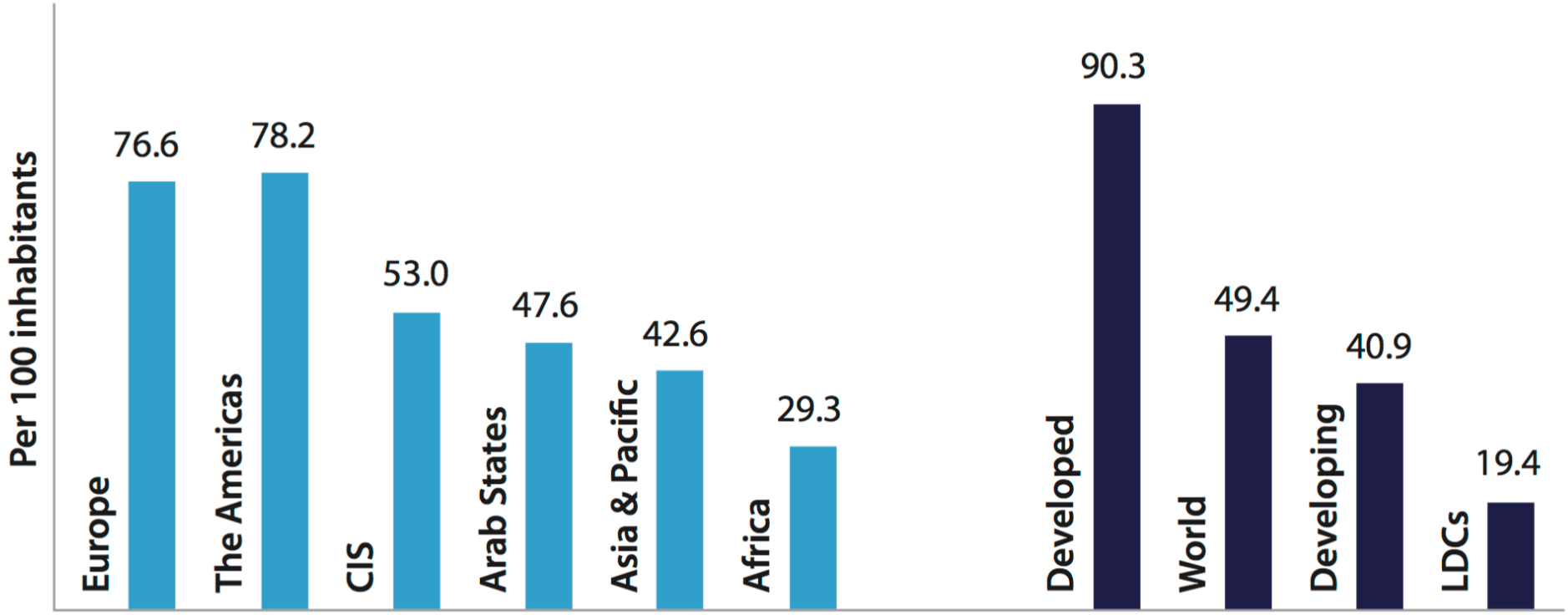
Technology for Development Overview

Agenda

- Review the schedule
  - Team assignments
- Unwin reading
- Toyamo reading
- Review of ICTD Research

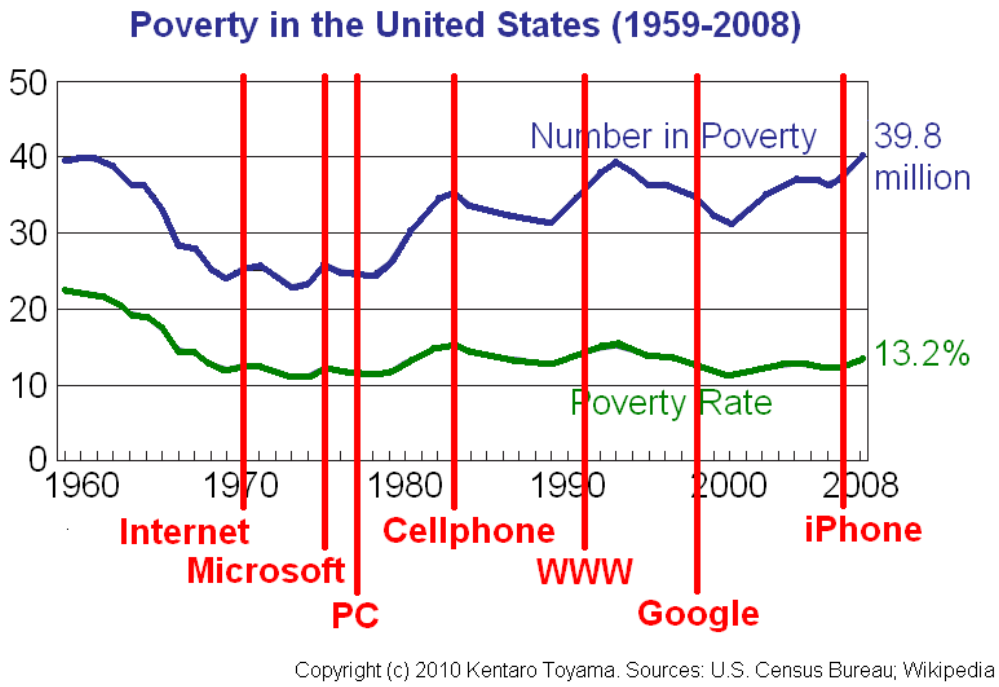
More recent Internet Data (Unwin pg 29)

Mobile-broadband subscriptions



Source: http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2016.pdf

Does technology solve poverty?



