcare organizations, IT authority and the capital city authority. Findings show that there are informally agreed upon and approved strategies in place for the adoption of IT governance. The contribution is in terms of suggestions of how senior management can enact the strategies and make use of the organization’s knowledge based and financial resources to inform adoption of IT governance.

E-commerce institutionalisation in Mozambique: enablers and barriers

Fernanda Matsinhe and Salah Kabanda

University of Cape Town, South Africa

Abstract

Electronic commerce (e-commerce) has been widely discussed in academia and practice over the past years, however, its application in the specific context of women led small medium enterprises (SMEs) in developing countries has been scanty. This study aims to respond to this paucity by investigating the process of e-commerce institutionalization among women-led SMEs in Mozambican context. Using the Perceived E-readiness Model (PERM) as a sensitising lens and following an interpretive paradigm; the study identifies organisational and external factors that are perceived to be enablers and hindrances towards E-Commerce adoption and institutionalisation in women led SMEs.

Contemporary Challenges in Street Trader-Customer Interaction Through Mobile Devices in Dodoma, Tanzania

Joel Rumanyika and Nasibu Mramba: College of Business Education (CBE), Tanzania
Matti Tedre and Solomon Oyelere: University of Eastern Finland, Finland
Mikko Apiola: University of Turku, Finland
Abstract

Street trading is a common form of informal work carried out by almost one million Tanzanians. Majority of street traders use mobile devices to interact with customers. Despite this interaction, there is no abundant information showing if their interaction is mainly effective and does not face challenges. This study investigated the challenges faced by street traders and customers interacting through mobile devices in Dodoma, Tanzania. Qualitative data were collected using in-depth interviews with 42 street traders and 32 customers, followed by focus group discussion with eight street traders and six customers. Thematic analysis was used to analyze the data. The results show that street traders and customers occasionally interact using mobile phones. However, that interaction is challenged by issues connected to financial, technical and social aspects. These challenges are; lack of reliability among mobile phone interacting customers, mobile network problems, lack of business communication transparency, deep-rooted customary practices and perceptions of street trading, poor customer care, lack of consensus over mobile business etiquette, poor quality of product pictures, short mobile internet bundle validity, mobile phone battery life, and costs of mobile handset, transactions, vouchers, packages, and transport. The results call for the option of bundle and transaction cost reduction, network infrastructure improvement and provision of education to street traders and customers so that they realize the significance of business interaction using mobile devices contrary to what is happening recently, as well as abiding by communication ethics to minimize the likely challenges.

eHealth in Zimbabwe, a case of techno-social development

Trymore Chawurura: Ministry of Health and Child Care, Zimbabwe
Ronald Manhibi Janneke van Dijk, and Gertjan van Stam: SolidarMed, Zimbabwe

Abstract

This paper presents a transdisciplinary eHealth narrative as it appears to health professionals, information and communication technology experts, and health practitioners in Zimbabwe. Harvesting from rich experiences and focus group discussions, the embedded authors present how various traditions position eHealth. Reflecting upon the genesis of the
multiple perspectives - anthropological, computer science, medical, among others - this paper presents a practice of eHealth in Zimbabwe. The paper serves as a rationale for aligning eHealth with people, processes, systems and categorisations that consider the local cultures, the local way of meaning-making, and value local systems.

**Investigating the implementation of ICT tool to electoral process in Nigeria**

Aishatu Shuaibu and Muhammadou Kah: *American University of Nigeria, Nigeria*

Salihu Dasuki: *Sheffield Hallam University*

**Abstract**

This study is aimed at understanding the implementation of Information Communication Technology (ICT) tool to electoral process and its challenges in Nigeria using actor-network theory (ANT) as a lens. Moment of translation of ANT was applied to gain an insight of the phenomenon. Empirical data was used for the analysis in the context of social behavior between human and non-human actors following inductive research approach. Case study methodology was carried out at Independent National Electoral Commission (INEC). The methods of data collection were through interview, participant observation and reviewing organizational documents. Challenges of the Smart Card Reader (SCR) in Nigeria’s electoral process are highlighted. Results of the study indicated that the challenges in implementation of the SCR emanated from the heterogeneous actors “human and non-human”, which lack synchrony during the process. Apart from the success of the card reader during accreditation, there was inadequate manpower training by INEC body and insufficient ICT infrastructure that weakened the ANT process.

**System Use And User Satisfaction in The Adoption Of Electronic Medical Records Systems: A Case of DHIS2 Tracker Implementation In Tanzania.**

Immaculate Ayebazibwe and Honest Kimaro: *University of Dar es Salaam, Tanzania*

Jens Kaasbøll: *University of Oslo, Norway*

**Abstract:**

The adoption of Electronic Medical Records Systems (EMRs) is on the rise in developing countries due to the need to ensure improved quality of healthcare through client continuum and monitoring and information sharing through collecting detailed, good quality and
reliable information overtime. In spite the benefits of EMRs, their success depends on use and satisfaction of users with the system. Recently National Tuberculosis and Leprosy Program of Tanzania adopted an EMRs known as the DHIS2 Tracker to help with case management, improve reporting and reduce lost to follow-up cases. This study therefore aimed to investigate factors influencing use and user satisfaction of DHIS2 Tracker by adapting both the DeLone & McLean Model with the Technology Acceptance Model. The research model consisted of six factors from which an online questionnaire using google forms was developed and shared with users of the system. In order to assess the relationship between factors, nine hypotheses were developed and multiple regression analysis was conducted. The analyzed data supported five out of nine hypotheses and indicates that system quality and attitude have positive significant influence on both system usage and user satisfaction, while use of the system has a positive significant influence on satisfaction. However, user background and information quality do not have significant influence on either use or satisfaction of DHIS2 Tracker. Qualitative results generated a new factor “organizational needs and demands” which has influenced the use and user satisfaction of the system. These findings help implementers understand areas of focus during implementation of DHIS2 Tracker.

ICT Use in the Context of Electricity Access in a Developing Country: A Choice Framework Analysis

Arlene Bailey, Aldrie Henry-Lee, Yhanore Johnson-Coke, Richard Leach, Anthony Clayton: University of the West Indies, Jamaica
Matt Gee and Oliver Browne: University of Chicago, United States

Abstract

With increasing focus on achieving energy access for all by 2030, and working towards the Sustainable Development Goals, in particular SDG 7, there is further interest in the role of Information and Communication Technologies (ICTs). This paper explores the ways in which ICTs are used in the context of initiatives to support electricity access in urban and periurban communities in a developing country, Jamaica. A survey of 2,082 households and focus group discussions in 10 communities, along with interviews with key stakeholders support the data collection for the study. Kleine’s Choice Framework, which operationalises Sen’s capability approach, is used to analyse individual and collective choices related to ICTs and electricity access, and the associated development outcomes. Implications for research, policy and practice are discussed.
The influence of telecentres on the economic empowerment of youth in disadvantaged communities of South Africa

Samkello Lutho Booi, Wallace Chigona, Priscilla Maliwichi, and Khaya Kunene

University of Cape Town, South Africa

Abstract

Inequality among citizens is one of the causes of economic challenges bedeviling most developing countries. For South Africa, the inequalities are greatly attributed to apartheid government policy of segregating the black people from major development activities. Disadvantaged communities are an example of the post-apartheid effects, such that poverty and unemployment affect predominantly black people. ICT is an enabler to development and may play a role in education, health and the economy. Interventions such as telecentres are known for their social-economic benefits for people living in disadvantaged communities. We investigated how telecentres influence the economic empowerment of youth in disadvantaged communities in South Africa and what factors affect the usage of telecentres by the youth of disadvantaged communities in South Africa. The case of Smart Cape and a privately owned telecentres in Cape Town was used. This study used the Choice framework as a theoretical lens. The analysis showed that although youth are empowered by using the telecentres, they are still facing challenges. These challenges contribute towards prohibiting them from optimally achieving economic empowerment. This research may help policy makers and project implementers on how to design and implement similar projects in future.

