ICT’s, Poverty, and Development

Theoretical argument:

- We live in a knowledge or informational society (Castells)
- An important determinant of persistent poverty is a knowledge and communications gap (Stiglitz)
  - e.g. LDCs have “obstructed, incomplete and ‘relatively dark’ economic systems” with highly imperfect information and incomplete markets
- Modern, digital, ICT’s are the fundamental enablers to the networked society (Negroponte)
From Theory to Anecdote

Anecdotal argument:

- SARI project featured in Washington Post, CNN, New York Times, AP wire story, ....

- The Latin American farmer and his goat.
Empirical argument:

- Widely noted that there is little rigorous evaluatory research in ICT4D - most research has been atheoretical, anecdotal, or methodologically weak (Colle & Roman)
Empirical Results: Two Primary Units of Analysis

- Micro: Relating the development role of ICT’s to local firm productivity, consumer welfare, organic networks…

- Macro: Relating the development role of ICT’s to indicators of national aggregate activity…
The stages of ITID scholarship

1. Descriptive
2. Discourse of success stories
3. Self-reflection and self-doubt
4. Synthetic

Time
1980’s  1990’s  2003  2006?
Towards synthetic scholarship

- Founded in theory
- Common concepts
- Grounded in empirical analysis
- Cumulative, comparative, and aware of lessons
- Contextualized
- Cross-disciplinary
- Globally aware, locally engaged
- ?
Heeks ICT4D 2.0 Manifesto

- ICT4D 1.0
  - mid/late-1990s to mid/late-2000s
  - Telecentre as archetype
  - failure, restriction and anecdote
Heeks ICT4D 2.0 Manifesto

ICT4D 2.0

- Less emphasis on what might be used (the Internet and PCs), and more emphasis on what is actually used (mobiles, radio, television).
- Less emphasis on fundamental technical innovation; and more emphasis on application and business model innovation.
- Less emphasis on piloting and sustaining new applications, and more emphasis on assessing and scaling existing applications.
- Participation of beneficiaries in the design and/or construction of the ICT4D project.
- Flexibility and improvisation in the implementation of the ICT4D project.
- Learning in order to improve implementation of the ICT4D project (embracing both learning from past experience and iterative learning-by-doing during the project).
- Utilizing and building local capacities including those of local institutions.
- Competent leadership of the ICT4D project that is able to promote the other four elements.
SARI: Sustainable Access in Rural India

SARI aimed to….

demonstrate the sustainability of the Internet and Internet-enabled systems and services in poor rural communities.

and show a linkage between such technologies and social and economic development.

(with A. Jhunjhunwala, C. Maclay & J. Sinha)
The Village Information Center

Telecenters, telecottages, community technology centers, community communication shops, village knowledge centers, public call offices, networked learning centers, multipurpose community telecenters, digital clubhouses, *cabinas públicas*, *infocentros*, community access centers, ….
The SARI Village Information Centers

- Provide Internet via WLAN, PC, and application suite to villages - many that are off the phone grid

- Each village information center is locally owned and operated (franchise model)
Project Scope

- Working in Madurai District, Tamil Nadu, South India
- Madurai city not included
- Pilot project undertaken in the Taluk of Melur covering the two Panchayat Unions of Melur and Kottampatti
- Service area 2,000 sq km, 32,000 people
Project Scope

- 80 connections in over 50 villages
- Average village size of 1,000 households; smallest is 300 households
- Highest density of rural Internet kiosks connections anywhere
- In catchment area 23% of population has used the Internet (national average 1.5%, world 9%)
Connected Villages

- Padinetankudi
- Karungalakudi
- Keelavalavu
- Vellalur
- Urranganpatti
- Thaniamangalam
- Alagarkovil
- Neaythanpatti
- T. Ulagpitchanpatti
- Sengaramampatti
- Othakadai
- Attapatti
- Kottampatti
- Chittampatti
- Pudhutamaipatti
- Pulimalaipatti
- Mankulam
- Karpuooravahini
- A. Vellalapatti