Source: Kentaro Toyama
http://www.kentarotoyama.org/talks/2011%2010%2020%20Myths%20Update%20-%20UW%20Change%20-%20Toyama.ppt

Sources

- ICTD interventions: trends over the last decade:
  - Christopher Chepken, Raymond Mugwanya, Edwin Blake, and Gary Marsden. 2012. ICTD interventions: trends over the last decade. In Proceedings of the Fifth International Conference on Information and Communication Technologies and Development (ICTD '12). ACM, New York, NY, USA, 241-248. DOI=http://dx.doi.org/10.1145/2160673.2160704
- ICTD *State of the Union*:
  - Patra, R.; Pal, J.; Nedevschi, S.; , "ICTD state of the union: Where have we reached and where are we headed," *Information and Communication Technologies and Development (ICTD), 2009 International Conference on , vol., no., pp.357-366, 17-19 April 2009 doi: 10.1109/ICTD.2009.5426693 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5426693&isnumber=5426671*
- The Changing Field of ICTD:
  - Ricardo Gomez, Luis F. Baron, and Brittany Fiore-Silfvast. 2012. The changing field of ICTD: content analysis of research published in selected journals and conferences, 2000--2010. In *Proceedings of the Fifth International Conference on Information and Communication Technologies and Development (ICTD '12). ACM, New York, NY, USA, 65-74. DOI=10.1145/2160673.2160682 http://doi.acm.org/10.1145/2160673.2160682*
- In search of missing pieces: A re-examination of trends in ICTD research
  - Meghana Marathe, Priyank Chandra, Vaishnav Kameswaran, Tsuyoshi Kano, and Syed Ishtiaque Ahmed. 2016. In search of missing pieces: A re-examination of trends in ICTD research. In *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development* (ICTD '16). ACM, New York, NY, USA, Article 59, 4 pages. DOI: https://doi.org/10.1145/2909609.2909644
- Geographic Diversification of ICTD Research
  - Tsuyoshi Kano and Kentaro Toyama. 2016. Geographic Diversification of ICTD Research. In Proceedings of the Eighth International Conference on Information and Communication Technologies and Development (ICTD '16). ACM, New York, NY, USA, Article 57, 4 pages. DOI: https://doi.org/10.1145/2909609.2909641

ICTD interventions Methodology

- Literature review
  - Broad keyword searches
  - Winnowed down to 93 articles
- Developed classification
- Analyzed articles based based on these variables

Table 1. Dimensions vs. variables.

	Dimension	Variable
1	ICT	- Telecommunication - Terminal device
2	Development	- Domain area - Target group - Region of study
3	Research	- Research methods applied - Discipline of study

State of the Union Methodology

- Extensive literature review
- Survey of 50 researchers and practitioners in the *discipline*.
  - Limited it to *experts* in the *discipline*
  - *Experts:* 5+ years
  - *Discipline:* mainstream **research** and development
- Intentionally a small group
  - And potential for bias is noted.

Changing Field of ICTD Methodology

- Content analysis of 948 papers
- Taken from selected peer reviewed journals and conferences published between 2000 and 2010
- In the academic literature on the interdisciplinary field of Information and Communication Technologies for Development (ICTD or ICT4D)

Table 1. 2000-2010 ICTD journals and conferences studied.

Acronym	Rank	Full name	Active since:	Published 2000-2010
ITID	1	Information Technologies & International Development	2003	26 issues 194 papers
EJIS DC	2	Electronic Journal of Information Systems in Developing Countries	2000	44 issues 270 papers
ITD	3	Information Technology for Development	1986	7 issues 149 papers
JOCI	NA	Journal of Community Informatics	2004	18 issues 115 papers
IJICTHD	13 (Too new)	International Journal of Information and Communication Technologies for Human Development	2009	8 issues 36 papers
ICTD	Top	International Conference on Information & Communication Technologies and Development	2006	4 conf, (2006, 07, 09, 10) 140 papers
IFIP WG 9.4	Top	International Conference on Social Implications of Computers in Developing Countries	1998	4 conf, (2002, 05, 07, 09) 160 papers

Living and Working Locations

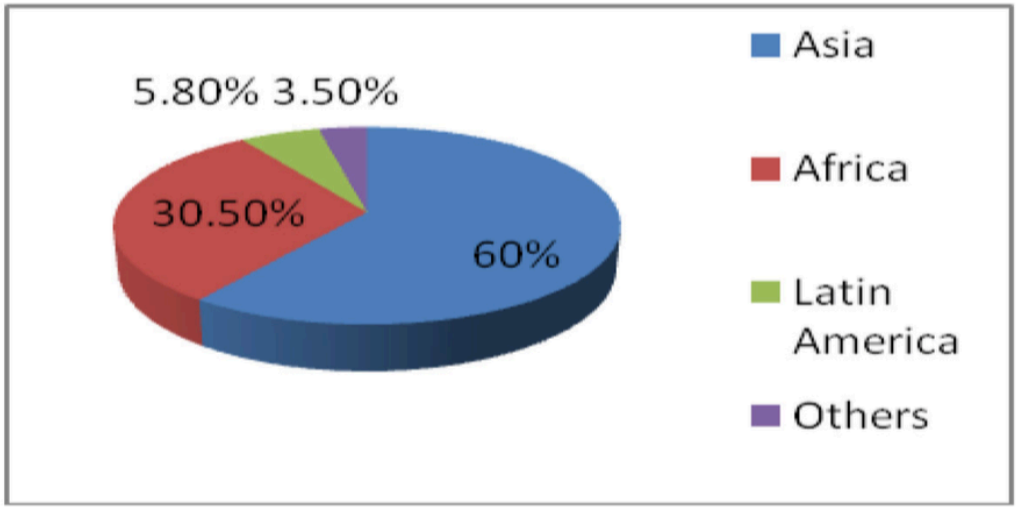


Figure 5. Percentage of ICT4D works by region.

Source: Chepken et al

Table 1. The ten most frequent affiliations of authors

Top 10 Affiliations	Count
University of Washington, Seattle	38
University of California, Berkeley	30
Microsoft Research India	22
University of Michigan	14
University of Cape Town	12
Carnegie Mellon University	12
Georgia Institute of Technology	12
New York University, New York	10
Unaffiliated	9
Michigan State University	8

Source: Marathe et al

TABLE III
LOCATION OF RESPONDENT AND REGIONAL FOCUS

Country	Physical location of Respondent	Location where respondent primarily active in ICTD work
USA	25	4
India	10	20
Malaysia	2	1
Philippines	2	2
Barbados	1	1
Brazil	1	1
Ghana	0	2
Botswana	0	1
Chile	0	1
Colombia	0	1
Canada	1	0
Greece	1	0
Netherlands	1	0
Nigeria	1	0
South Africa	1	1
Spain	1	0
Sweden	1	0
Switzerland	1	0
Uganda	1	0
Macedonia	0	1
Nigeria	0	1
No Specific Region	--	12
Total	50	50