A Framework for Understanding the Empowerment Effects of Telecentres on Rural Communities in Developing Countries

Sellina Khumbo Kapondera and Niki Panteli: Royal Holloway University of London, United Kingdom

Roberta Benardi: University of Bristol, United Kingdom

Abstract

This paper proposes a framework for understanding how individuals empowered by telecentres, in return, empower their rural communities. The issue is that although ICT4D projects such as telecentres are viewed as a vital way to foster social economic development, their effectiveness on reducing digital exclusion is continuously being questioned.
This research suggests that the way telecentres users empower communities is key to understanding how communities can harness ICTs (Information and Communication Technologies) to fight against digital exclusion. The study adopts qualitative research methods and targets two telecentres in Malawi. The study will help understand how individuals empowered by the use of ICTs such as telecentres can then empower members of their community. Hence, this study will provide insights of how ICTs can also become means to generate collective empowerment.

The ins and outs of participation in a weather information system

Bidisha Chaudhuri: International Institute of Information Technology Bangalore, India
Linus Kendall: Sheffield Hallam University, United Kingdom

Abstract

In this paper our aim is to show even though access to technology, information or data holds the potential for improved participation, participation is wired into a larger network of actors, artefacts and information practices. We draw on a case study of a weather information system implemented and developed by a non-profit organisation to both describe the configuration of participation, but also critically assess inclusion and exclusion. We present a set of four questions - a basic, practical toolkit - by which we together with the organisation made sense of and developed participation in the system.

ICT enabled peace network: Case study of conflict early warning system in Kenya

Arunima Mukherjee and Festus Mukoya
University of Oslo, Norway

Abstract

Building peace in post-conflict societies is a contemporary and urgent humanitarian challenge facing the world. ICTs can potentially play a role in this process, but how and why this can be done has not attracted adequate research attention, especially in the ICT4D domain which should naturally be at the forefront of such efforts. Drawing upon Castells' notion of counter-networks, this paper based on an empirical analysis of peace-building efforts in North-West Kenya, examines the role of ICTs in enabling effectively
information flows to strengthen the efforts in building a “peace network.” Important lessons are discerned on how such counter networks can be cultivated, and some reflections are presented on how these lessons may or not be applied to other conflict-ridden areas. Key words: Peace, Post-conflict, Early Warning, Kenya

Understanding the Role of ICT for Human Development: Affordances and Capability Approach

Mathias Hatakka: Orebro University, Sweden
Øystein Sæbø and Devinder Thapa: University of Agder, Norway

Abstract

In this paper we suggest a framework to evaluate development impacts of ICT interventions, to provide a better understanding of the effects of ICT interventions. The framework is based on the capability approach and the theory of affordances. The capability approach describes development as freedom of choice, and affordances entail the relational aspects of people and technology that may lead to enhanced capabilities and choices. The framework enhances the understanding of the role of ICT in the development process, as well as the different paths that ICT implementation can take, based on individuals’ goals, and agency amid existing social structures. We exemplify the framework on a case concerning the use of ICT in study-circle education in rural areas of Kenya’s South Coast. More specifically, we look at how the ICT and study-circles have enabled the capability to increase the livelihoods for the individuals by starting Internet cafés. However, the enhanced capability was contingent on individuals’ abilities to perceive and actualize the affordances, which were tied to resources, skills, socio-cultural norms, and infrastructure. Subsequently, lack of individual resources or unsupportive social arrangements can lead to hidden or false affordances that may limit the potential impacts of ICT use on development.
Southern Theory in ICT4D

David Kreps and Julian Bass

University of Salford, United Kingdom

Abstract

This paper suggests that the dominance of positivist and interpretivist research paradigms in ICT4D may be viewed as a continuation of colonial sway over the endeavors of the Global South. Southern Theory - as introduced in the work of Raewyn Connell, the Comaroffs, and others - may be a route by which researchers in the Global South can reclaim the intellectual territory of ICT4D, with indigenous and regional research paradigms rather than those simply absorbed from the Global North.

Combining Pragmatism and Critical Realism in ICT4D Research: An e-Resilience Case Example

Richard Heeks and Angelica Ospina: The University of Manchester, United Kingdom

P.J. Wall: Trinity College Dublin, Ireland

Abstract

ICT4D research is strongly oriented to practice but hardly ever explicitly uses the research paradigm of pragmatism. In this paper we argue that, though highly-relevant to ICT4D, pragmatism suffers some shortcomings in terms of its philosophy of the world, explanatory power, truth-testing, and values. We suggest that “pragmatist-critical realism” - a novel research paradigm combining pragmatism and critical realism - can address these shortcomings and provide a valuable foundation for ICT4D research; particularly action-oriented research. We outline a four-step operational methodology for pragmatist-critical realism based on an action research project that created an “e-resilience” action plan applying ICTs to strengthen resilience of farming communities in Uganda. We hope other action and design-oriented ICT4D researchers will be encouraged to assess whether pragmatist-critical realism could form a useful basis for their future research.
Participatory Video, giving Voice and Respect to the Epistemic Sovereignty of communities in rural Zimbabwe

Peter Makamba: *Apostolic Church, Zimbabwe*
Chido Matewa: *Africa Women Filmmakers Trust, Zimbabwe*
Janneke van Dijk, Gertjan van Stam: *SolidarMed, Zimbabwe*
Peter Vhoko: *Zimbabwe National Family Planning Council, Zimbabwe*

**Abstract**

To inform program development in health in the rural areas of Masvingo Province in Zimbabwe, Ministry of Health and Child Care authorised cooperating partners to execute participatory video projects in rural districts in Masvingo Province. The Participatory Video process was a result of the desire to go beyond prescribed, non-participative or cultural insensitive data gathering methods. Two videos were produced that significantly shaped thinking of stakeholders being informed on health-seeking behaviours and utilisation of services. This use of Information and Communication Technologies proved a fruitful way to engage, interact, and develop public conversations, giving a voice to formerly disenfranchised groups (e.g. ostracised religious groups or ‘closed’ communities). Participatory Video is recognised as a culturally aligned method appropriate for a setting other than the West.