- Navinipatti
- Kellaiyur
- Kallampatti
- Arittapatti
- Narasingampatti
- Therukutheru
- Kottakudi
- T. Vellalapatti
- Thiruvadhavur
- Arasappamappatti
- Vellaripatti
- Andipattipudur
- Thumbaipatti
- Melur- Kalanjiyam Tr Centre
- Palayasukkampatti
- Kuthappanpatti
- Kidaripatti
- Kattayampatti
- Pullipatti
Connected Villages
Deployed Applications

- Education & Training (Windows, Office, etc.)
Deployed Applications

- Cybercafe applications (e-mail, voicemail, chat, typing)
Deployed Applications

- E-government services (caste, income, birth, death certification, pension schemes, petitions, etc.)
Deployed Applications

- Entertainment applications (Tamil movies, astrology, games)
Deployed Applications

- Tele-health, tele-agriculture, tele-veterinary services
An Anecdote: Tele-Agriculture Services

- Suganya is the local operator in Ulagapichanpatti
- Lady’s fingers (bhendi) leaf and vegetable turning whitish-yellow in color
- Suganya sends images to Agricultural College
- Diagnosis is made (yellow mosaic disease) and remedy proposed (spray a boron and nitrogen solution)

(with Madurai Agricultural College and Research Centre)
Tele-Agriculture Services

- Printout of the reply given to the farmer who is charged Rs. 12 for entire services
- $3,000 worth of crops saved, livelihood for 10 households
- Similar tele-agriculture services provided for cotton and eggplant
- Over 45 tele-agricultural services performed in 6 months
Panel Research Inputs Included

- household surveys
- operator surveys
- user surveys
- instrumented PC’s
- ISP meter reads
- maintenance logs
- daily usage reports
- government usage reports
- baseline surveys
- payment reports

There is an extraordinary challenge in collecting solid data on usage, outputs, and outcomes from rural facilities. (Colle & Roman)
We performed a 22 month study of over 50 village information centers.

(With J. Thomas)
Revenues Indicator

Overall Average Payments for Internet Usage

[Bar chart showing monthly payments with a peak in May 2003 and an overall average indicated.]
Some Usage Results

- A good predictor of usage of the facility is the size of the village the center is situated in - the larger the village the higher the usage ($r = 0.43, p < 0.1, n = 22$).

- Where the facility is managed by its owner (as opposed to the owner hiring an independent salaried operator) usage levels increase ($r = 0.44, p < 0.1, n = 24$).
Some Revenue Results

- Revenue levels rise in situations where the operator has attained a relatively high education level ($r = 0.38$), has more prior computer experience ($r = 0.38$), or has longer experience working at the facility ($r = 0.41$), ($p < 0.1$, $n = 23$).

- Controlling for income, revenues drop if the catchment area is made up of a relatively high proportion of marginalized castes or communities (e.g. Scheduled Castes or Muslims) ($r = -0.44$, $p < 0.1$, $n = 22$).
Revenue and Usage Results

- Caste, gender, and age of the operator do not have a statistically significant influence on either usage or revenue levels.

- Relative income level of the catchment area does not significantly influence the revenues nor usage - suggesting that all economic groups are finding something within the service range they value.
Some Conclusions from the User Survey

- Women are quite underrepresented as users.
- Christians and Muslims are also underrepresented.
- BC and SC are “over” represented as compared to villages at large.
- Men play games, browse, or chat. Women train or do “other” things. If women are going to browse or chat it is likely the operator is male.
- Operators attract their own caste more than expected by chance.
- Women seem to be willing to spend more money if they perceive to get value for their money.
Focused User Study

- Rogers Diffusion of Innovation Framework
- Adopter categories
  - Innovators
  - Early adopters
  - Early majority
  - Late majority
  - Laggards
Focused User Study

- Innovation qualities
  - Perceived attributes (relative advantage, compatibility, trialability, observability)
  - Adoption decisions (optional, collective, authoritarian)
  - Communication channels (mass media, interpersonal)
  - Nature of normative social environment
Users from Four Villages

(with R. Kumar)
Innovators / early adopter qualities
- Relatively high socio-economic position
- Men
- Young

Innovation qualities
- Relative advantage (people used services they valued)
- Compatibility (women did not use the services much)
- Complexity (more educated people used the system)
Women are more likely to report that the Internet was *not* useful (c2=6, p < 0.001, n=119).