Source: Patra et al

Location of research - updated

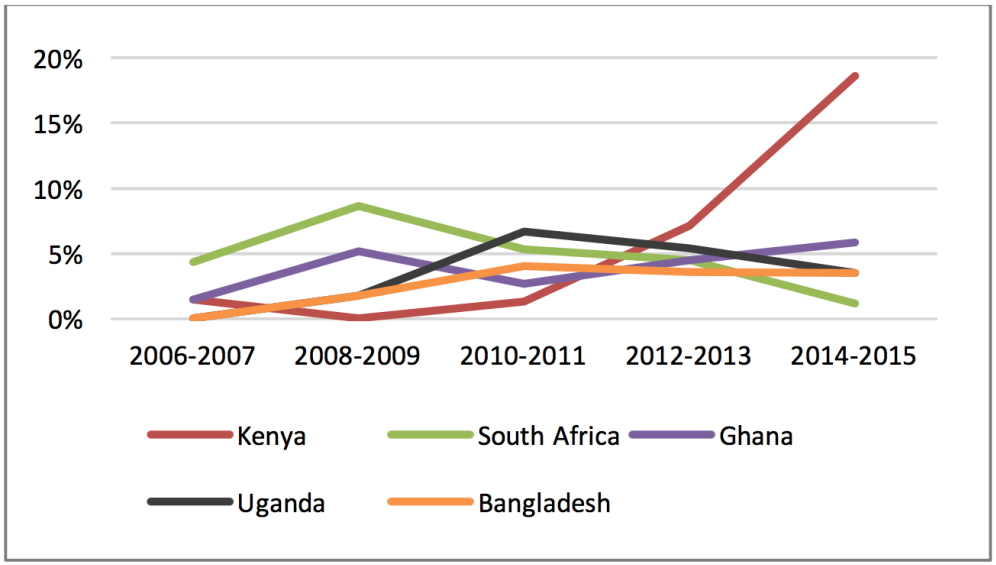


Figure 2. The proportion of ICTD papers in five of the top six countries (and "other," excluding India) as a percentage of the total.

Source: Kano et al

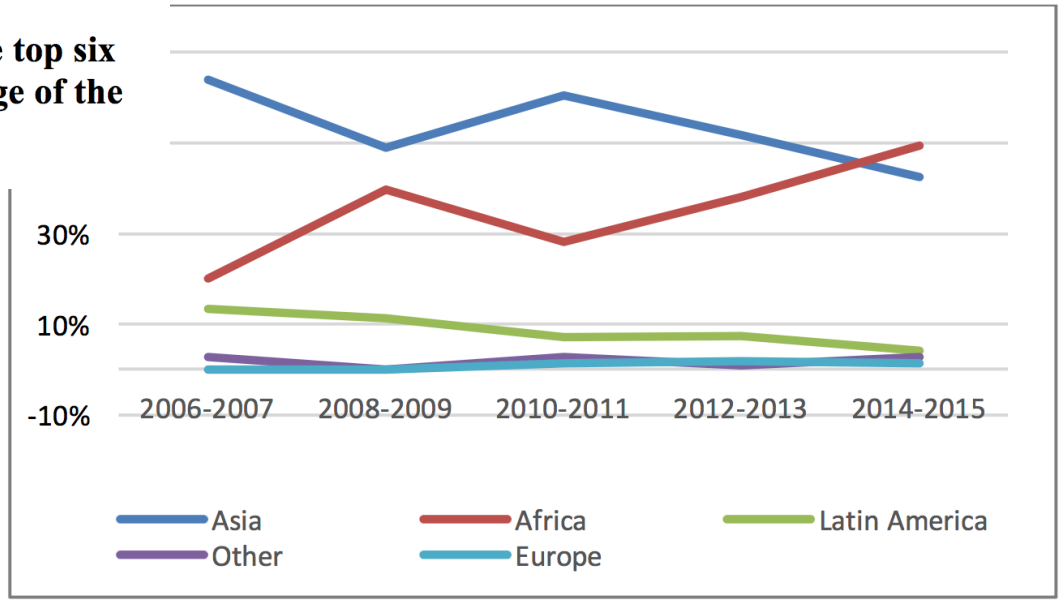


Figure 3. The proportion of ICTD papers in each region as a percentage of the total (2006-2015).