Mechanisms Fostering the Misuse of Information Systems for Corrupt Practices in the Nigerian Public Sector

Ibrahim Inuwa, Chidi Ononiwu, Muhammadou M. O. Kah and Ago Quaye
*American University of Nigeria, Nigeria*

**Abstract**

The paper explores the misuse of information systems (IS) for corrupt practices in the Nigerian public sector. The core research question is, why do the misuse of IS for corrupt practices occur in the Nigerian public sector? Or, what generative mechanisms could exist for the misuse of IS for corrupt practices to be possible in the Nigerian public sector? The study leveraged the abductive-retroductive strategy native to the Bhaskar’s critical realism to investigate the phenomenon. The Morphogenetic Model of Emergent IT Use, Routine Activity, Need, and the Normalization theories were adopted as theoretical lenses; and Danermark et al.’s six stage explanatory frame-work embedded with a single case-study was adopted as the methodology. Our empirical data emanates from
the Economic and Financial Crimes Commission, Abuja - Nigeria, as a case study that involves semi-structured interviews as primary sources of data, while archival documents and press media were used as secondary data sources. From the data analysis, the political dysfunctional structures of the Nigerian state and IT embeddedness of the corrupt routines were identified as core causal mechanisms generating the misuse IS for corrupt practices. The two mechanisms complement each other in producing the events of IS misuse. Such events were also characterized in the form of motivated offenders, suitable target, and absence of a capable guardian by our findings. The findings of the study contribute to theory, practice, and the methodology of critical realism.

Method of Research in a We-Paradigm, lessons on Living Research in Africa

Gertjan van Stam

Macha Works, Zambia

Abstract

This paper paints a picture of how a method of research in an African we-paradigm looks like. The paper describes living research, where the researcher is an integral part of a community, being a recipient of communal grace and partaker in, and reporter of, the communal development of embodied knowledge.


Calisto Kondowe and Wallace Chigona

University of Cape Town, South Africa

Abstract

Although development studies/theory are critical in all areas pertaining to global development, Information and Communication Technology for development (ICT4D) studies have been argued to have paid little attention to the controversies around development. The study examines the position or conceptualisation of “development” in ICT4D studies by the World Bank through a critical discourse analysis of the World Bank Report 2016 on Digital Dividends. The study is centred on the recent growing emphasis on ICTs for development focusing on contemporary processes of social transformation.
which are variously identified within the critical discourse analysis (CDA) by such terms as ‘neo-liberalism’, ‘globalisation’, ‘information society’ and ‘knowledge-based economy’. Contrary to research in ICT4D which argue that ICT4D research pay less reference to development theories/studies, I argue ICT4D is development-ideology laden and engages development theories, however, implied. The weakness of the report is not that it does not use development theories as the emphasis on technological progress and economic growth, but that it was done signalling and implying the writers’ own understanding of development and the development school to which they subscribe. While there may now be a certain shift in World Bank discourse towards somewhat greater acceptance of a role for the state, there is still a widespread understanding around markets as the main players, and that globalisation and capital accumulation are the language and logic where ICTs make a mark in development.

Capabilities and Affordances in ICT4D context: Similarities, Differences and Complementarity

Devinder Thapa: University of Agder, Norway
Yingqin Zheng: Royal Holloway, University of London, United Kingdom

Abstract

The paper examines two concepts that have been frequently used in ICT4D research, capabilities and affordance. We seek the delineate their similarities, differences and how they should be accurately applied in ICT4D. Both concepts connote a space of opportunities, both are relational between artefact and human agency when applied in ICT4D, and both entail potentials rather than actualisation of possibilities. By comparing the two at some length we hope to generate a more refined understanding of both concepts and how they could be more accurately applied in ICT4D.
Identifying Generative Mechanisms in a Mobile Health (mHealth) Project in Sierra Leone: A Critical Realist Framework for Retroduction

P.J. Wall, Dave Lewis and Lucy Hederman

Trinity College Dublin, Ireland

Abstract:

This paper examines an ongoing mobile health (mHealth) initiative in Sierra Leone. The research question asks why the mHealth project evolved the way it did, and what were the mechanisms that determined the outcome. We use a research framework that relies on critical realism and Margaret Archer's morphogenetic approach to hypothesize mechanisms that provide an answer to the research question. Critical realism is used as the philosophical approach as it addresses many of the concerns associated with the interpretivist and positivist approaches that have dominated the ICT4D field for many years. A detailed research framework based on critical realism and the morphogenetic approach is presented, and one of the mechanisms retroduced from this framework is discussed in detail.

Unpacking Empowerment in ICT4D Research

Priyanka Pandey and Yingqin Zheng

Royal Holloway University of London, United Kingdom

Abstract

Information and communication technology is said to provide paths to empowerment, yet the current ICT4D literature weakly conceptualises how this occurs. This article questions the conceptual alignment between the empowerment concept and the actual empowerment outcome attained through technology. We use Alsop and Heinsohn's measuring empowerment framework and Zimmerman's individual empowerment framework to analyse the missing links between empowerment and technology within current ICT4D research. We argue that research on empowerment in ICT4D needs to 1) be more specific about what type of empowerment takes place; 2) take into account both agency level changes and socio-institutional structures, 3) consider the dual effect of both empowerment and disempowerment.
Digital Development: Elements of a Critical ICT4D Theory and Praxis

Anna Bon and Hans Akkermans
Vrije Universiteit Amsterdam, Netherlands

Abstract
In recent years, critical research literature in ICT4D has grown. It is widely accepted that theory is to inform practice. However, the inverse directionality, practice informs theory, is much less present in ICT4D, including in critical research. In this paper, we discuss ways how ICT4D research and theory may be better informed by practice --- in terms of (i) recognizing praxis-oriented research paradigms and integrating their results, (ii) development of foundational theories, (iii) critical analysis of ICT4D emerging policies, and (iv) positioning ICT4D in the wider development debate. This suggests several elements or directions in which critical research has the potential to push current boundaries of ICT4D in terms of content as well as relevance.

Adopting Theory of Change for ICT4D Project Impact Assessment

Yan Li: Claremont Graduate University, United States
Manoj Thomas: Virginia Commonwealth University, United States

Abstract
A compendium of impact assessment (IA) frameworks are available to understand the impact of ICT4D initiatives in Low Income Countries. However, existing frameworks do not adequately address the unique challenges of IA for ICT4D, especially the multi-level and time variant characteristics of the IA. To address these challenges, we propose the use of Theory of change (ToC) as a generic framework for IA of ICT4D projects. Based on the seminal work by Weiss (1995), we argue that ToC can be viewed both as a methodology and a deep critical reflection process. We demonstrate the ToC approach for IA using a case study of an ICT4D project for LICs.
A Local Perspective: Working an Agricultural Information Service into a Rural Community

Lars Rune Christensen and Hasib Ahsan: *IT University of Copenhagen, Denmark*
Mamunur Rashid: *Welthungerhilfe, Bangladesh*
Badal Kumar Das: *mPower Social, Bangladesh*

**Abstract**

Accounting for the ways in which ICT initiatives are worked into local communities is part of rendering “the local perspectives” within ICT4D. This paper is part of that. Based on in-depth fieldwork, we investigate the integration of an agricultural information service into a rural community in Bangladesh. We find that it takes work beyond the initial design and cursory introduction of the service to make the service work in a low-income rural community: it takes the strength of the farmers self-help groups to circulate the messages by word-of-mouth, it takes posters placed at key junctions according to a socio-geographic understanding of the village manifest in a map, and it (ideally) involves the support of the elite of the community via the broadcast of messages at places of high symbolic value. It takes all this in addition to a well-made information service delivering relevant and timely messages on for example agricultural matters. Hence, reducing the issue to one of technical delivery mechanism does not tell the full story.