Domains of work

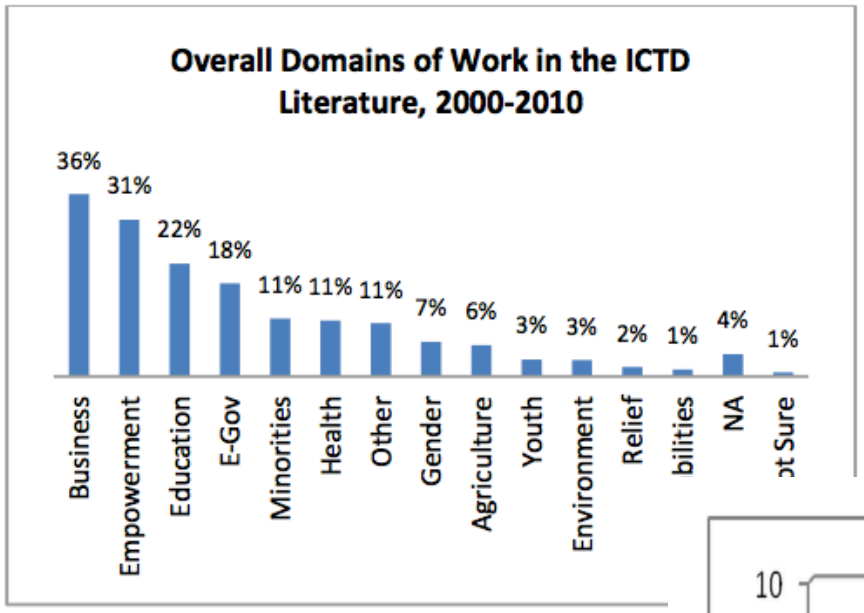
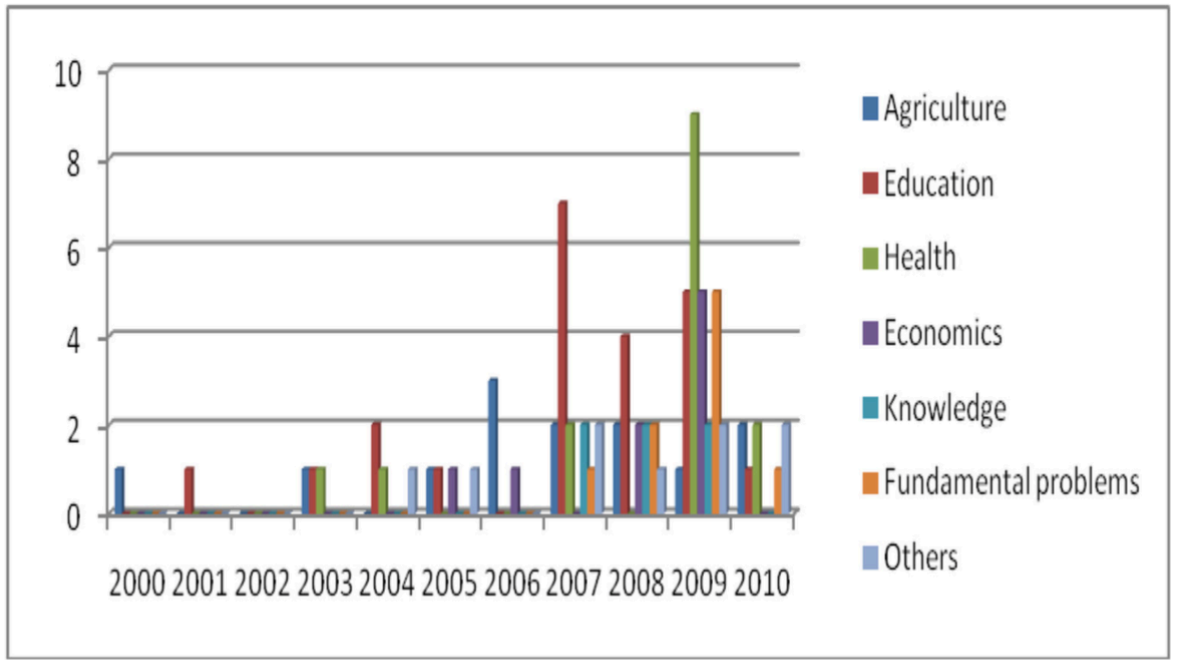


Figure 1. Overall domains of work in the IC 2000-2010 (note: non-exclusive category, do 100%).

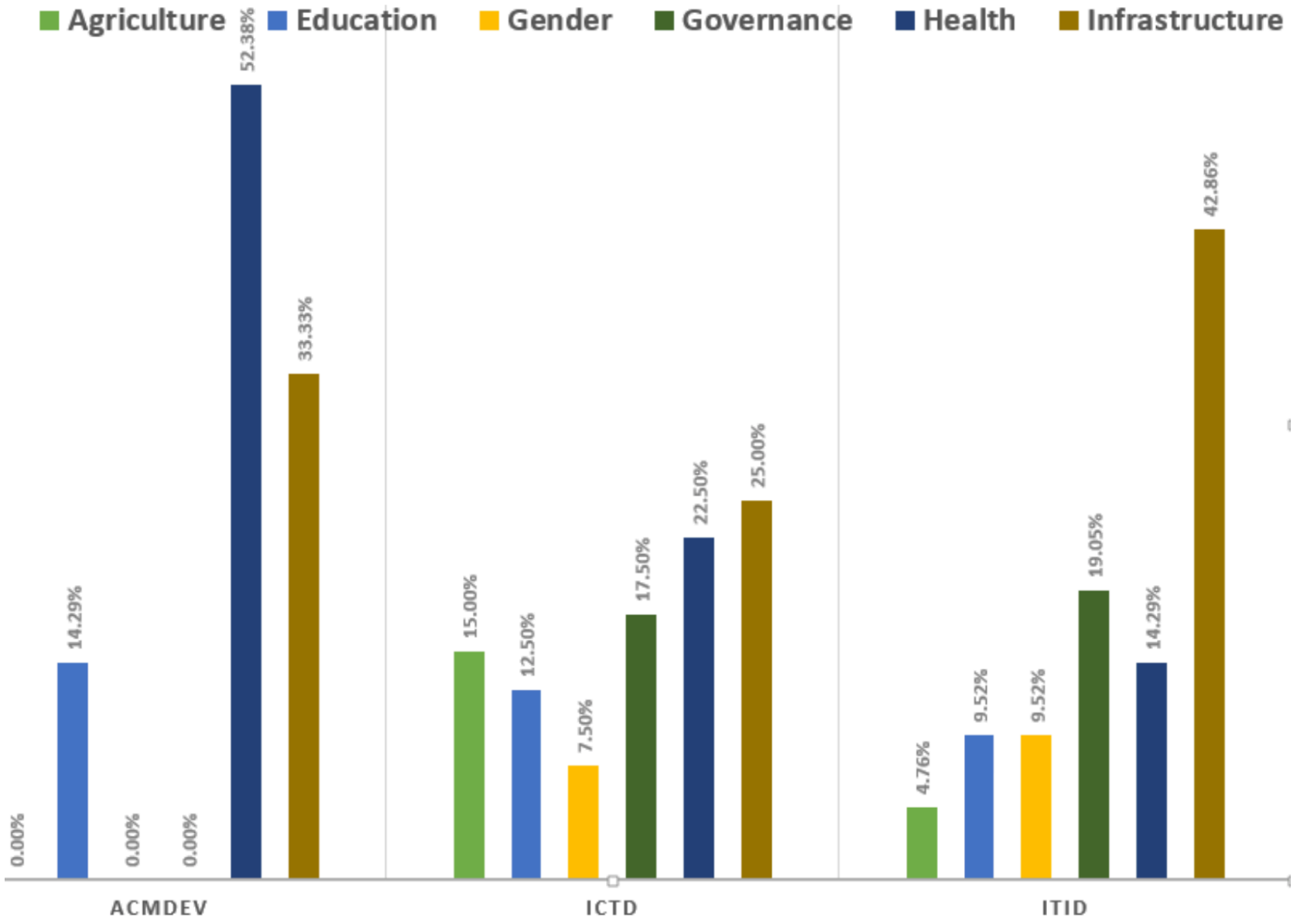
Source: Gomez et al



Source: Chepken et al

Figure 3. Domain area.

Domains of work



Source: Marathe et al

- In light of the Unwin article and the discussion of what is development, notice this excerpt from the Gomez et al abstract.

  Results indicate that the majority of the literature focuses on business and empowerment as the primary domains of ICTD work, and on ICT in general and on information systems as the most common technology objects of analysis, with a growing trend toward mobile phones.

Business Stakeholders - Future

TABLE X
AREAS OF FUTURE IMPORTANCE FOR BUSINESS STAKEHOLDERS

Top 5 areas ranked by respondents	Percent Respondents
Microfinance and microcredit	41.7
Mobile commerce	41.7
Supply chain management	16.7
Online commerce	13.9
Low cost sales devices	13.9

Education Active Areas

- Low-cost computing
  - OLPC XO $100 laptop for $188
  - OLPC XO Tablet for $129
  - Aakash $35 tablet
  - Raspberry Pi $25 computer

Education Active Areas

- Computer-aided learning
- Interface design and shared computing
  - MultiMouse

Education Active Areas

- Cellphones for game-based learning
- Open source software
  - E.g. Edubuntu
- Open source curriculum
  - OpenCurriculum
    - http://www.opencurriculum.org
  - Founded by CMU Heinz grad: Varun Arora
- SMS for question/answer university lectures

Millee

Figure 5. The receptive phase in the initial iteration of the adapted Frogger (left) and Floored (right). In Frogger, the player had been taught "cat" and was being taught "rabbit." In Floored, she was being taught "cat."

Millee.org - Designing educational games to teach English on low-cost mobile phones.

Lead PI: Matt Kam

Education – Future

TABLE VI

AREAS OF FUTURE IMPORTANCE IN EDUCATION

Top 5 areas ranked by respondents	Percent Respondents
Remote learning	31.4
Educational games	25.7
Low cost computing	22.8
Life-long learning	17.1
Online content	14.2

Education – Some Local Links

- TCinGC
  - Student information systems
    - Alaska, Ghana, Philippines, Palau, India
  - School infrastructure
    - Rwanda, Philippines, Cook Islands

Governance

- Migration of services on-line
- Migrate transactions to on-line
- Enable e-payments
- E-voting

- Intended to:
  - Lower transaction costs
  - Broaden availability
  - Improve transparency

Governance – Future

TABLE VIII
AREAS OF FUTURE IMPORTANCE IN GOVERNANCE

Top 5 areas ranked by respondents	Percent Respondents
Sharing of public information	47.3
Digitization of records (land, tax)	31.5
Improved transparency, corruption reduction	26.3
E-payment and online retailing	23.6
E-voting	7.8

World Wide Web Foundation

- "Establishing the open Web as a basic right and a public good
  - Ensuring everyone can access all of the Internet, all of the time.
  - Fighting for your rights to freedom of expression and privacy online.
  - Democratising the world's information through open data"
- http://www.webfoundation.org

Governance – Local Links

- TCinGC
  - Financial Intelligence
    - Managing data to investigate money laundering
  - Government web sites
    - Cook Islands Ministries of Agriculture, Transport, Health, …
    - Palau Financial Intelligence Unit
    - Marshall Islands Banking Commission
  - Government operations
    - Nauru fuel rationing database
    - Nauru Information Management Strategy

Healthcare Active Areas

- Telemedicine
  - Long distance communication to expand access to remote rural areas where there are no doctors
- Information Gathering
  - Particularly for epidemiological research
    - i.e. incidence, distribution, and possible control of diseases
  - Public health surveying
  - Patient health monitoring (e.g. TB medication)
  - Healthcare aid impact assessment
- Expat doctors connecting back home
  - Web technologies connecting doctors across borders
- Low-cost medical diagnostic devices
  - Ultrasound, x-ray, and sensors

Healthcare – Future

TABLE IV
AREAS OF FUTURE IMPORTANCE IN HEALTHCARE

Top 5 areas ranked by respondents	Percent Respondents
Medical records	57.8
Supply-chain management	50.0
Tele-diagnosis and treatment	44.7
Collection of epidemiological data	44.7
User interfaces	28.9

Healthcare – Some Local Links

- TCinGC
  - Cook Islands Ministry of Health
  - Palau Ministry of Health
  - Ebeye Hospital – Marshall Islands
- HealthLine
  - Telephone-based automated dialog system for access to healthcare information by community health workers in Pakistan.
  - Roni Rosenfeld in SCS
  - http://www.cs.cmu.edu/~healthline/
  - (This research has been completed)

Agriculture Active Areas

- Telecenters
  - Historically a big area of research
  - Poor to mixed results
  - But well understood now what works and what doesn't
    - Unfortunately, organizations still do it the "doesn't" way.
- Cellphones and PDAs in organic certification
- Sensor networks for water management
- Livestock management
- Price information
- Farming extension and information sharing
- Micro-entrepreneurship

E.g. Digital Green

- Used video to
  - articulate,
  - disseminate,
  - and archive
  - agricultural best practices among small and marginal farmers.
- Practices
  - a participatory process for local video production,
  - a human-mediated instruction model for video dissemination and training,
  - a hardware and software technology platform for exchanging data in areas with limited Internet and electrical grid connectivity, and
  - an iterative model to progressively better address the needs and interests of the community with analytical tools and interactive phone-based feedback channels.
- Interesting note: videos start with local village entertainment.
- 5 times more farmers adopted sustainable farming practices after using Digital Green than had with prior agricultural extension practices.
- Digital Green: http://www.digitalgreen.org/