Factors that Influence Workers’ Participation in Unhygienic Cyber Practices: A Pilot Study from Nigeria

Princely Ifinedo and Nigussie Mengesha: *Brock University, Canada*
Olumide Longe: *Caleb University, Nigeria*

**Abstract**

Participation or engagement in unhygienic cyber practices could ultimately harm an organization’s information and communication technologies, if unchecked. This study used concepts from the theory of planned behavior and organizational control theory to examine the effects of factors such as attitude, subjective norms, organizational facilitators, monitoring, and self-efficacy on workers’ participation in unhygienic cyber practices. A cross-sectional survey of Nigerian professionals was used to test the formulated hypotheses. Partial least squares (PLS) technique was used for data analysis. The results indicate that attitude toward cyber hygiene has a negative effect on participation in unhygienic cyber
practices; similarly, subjective norms have a negative effect on engagement in such acts. The data did not show that organizational facilitators, self-efficacy, and monitoring had a meaningful impact on Nigerian workers’ participation in unhygienic cyber practices. Implications of the study were discussed and contribution to the extant literature noted.

Usability Problems and Obstacles to Addressing them in Health Information Software Implementations

Magnus Li: University of Oslo, Norway

Abstract

Usability is widely recognized as a desired attribute of technology, referring to how usable it is to the intended users. As health information systems in developing countries are increasingly digitalized, interaction with familiar analog technologies is replaced by digital user interfaces for many health workers. An array of literature documents usability problems in such initiatives, arguing for their adverse effects on the users, and the system as a whole. What makes it challenging to achieve usability in this context has, however, not been explored extensively. This empirical paper attempts to bring focus to this gap, by defining the concept of usability design obstacles, which refer to aspects that complicate the usability design process. The relevance of the concept is illustrated through three empirical vignettes based on two action research projects in Uganda and India. Three concrete obstacles are outlined. These are 1) constraints introduced by software, 2) constraints introduced by legacy design, and 3) scale and heterogeneity of user groups. It is argued that to address the usability problems commonly outlined and discussed by existing literature, more focus on how to overcome such usability design obstacles is crucial. The obstacles identified in the empirical case of this paper also represent avenues for further research, which are discussed.
Human-Computer Interaction for Development (HCI4D): the Southern African Landscape

Judy van Biljon: University of South Africa, South Africa
Karen Renaud: Abertay University, United Kingdom

Abstract

Computer interaction for Development (HCI4D) research aims to maximise the usability of interfaces for interacting with technologies designed specifically for under-served, under-resourced, and under-represented populations. In this paper, we provide a snapshot of Southern African HCI4D research against the background of the global HCI4D research landscape. We commenced with a systematic literature review of HCI4D (2010-2017) then surveyed Southern African researchers working in the area. The contribution is to highlight the context-specific themes and challenges that emerged from our investigation.

Using PESTELMO to Examine Digital Services Contexts in Developing Countries

Catherine G. Mkude: The Open University of Tanzania, Tanzania
Maria A. Wimmer: University of Koblenz-Landau, Germany

Abstract

HCI4D is context-oriented. Literature highlights that successful implementation of digital solutions in developing countries needs deeper understanding of the context. Despite numerous literatures pointing the importance of context-oriented HCI4D, there is no holistic method that guides researchers and implementers of HCI solutions in analysing different contexts of countries. To bridge this gap, this paper introduces the PESTELMO (Political, Economic, Socio-cultural, Technological, Environmental, Managerial and Organisational) analysis method for holistic analysis of contexts in which HCI4D is researched or implemented. The PESTELMO analysis method is proposed in this research as an integrated approach to research and cater for the external and internal environments surrounding digital service provisioning in a given context, hence addressing HCI4D perspectives in research, implementation and deployment. Last but not least, PESTELMO is suggested as a suitable holistic method for the analysis and assessment of interrelations, interactions and interdependences among the PESTELMO factors and sub-factors.

Tanmay Joshi, Sharmistha Swasti Gupta, and Nimmi Rangaswamy

International Institute of Information Technology Hyderabad, India

Abstract

Financial transactions are intimately bound with social interactions and woven into everyday economic lives. In this paper, we focus on PayTM, a digital wallet, and a specific set of users of PayTM, street vendors in urban India. Through an ethnographic investigation, we offer to unpack two questions: 1. Can digital forms of money create financial inclusion by opening up access to the marginalized 2. Can digital platforms amplify socio-economic capacities of low literate users enhancing financial literacy? We argue that digital and financial literacy is an immersive component of digital wallet use acquiring ‘everyday life’ in specific socio-economic ecosystems. Our study captures daily practices of digital money staking a claim in advancing the understanding of financial inclusion as a lived process accumulating habits, practices and stakes to expand socio-economic capabilities.

Socio-technical HCI for Ethical Value Exchange: Lessons from India

Jose Abdelnour Nocera: University of West London, United Kingdom
Torkil Clemmensen: CBS, Denmark
Morten Hertzum: University of Copenhagen, Denmark
Dineshkumar Singh: TATA Consultancy Services, India
Veerendra Veer Sing: ICAR-CMFRI Mumbai Research Centre, India

Abstract

Ensuring ethical value exchange is moving to the forefront of the global challenges that HCI will have to address in the coming years. We argue that applying a context-sensitive, socio-technical approach to HCI can help meet the challenge. The background is that the life of marginalized people in contemporary society is challenging and uncertain. The marginalized can face health and cognitive issues as well as a lack of stability of social structures such as family, work and social inclusion. Three questions are of concern when innovating together with people ‘at the margins’: how can we de-scribe users without attempting to stereotype badly, what socio-technical HCI methods fit the local societal context, and how to make the design sustainable in face of current planetary challenges (e.g., climate
change)? We discuss a socio-technical HCI approach called human work interaction des-ign (HWID) to meet the challenges of designing for ethical value exchange where value extraction is not dominated by one party but equally shared across all stakeholders. We introduce an ongoing case of a digital service to support fishing in Alibaug, India. As a multidisciplinary team of researchers we evaluate the socio-technical infrastructure surrounding a mobile app to support sustainable fishing. This is done through the lens of HWID by highlighting inwardly and outwardly socio-technical relations between human work and interaction design. We conclude by highlighting the value a context sensitive, ethical socio-technical framework for HCI.