Agriculture – Future

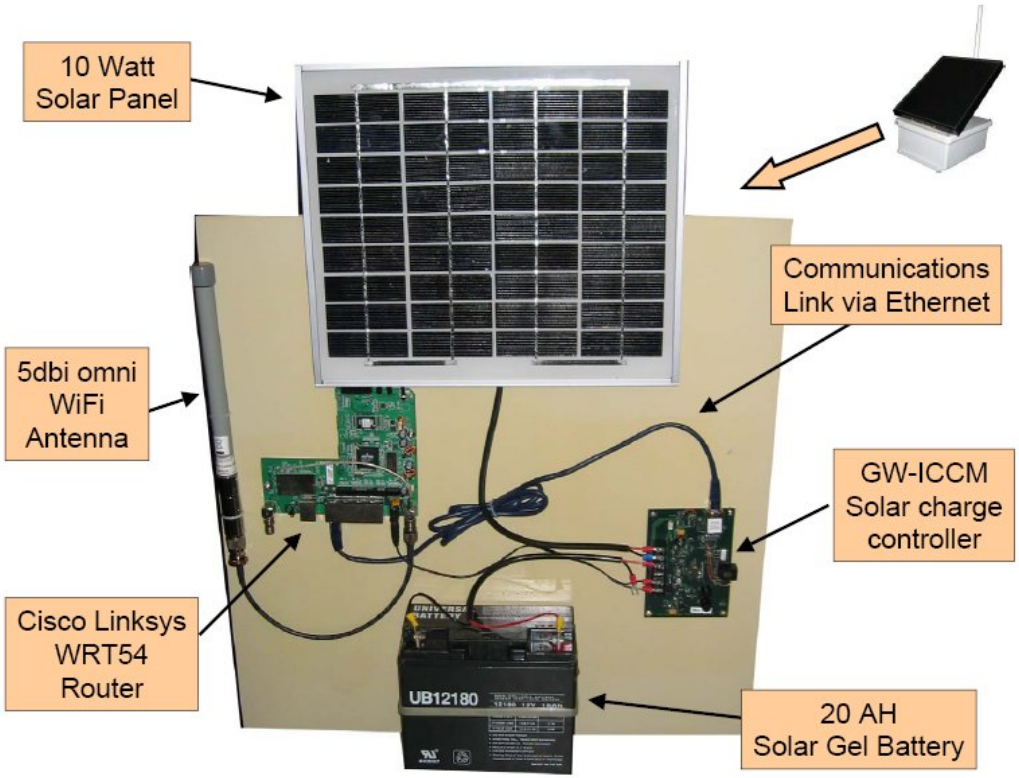
TABLE V
AREAS OF FUTURE IMPORTANCE IN AGRICULTURE

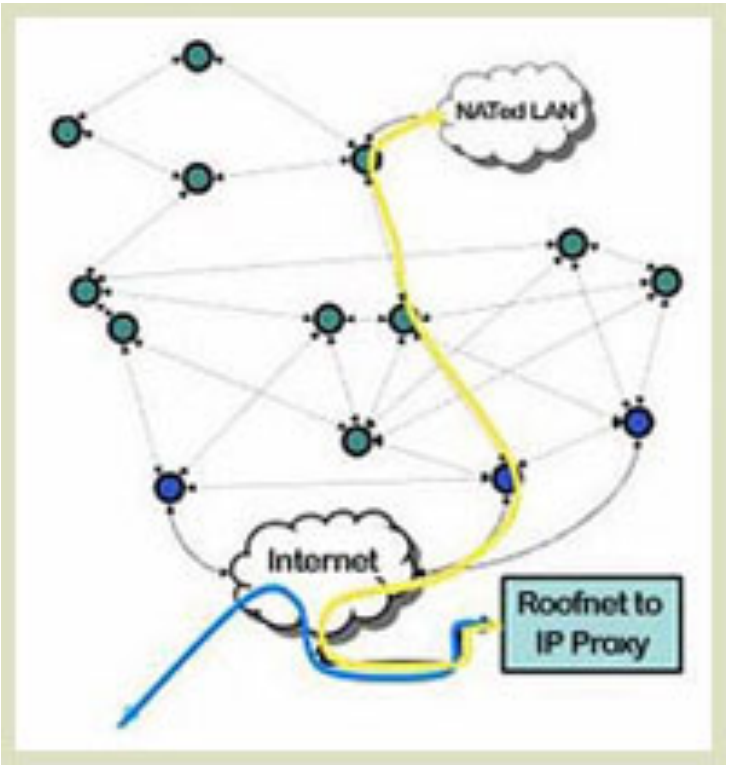
Top 5 areas ranked by respondents	Percent Respondents
Best practices and information sharing	56.7
Market access and information	51.3
Supply chain management	45.9
Sensors	21.6
Access to expert information	18.9

Communications & Infrastructure

- Communications backbones
  - E.g. Fiber Africa
- Long-distance use of wifi
  - E.g. 6 MBPS Up to 400km
- Wifi mesh networks
- Low power, unreliable power

Green-Wifi.org





Communications & Infrastructure – Future

TABLE VII
AREAS OF FUTURE IMPORTANCE IN COMMUNICATIONS

Top 5 areas ranked by respondents	Percent Respondents
Wireless/Low cost infrastructure	41.7
Low cost phones and devices	30.6
Mobile phones & phone coverage	22.2
Community radio & TV	22.2
VoIP	19.4

User Interface Design

- Visually enhanced interfaces for illiterate users
- Speech based systems for agriculture and healthcare
- Small screens for using mobile phones

User Interface Design – Future

TABLE IX
AREAS OF FUTURE IMPORTANCE IN DESIGN

Top 5 areas ranked by respondents	Percent Respondents
Voice recognition and synthesis	57.1
Local language software	54.2
Translation	20.0
Accessibility	17.1
Illiterate-friendly interfaces	14.2