Research in Progress: Holistic Climate Service Prototypes for Farmers in Tambuu, Tanzania

Ville Myllynpää, Jaakko Helminen, Mikko Apiola, Jani Haakana, Tomi Westerlund and Erkki Sutinen: University of Turku, Finland
Ezra Misaki: College for Business Education, Tanzania

Abstract

Urgent efforts are needed to address climate change and changing climate variability. Solutions are needed at economic, political, scientific, educational, as well as technological domains. Our previous re-search in Tambuu, Tanzania, shows that the acute information needs of the community are credible and trustworthy weather information, knowledge in best uses of weather information, and education about best farming practices. Delivering the information for end users in Tambuu is a challenge in itself. Based on these results and following the principles of System Action Design Research, we developed prototypes for future climate services together with local farmers in Tambuu community. These prototypes and our plans are presented in this research-in-progress paper.
Investigating the Adoption of an Integrated Hospital Information System in Rural Uganda: A Case of Kisiizi Hospital

Amos Baryashaba, Angella Musimenta: Mbarara University of Science and Technology, Uganda
Samuel Mugisha: Innovation Streams Ltd, Uganda
Leonard Peter Binamungu: University of Dar es Salaam, Tanzania

Abstract

Electronic Medical Records (EMRs) have been proposed to improve the quality of services in healthcare organisations. However, sometimes, the design contexts of these systems tend to be different from the use contexts. This and other factors have been reported to cause failures of EMR adoptions. By focusing on factors from the Unified Theory of Acceptance and Use of Technology (UTAUT) model, we use interviews and questionnaire as data collection instruments to study the adoption of an EMR which was locally developed in rural Uganda; to generate lessons that would sustain the use of the EMR. We found out that all of the following factors, from the UTAUT model, significantly affected the usage of the system and, consequently, facilitated the adoption of the EMR at Kisiizi Hospital: expected improvement in job performance, the easiness with which the system can be learned and used, support and influence from management and peers, and the availability of organisational and technical infrastructures to support the use of the system. All of these were largely due to the fact that physicians from Kisiizi Hospital initiated and drove the system development and implementation processes, making sure that correct requirements were captured, and championing the use of the system by staff at the hospital. The in-context explanations for the findings are also provided.
Research in Africa for Africa? Probing the Effect and Credibility of Research Done by Foreigners for Africa

Munyaradzi Mawere: Great Zimbabwe University, Zimbabwe
Gertjan van Stam: Macha Works, Zambia

Abstract

This paper probes research being carried out by researchers foreign to Africa. From an assessment of decennia of research, we address the many and varied ways in which the work of foreign researchers, often from countries with unresolved colonial baggage, cast their normalising shadows over African realities. From experiences in Mozambique, Zambia and Zimbabwe, among others, through the exposé of the complex and expansive array of influences and coloniality, we paint a picture how foreign researchers benefit from enshrined and ongoing practices that dominate research scenes. These practices depreciate African research and development done by Africans, in Africa for utilisation in Africa. We propose the need to mainstream decoloniality and communiversity as to affect the primacy of African researchers researching in, on and for Africa.

eLearning in an African Place: How ‘alien’ eLearning models are failing many in Africa

Munyaradzi Mawere: Great Zimbabwe University, Zimbabwe
Gertjan van Stam: Macha Works, Zambia

Abstract

This paper discusses eLearning in contemporary times in an African place. While the paper acknowledges the importance of eLearning in that it facilitates distance learners’ activities and bridges geographical gaps across the world, it notes that in convoluted environments such as those of Africa, eLearning raises a lot of critical questions, some of which are cultural, and others are ethical and epistemological. This ambiguity emerges largely be-cause eLearning, as it is understood in Africa, comes in foreign packages. The paper argues for the decolonisation of eLearning - that external practices of eLearning, particularly those ‘imposed’ on Africa from Europe and North America, fail many environments in Africa. This failing is because such practices rubberstamp the long-criticized philosophy of one-size-fits-all which has been blamed for impoverishing Africa besides underestimating the potential contribution of the African continent to the global world. On this note, the
paper concludes that unless we decolonise eLearning and consider the issues of sensitivity, inclusivity, and attainability, eLearning will not be palatable or at least beneficial for most in Africa.

**Information and Communication Technology in Mathematics Education**

- **Integration Readiness in Tanzania Higher Education Institutions**

  Mzemwe Mazana: *College of Business Education, Tanzania*
  Calkin Montero and Solomon Oyelere: *University of Eastern Finland, Finland*

**Abstract**

The use of ICT tools in mathematics instructions has been proved to have a positive impact on students’ success. However, little is known about the ICT readiness of both teachers and students to incorporate these tools in mathematics teaching-learning process. This study investigates the readiness of teachers and students to integrate ICT in mathematics teaching and learning at a higher education institution in Tanzania. Specifically, the study assesses the device, skills and psychological readiness of teachers and students to integrate ICT tools in mathematics instructions. The study employs both qualitative and quantitative methods whereby data are collected through interviews and questionnaires respectively. Seven teachers and 129 bachelor degree students pursuing business studies, form the study population. Descriptive statistics are used to analyze the quantitative data while qualitative data are analyzed through content analysis. Results show that teachers and students have device, skills and psychological readiness to integrate ICT in teaching and learning of mathematics. This is significant as it provides information that will be useful in planning the use of ICT tools to benefit teaching and learning. This study contributes to transfer and diffusion of technology discourses.
Developing multimedia enhanced content to raise HIV/AIDS awareness to children

Patricia Makuru, Fatuma Simba, and Ellen Kalinga

University of Dar es Salaam, Tanzania

Abstract

It is estimated that more than two-thirds (70%) of all the 35 million people living with Human Immunodeficiency Virus (HIV) in the world are in Sub-Saharan Africa. Tanzania as one of the country in sub-Sahara region is no exceptional, more than 60 percent of all new HIV infections in Tanzania occur among young people. While almost all children in Tanzania aged 15 years and below have heard about HIV/AIDS, less than half have enough knowledge to protect themselves against infections. It is known that HIV/AIDS is taught in primary schools, although majority of the pupils demonstrated a very low level of knowledge about HIV/AIDS. This raised a concern on the effectiveness of HIV/AIDS and life skills education in primary schools. Information and Communication Technology (ICT) has a great potential for HIV/AIDS education to children because they like and enjoy to use ICT resources for entertainment, learning, networking and communication. Hence, it is important to apply technology for educational in teaching HIV/AIDS through the use of multimedia contents in accordance to the local context of Tanzanian curriculum for primary schools. Therefore, the main objective of this paper is to develop multimedia enhanced contents to raise HIV/AIDS awareness to children. ADDIE model, Adobe Flash Professional 5, Action Script programming language and articulate storyline2 authoring tool, were used in the development of multimedia enhanced contents. Results show that level of HIV/AIDS knowledge among pupils after using the interactive multimedia has been enhanced in the tested three knowledge areas (causes, prevention and effects). Results in this paper suggest that, multimedia enhanced contents can be used to complement text book based learning approach in enhancing HIV/AIDS awareness for children in primary schools in Tanzania.
Community-centered, project-based ICT4D education in the Field

Anna Bon, Jaap Gordijn, Hans Akkermans, and Victor de Boer: Vrije Universiteit
Amsterdam, Netherlands

André Baart: University of Amsterdam, Netherlands

Cheah Waishiang and Sze San Nah: UNIMAS, Malaysia

Abstract

The growing demand for user-centered, sustainable, collaborative and ecosystem-aware ICT4D programs and projects brings requirements for education of a new generation ICT4D professionals. This paper presents a post-graduate field-based course in ICT4D that teaches how to co-create and deploy community-centered ICT services. The course has been deployed in Sarawak, Malaysia for a group of computer science, information science and artificial intelligence students. The course design, experiences and outcomes are presented in this paper.

Data Science postgraduate education at University of Dar es Salaam in Tanzania: Current demands and opportunities

Betty Mbwilo, Honest Kimaro and Godfrey Justo

University of Dar es Salaam, Tanzania

Abstract

Several studies indicate that there are no enough people in the market with data science skills and even those graduates in ICT from universities do not possess skills required by employers. Thus, researchers have suggested the urgency for universities to review their curricular as the world is heading towards data era. The aim of this research was to analyze the current skill-gaps needs from stake-holders and opportunities to establish data science postgraduate programme that reflects the current technological trends and market demands at the University of Dar es Salaam (UDSM). A questionnaire was administered to 85 identified organizations to solicit information on the needs for data scientists and existing skill gaps. A total of 61 filled questionnaires response were received out of the 85 that were administered to selected organizations indicating a turn out rate of over 70%. Overall the analyzed data articulated a compelling evidence for the local industry growing need for data scientist. The survey that was conducted was followed up by conduct of various workshops and meetings to solicit inputs from different experts and stakeholders.
on different versions of the developed curriculum. Finally, a new programme in MSc in data Science was approval and established from April 2018 at UDSM. Despite its late approval and without formal advertisement on the public media, the programme attracted a large number applicants for 2018/19 academic year, compared to other postgraduate programmes in ICT offered at UDSM.

Building Sustainable Collaborations and Academic Networks in Low Income Countries: Case of Master Programmes

Jens Kaasbøll: University of Oslo, Norway
Chipo Kanjo: University of Malawi, Malawi
Honest Kimaro: University of Dar es Salaam, Tanzania

Abstract

During development of health information systems, local specialists were needed to take the local lead and train others. Through external funding, nine master programmes in health information systems were set up in developing countries in collaborations between a local university and the University of Oslo. While development efforts tend to fade out after initial project funds have been spent, keeping the programmes running was crucial for the upkeep also of the health information systems. Their planning, running with external funds and continuation has been analysed by means of a Collaborative Governance Model, which was made more specific through literature on higher education. The specifics concerned initial planning, where bringing in relevant stakeholders, include local knowledge, network globally and have an interdisciplinary approach to learning were confirmed. During the implementation with project funding, small wins kept the collaboration going, and face-to-face dialogues for common problem definition helped solving emerging issues. The outcome has been that all nine programmes continue running, and local, regional and international collaboration help keeping the academics flourishing. More than 500 master students have graduated.
Towards Developing Interactive Content for Enhancing Life Skills Education in Tanzania: Possibilities and Pitfalls

Christian Misobi Budoya, Mussa M. Kissaka and Joel S. Mtebe

University of Dar es Salaam, Tanzania

Abstract

Feasibility study is the first and important stage in any planning of introducing a new solution for overcoming existing challenges. It saves a lot of resources that could be lost if such solution fails to solve the intended problem. On the other hand, it gives a proper way to go ahead with the plan of introducing the solution. The purpose of this study is to establish necessary and basic requirements as possibilities and pitfalls for deploying cost effective interactive multimedia content for enhancing an ineffective provision life skills education at primary school level in Tanzania. Ten primary schools were randomly selected and surveyed from which 65 teachers and 407 pupils participated in the study. Questionnaires, interviews, and documentary reviews were used as data collection tools. It was found that the Internet penetration is 45% of the population with 82.6% of Internet users are smartphones users. Number of computers and tablets at schools are still limited to 1:1036 computer pupils ratio, 96% of pupils had access of computers and smartphones from parents. Moreover, 77% of teachers used conventional and lecturing style in teaching, 100% of life skills content was static found in inadequate textbooks. Based on these results, deployment of self-learning enabled interactive multimedia content is possible and will bring positive impact if it will be developed to operate in ICT devices available in both primary schools and pupils’ parents as well. This study informs the proper way of introducing cost-effective interactive multimedia content at primary school level in Tanzania.
The Role of Human Centered Design (HCD) and Challenge Driven Education in Enhancing the Innovation Capacity of Africa’s Young People: Case of Youth for Children (Y4C) Innovation Hub in Tanzania

Hellen Maziku, Joseph Cosmas, Honest Kimaro: University of Dar es Salaam, Tanzania
Norah Maki and Charles Otine: UNICEF, Tanzania

Abstract

As the world advances rapidly and economic conditions continue to change, issues such as globalization and changing labour markets are putting a huge pressure on youth worldwide. There is an urgent need for young people to be trained with flexible set of skills that will allow them to take the front seat and actively contribute to initiatives directly affect their development. The first step towards addressing the pressing concerns of today’s youth, especially in Africa, involves improving the existing education systems. This paper elaborates curriculum improvement in education systems by adapt a human centered design (HCD) and Challenge-Driven Education (CDE) approaches that encourages students to work on projects that address real challenges solicited from industry partners. Youth for Children (Y4C) innovation hub, a partnership between UDSM college of ICT (CoICT) and UNICEF Tanzania, was established in 2016 to promote child rights and provide the design skills and social context to support students in developing products and solutions with real social value. Y4C Hub provides unique value in its emphasis on HCD and CDE approaches where projects are undertaken for a period of one year and are directly linked to solving real challenges facing the society in collaboration with the challenge owners and mentors. In the year since launching the hub, 173 CoICT students, 36 supervisors, and 50 secondary school girls have been trained on HCD. A Final Year Project course curriculum has been reviewed to reflect a more challenge driven approach, offering a chance for promising projects to be incubated.
Information Systems Education for Development: A typology of ICT4D pedagogies

Gwamaka Mwalemba

University of Cape Town, South Africa

Abstract

This paper is an attempt to incorporate IS education within the ICT4D re-search and practice discourse. The motivation for the study comes from an understanding that while the research on ICT4D theories and practice has grown in popularity, there has been very little effort directed towards establishing the link between university education and ICT4D practices. IS education literature is still preoccupied with discussions on curriculum and pedagogies focused on equipping students with instrumental knowledge grounded on the ‘catching up’ and ‘conformist’ IS practices. As a result learners, especially at undergraduate level, are left with little to no exposure on reformists and transformists IS discourses that have been identified as critical to the success of ICT4D. By drawing parallels to other patterns in ICT4D research and practice, this study hopes to shade light to a gap in IS education that if not addressed will continue to be a major obstacle to ICT4D initiatives.
Handover management in femtocell LTE networks under fast varying channels

Catherine Protas and Kwame Ibwe

University of Dar es Salaam, Tanzania

Abstract

To increase network capacity of a mobile communication system, three main ways can be derived from Claude Shannon equation. These are the use of smaller cells, increase of bandwidth and improvement of communication technology. Since there is only a finite amount of radio spectrum available and it is also required by other applications, there are limits to bandwidth increment. Combining the later and former, LTE small cells method is best practical way to increase system capacity of mobile communication system. However, deployment of femtocells with small coverage range leads to frequent handover initiation. The problem escalates when femtocells operate in open access mode while accommodating highly mobile users who initiate unnecessary handovers as they stay in a femtocell for short time. To tackle these challenges, a hybrid handover decision algorithm is presented. The proposed algorithm selects the most appropriate target femtocell for handover using velocity of the user, throughput gain and adaptation of signal averaging and hysteresis margin methods. Simulation results show 1.7 times reduction in the amount of handovers in comparison with the traditional handover schemes.