Technology Areas

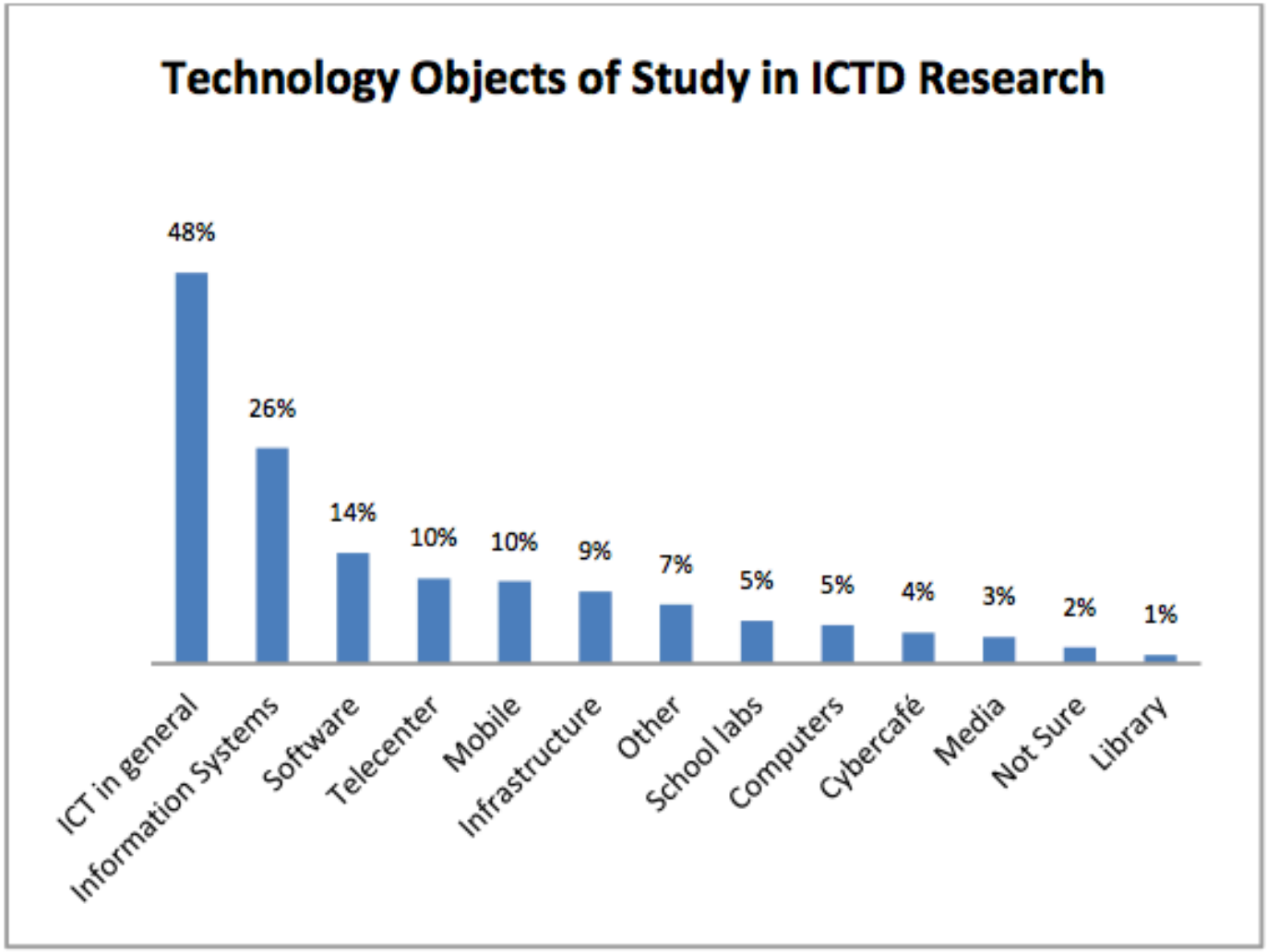


Figure 2. Technology objects of study in ICTD research, 2000-2010.

Source: Gomez et al

Technology Trends

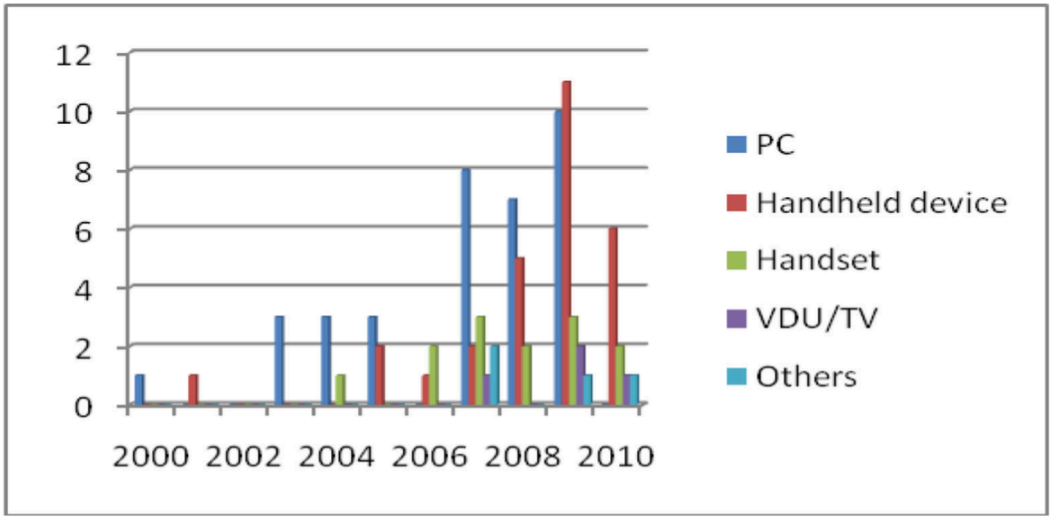


Figure 2(a). Terminal/platform analysis.