Trends and Opportunities for Traffic Engineering Paradigms Across Mobile Cellular Network Generations

Khadija Mkocha, Mussa Kissaka, and Omar Hamad

University of Dar es Salaam, Tanzania

Abstract

Traffic engineering is at the heart of telecommunications engineering. In the later, we have recently experienced a revolution in the form of mobile cellular networks, in their various generations. History shows a close relationship between the advancements in both telecommunications networks and their corresponding engineering methods. This survey employed qualitative document analysis to chronologically explore the evolution of, and interrelationships between traffic engineering and the mobile cellular networks from 1990s to date. We are currently at the right point in time to make giant leaps in both traffic engineering methods and network technology revolution. This study points out the opportunities that the current state of affairs avails to research in these fields.
Information Security Culture Assessment of Small and Medium-Sized Enterprises in Tanzania

Zainab Ruhwanya and Jacques Ophoff

University of Cape Town, South Africa

Abstract

This study explores the status of information security culture (ISC) of small and medium-sized enterprises (SMEs) in sub-Saharan Africa (SSA) using Tanzania as a case. To assess the ISC of SMEs, measurement criteria from organizational and environmental dimensions were compiled from the literature. A combination of quantitative and qualitative methods was employed to collect data. The ISC dimensions were assessed using surveys collected using both paper and online sources, from 39 SMEs in the roundtable and five focus group discussions. The findings indicated lack of information security policy, absence of security education, training and awareness (SETA) programs, lack of human resource, poor risk assessment, and management and lack of national information security culture initiatives. These findings show the immaturity of ISC in SMEs in Tanzania. The results and implications of these findings suggest further research and intervention is necessary to institutionalize ISC in the SME environment.

Rate Adaptive Congestion Control Scheme Using Lookup Table To Enhance Quality Of Experience In Video Streaming.

Jane Lissah and Mercy Mbise

University of Dar es Salaam, Tanzania

Abstract

In recent years video communication has occupied a large percentage of Internet traffic and the trend is expected to increase. Many services are offered via the Internet use video content to reach millions of users. Real time video services in the Internet are mostly done by using User Datagram Protocol (UDP). UDP is preferable because it is fast, but has a weakness of not supporting congestion control mechanisms; hence it usually floods the channel it is using causing congestion which then leads to packet loss, excessive delay and jitter. To support good quality of experience (QoE), packet loss, delay and jitter must be kept at accepted values. This paper presents part of an ongoing MSc. research work whose aim is to develop a rate adaptive congestion control scheme using a lookup table. The scheme use Real Time Transport Protocol (RTP) and RTP Control Protocol (RTCP) to
provide end to end network transport service which is not provided by UDP and control service. The proposed congestion control scheme comprises of two components: a lookup table and congestion control equation. The lookup table is created at the beginning of sender’s application and keeps a record of fraction loss and Inter Packet Gap (IPG), which is the interval in time between sending packets. Upon receiving a report the lookup table is searched to see if there is a match for the report’s fraction loss value and returns, the appropriate IPG value. If there is no match a congestion control equation is used to compute a new IPG value, which is then added to the lookup table and used for rate adjustment. Simulation of the proposed work was done using NS3, where by the Quality of Service (Qos) parameter which affect the Quality of Experience (QoE) such as delay and jitter were observed. Elvavid, a video quality evaluation tool is used to measure the quality of video by using Peak Signal Noise Ratio (PSNR) and Mean Opion Score (MOS) measurements.

Exploring the Impacts of Intrinsic Variables on Security Compliance Efficiency using DEA & MARS

Charlette Donalds: UWI, Mona, Jamaica
Kweku-Muata Osei-Bryson: Virginia Commonwealth University, United States
Sergey Samoilenko: Averett University, United States

Abstract

Given that appropriate human behavior is required to minimize the occurrence of cybersecurity breaches, the issue of security compliance is critical. Within this context organizations would be interested in the efficient achievement of security compliance. In this paper we explore the concept of Security Compliance Efficiency, and present a hybrid DEA+MARS methodology for identifying its antecedents. We also present resulting examples of relationships that describe the impacts of intrinsic variables on Security Compliance Efficiency.
Enhancing Faults Monitoring in Secondary Electrical Distribution Network

Yona Andegelile, Godfrey Chugulu, Ally Bitebo, Hadija Mbembati and Herald Kundaei

*University of Dar es Salaam, Tanzania*

**Abstract**

Inefficient fault management in electrical Secondary Distribution Network (SDN) is one of the major challenges facing most power utility companies around the world including Tanzania. Currently, faults management processes from detection to clearance are done manually due to the lack of visibility in SDN resulting to long Mean Time To Repair (MTTR) and high operational costs. Advancements in ICT and sensing technologies have made it possible to have cost effective electrical power network visibility solutions. This study proposes algorithms that enhance fault detection and monitoring in the Tanzania SDN based on distributed processing architecture. The proposed algorithms include sensing and data acquisition, fault detection, localisation and visualisations. The algorithms were deployed and tested on live network at UDSM-Kijitonyama Campus. Different faults scenarios were tested and the results were promising.

A critical Review of Edge and Fog Computing for Smart Grid Applications

Gilbert Mapunda Gilbert, Shililiandumi Naiman, Honest Kimaro and Burchard Bagile:

*University of Dar es Salaam, Tanzania*

**Abstract**

Smart grid and cloud computing architectures have been perfectly suiting each other naturally. As a result, clouding computing architectures have dominated in the implementations of smart grid applications. However, continuing additions of heterogeneous (sensing and actuating) devices, emergence of Internet of Things (IoT), and massive amount of data collected across the grids for analytics, have further contributed to the complexity of smart grids. Cloud computing architectures can no longer provide smart grid services effectively. Edge and Fog computing approaches have relieved the cloud computing architectures of problems related to network congestion, latency and locality by shift of control, intelligence and trust to the edge of the network. In this paper, a systematic literature review is used to explore the research trend of the actual implementations of edge and fog computing for smart grid applications. A total of 70 papers were reviewed from the popular digital repositories. The study has revealed that, there is an immense number of smart grid
applications that have exploited edge and fog computing approaches. The study also shows that, significant number of the smart grid applications are related to design and energy optimizations and intelligent coordination. There also challenges and research issues that hinder smooth adoption of edge and fog computing for smart grid applications.
Information about the Conference Local Organizing Partner

The College of Information and Communication Technologies (CoICT) of the University of Dar es Salaam (UDSM), Tanzania and the Department of Informatics of the University of Oslo, Norway were jointly granted honor to organize the 2019 IFIPWG 9.4 international conference in Dar es Salaam. CoICT is one of the main constituent colleges of the University of Dar es Salaam (UDSM), the oldest and biggest public university in Tanzania. The college is made up of two major departments and two units, namely: Department of Electronics and Telecommunications Engineering (ETE)

1. Department of Computer Science and Engineering (CSE)
2. Centre for Virtual Learning (CVL) and
3. University of Dar es Salaam ICT Incubator (UDICTI)

The main objective of CoICT is to spearhead UDSM efforts in the development of the knowledge and practical implementation in the field of Information and Communication Technology (ICT) with a goal of becoming a Centre of Excellence in the provision of higher education, research, innovation, and public services in ICT.

CoICT offers friendly and supportive teaching and learning environment for a range of ICT related programs at all levels from certificate to higher degree levels for a population of more than 1200 students and supported by about 110 academic, technical and supporting staff. The College of ICT together with its 2 main academic departments administers 6 undergraduate programs, 7 postgraduate programs, and 2 non-degree programs as indicated in the table below.

<table>
<thead>
<tr>
<th>Program Level</th>
<th>Program Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Programs</td>
<td>1. B. Sc. In Computer Science (BSc. in CS)</td>
</tr>
<tr>
<td></td>
<td>2. B. Sc. with Computer Science (BSc. with CS)</td>
</tr>
<tr>
<td></td>
<td>3. BSc. in Computer Engineering and Information Technology (BSc. in CEIT)</td>
</tr>
<tr>
<td></td>
<td>4. BSc. In Business Information Technology (BSc. In BIT)</td>
</tr>
<tr>
<td></td>
<td>5. B. Sc. in Electronic Science and Communication (BSc. in ESC)</td>
</tr>
<tr>
<td></td>
<td>6. B.Sc. Telecommunications Engineering (BSc. in TE)</td>
</tr>
<tr>
<td>Postgraduate Programs</td>
<td>1. M.Sc. in Computer Science (MSc. in CS)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>2. M.Sc. in Electronic Engineering and Information Technology (M.Sc. in EIT)</td>
</tr>
<tr>
<td></td>
<td>3. M.Sc. in Telecommunication Engineering</td>
</tr>
<tr>
<td></td>
<td>4. M.Sc. in Health Informatics (MSc. in HI)</td>
</tr>
<tr>
<td></td>
<td>5. M.Sc. in Information Systems Management (MSc. in ISM)</td>
</tr>
<tr>
<td></td>
<td>6. M.Sc. in Computer and IT Systems Engineering (MSc. in CITSE)</td>
</tr>
<tr>
<td></td>
<td>7. M.Sc. in Data Science (MSc in DataSc.)</td>
</tr>
<tr>
<td></td>
<td>8. Postgraduate Diploma in Electronic Engineering and Information Technology (PGD in EIT)</td>
</tr>
<tr>
<td></td>
<td>9. Doctor of Philosophy in Electronics Engineering and Information Technology (PhD in EEIT)</td>
</tr>
<tr>
<td></td>
<td>10. Doctor of Philosophy in Health Informatics (PhD. in HI)</td>
</tr>
<tr>
<td></td>
<td>11. Doctor of Philosophy in Computer Science (PhD. in CS)</td>
</tr>
<tr>
<td></td>
<td>12. Doctor of Philosophy in Computer Engineering and IT (PhD in CEIT) by Thesis</td>
</tr>
<tr>
<td></td>
<td>13. Doctor of Philosophy in Telecommunication Engineering (PhD. in TE)</td>
</tr>
<tr>
<td></td>
<td>14. Doctor of Philosophy in Computer and IT Systems Engineering (PhD. in CITSE)</td>
</tr>
<tr>
<td></td>
<td>15. Doctor of Philosophy in Data Science (PhD. in DataSc.)</td>
</tr>
<tr>
<td>Non Degree Programs</td>
<td>1. Certificate in Computer Science (Cert. in CS)</td>
</tr>
<tr>
<td></td>
<td>2. Diploma in Computer Science (Dipl. in CS)</td>
</tr>
</tbody>
</table>

The Centre for Virtual Learning (CVL) is a unit in CoICT which provides technical support to all UDSM academic units in the design and provision of ICT-mediated distance learning programs. It also provides support in educational technology including instructional design, multimedia production and Learning Management System (Moodle) training.

University of Dar es Salaam ICT Incubator (UDICTI) is a unit in CoICT that nurtures
students who wish to start their own businesses. Students with business ideas are groomed as they turn their ideas into start-ups and are accommodated until they are able to stand on their own. UDICTI provides support, coaching, mentoring in technical and business related trainings to enable incubatees to become entrepreneurs.

The college through its two departments and the two units is also involved in other activities like innovative, consultancy, public services, research and publications in local and international conferences and journals. The college is also performing specialized professional and consultancy services, conducting continuous professional development programs in the fields of ICT, Electronics and Telecommunications.

The College carries out research in the diverse areas of ICT. Following the establishment of university wide guidelines for research centres and research centres of excellence at the University of Dar es Salaam in June 2014, the College has initiated the following research group in line with the guidelines:

1. Information Systems and Innovation (ISI) Group
2. Software Architecture and Engineering (SAE) Group
3. Embedded and Intelligent Systems (EIS) Group
4. Networks and Cyber Security (NCS) Group
5. Wireless Communication Research Group (WCRG)
6. Digital Signal Processing Research Group (DSPRG)
7. e-Learning Research Group (eLRG)
8. iGrid and Big Data Research Group
9. GeoInformatics Research Group

CoICT and UNICEF Tanzania have established the Youth for Children (Y4C) Innovation Hub at the College to promote child rights and invest in human centred, open innovation that contributes real social value. This initiative is committed to mainstreaming innovations for children and young people and supporting youth-led innovations in Tanzania. At the Y4C innovation hub, students are guided based on a human-centred design process to develop early-stage, open-source, products, services, and research that address community challenges.

The College is also implementing Challenge Driven Education (CDE) activities where students, staff and challenge owners work together in solving societal challenges which in-turn involve academia, society and the government with multidisciplinary disciplines to get solutions for a certain challenges. In the CDE environment, a challenge owner is involved throughout in the process of achieving the solution for a challenge at hand.
CoICT graduates are prepared to:

1. Be entrepreneurs
2. Work in the industries of ICT, Electronics and Telecommunications, Finance, Government Institutions, Private Companies, Educational Institutions
3. Work in the Research and Development (R & D) Institutions

The College of Information and Communications Technologies is located along Bagamoyo Road also known as Ali Hassan Mwinyi Road, in Kijonyama area close to Tanzania Commission for Science and Technology (COSTECH)

Contact Address:

The Principal,
College of Information and Communication Technologies,
University of Dar es Salaam,
P. O. Box 33335,
Dar es Salaam.

Telephone: +255 22 270 0201
Email: principalcoict@udsm.ac.tz
Website: www.coict.udsm.ac.tz