Source: Chepken et al

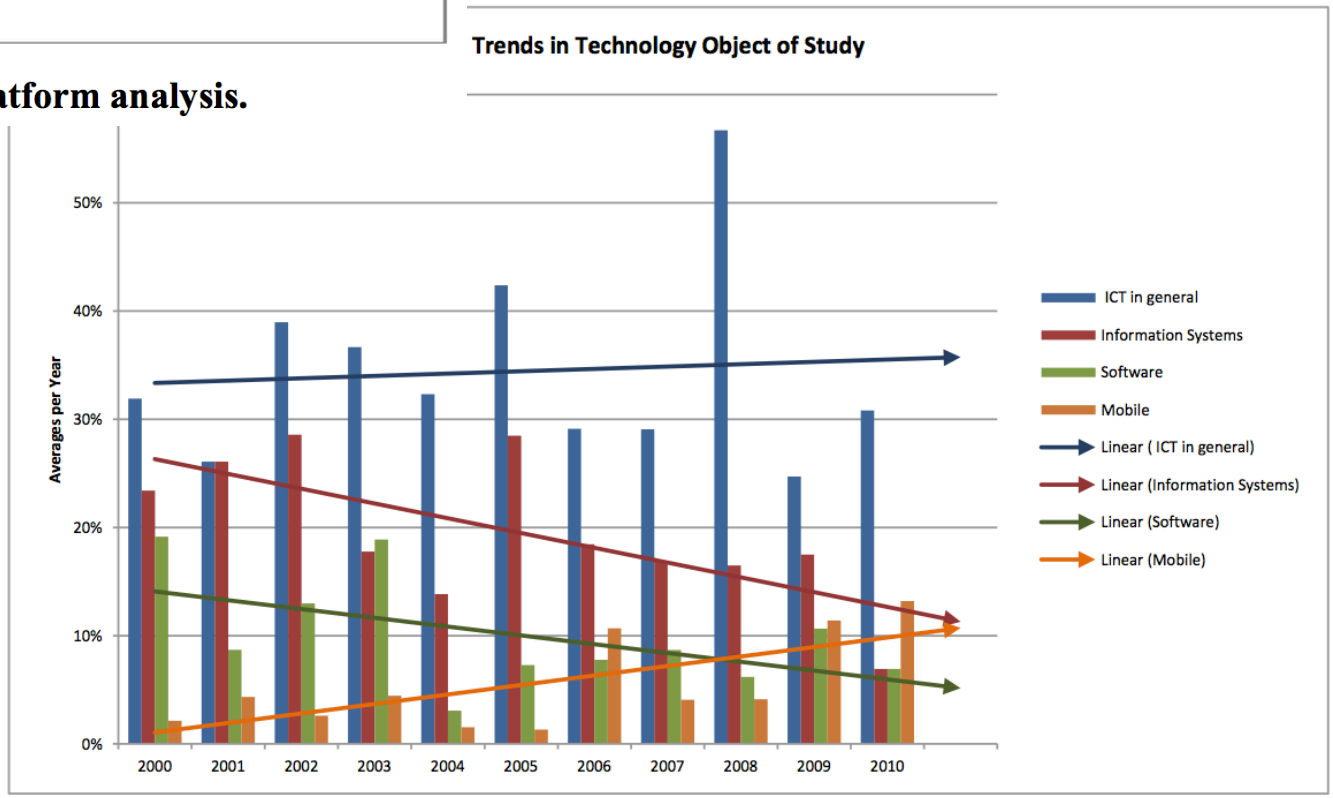
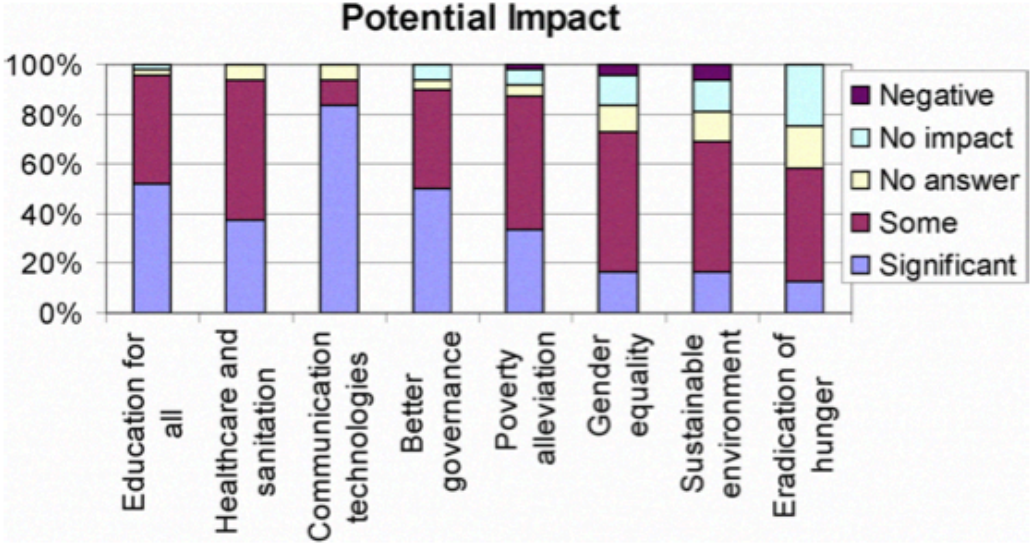


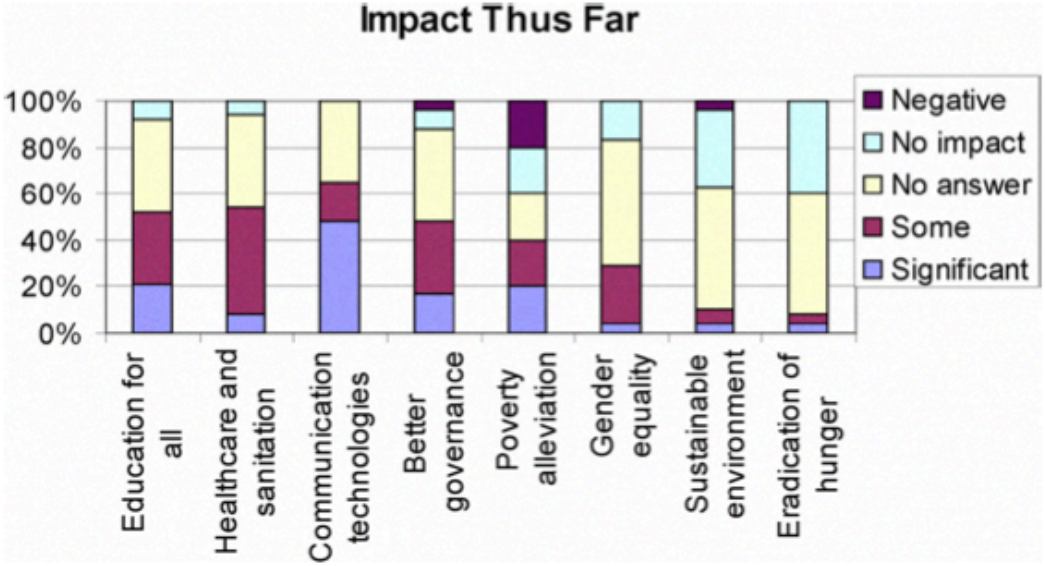
Figure 3. Trends over time in some of the technology objects of study.

Source: Gomez et al

Potential, Hope, and Hype

COMPARISON OF RESPONSES ON POTENTIAL AND ACTUAL IMPACT OF ICTD





For Tuesday…

- See the wiki…
  - Waters of Ayole video documentary
  - What is participatory research
  - Considering Failure: Eight Years of ITID Research