Women average 65 Rs per visit, men average 36.4 Rs. per visit (F=6, p<0.01, n=109). True when controlled for type of service performed.

Women are also more *willing* to pay larger amounts (c2=10.8, p=0.05, n=92).

(with S. Maier)
Women are more likely to engage in training or report “other” as their activity. Men are more likely to play games.
Users with male operators use voice mail/chat and browsing more than with female operators.

Effect is reduced though still significant when gender of user is controlled for.
Lack of interest is given as reason for low use by older users (mean 38 years). Younger users report location or time (mean 21 and 19 years).

If she reports hurdles to use she is much more likely to use it with infrequency.

If she does not perceive hurdles than she is likely to use it infrequently due to lack of interest (rather than location, time, money, etc.) and her family is more likely to use the center.
E-government Services

(with R. Kumar)
Percentage of Total Applications Received From Kiosks

- Income Certificates: 3.5%
- Community Certificates: 6.4%
- Death Certificates: 13.6%
- Old Age Pension: 40.6%
- Birth Certificates: 65.6%
- General Grievances: 37.0%
Applications in Big Villages: Kiosk vs Non-Kiosk
By offering e-government services through a kiosk leads to an increase of 4.950 and 2.925 in the average number of applications (per 1000 population) received for birth certificates and old age pensions respectively, when compared to that when the village has no kiosk, keeping other factors constant.
## Consumer Welfare Results

<table>
<thead>
<tr>
<th>Government Service</th>
<th>Cost and time estimate <em>without</em> e-government</th>
<th>Cost and time estimate <em>with</em> e-government</th>
<th>Savings in Cost and time with e-government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Certificates</td>
<td>Rs. 60 to 250, 3-7 days</td>
<td>Rs. 35, 2-3 days</td>
<td>Rs. 25 to 215, 1-4 days</td>
</tr>
<tr>
<td>Death Certificates</td>
<td>Rs. 60 to 250, 3-7 days</td>
<td>Rs. 35, 2-3 days</td>
<td>Rs. 25 to 215, 1-4 days</td>
</tr>
<tr>
<td>Old Age Pensions</td>
<td>Rs. 25, one day in visiting the Taluk office</td>
<td>Rs. 10, No visit required</td>
<td>Rs. 15, one day</td>
</tr>
</tbody>
</table>
An ICT4D Sustainability Framework

- Economic sustainability (Heeks)
- Social/Cultural sustainability (IDRC)
- Political/Institutional sustainability (IDRC)
- Technological sustainability (me)
- Environmental sustainability (everyone)
Sustainability Failure Model

- Financial Sustainability Failure
  - Institutional factor
  - Political factor
  - Technological factor

- Institutional Sustainability Failure
  - Cultural factor
  - Management factor
Economic Sustainability: A Micro Business Model

- Capital costs:
  - wiring, furniture $300
  - kiosk equipment 1,000
  - other 300

- Recurrent costs (monthly):
  - rent, electricity, maintenance 25
  - Internet 15
  - Interest and depreciation 28

- Break-even revenue $68 (per month) $2.70 (per day)
## Multivariate Analysis of Sustainability Factors

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Dependent Variable: Duration the kiosks remained open (number of days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference in the actual and the expected profits</td>
<td>0.022 ( (0.89)^a )</td>
</tr>
<tr>
<td>Different owner and operator</td>
<td>218.14* ( (1.94)^a )</td>
</tr>
<tr>
<td>Prior training of owner in computers</td>
<td>212.32* ( (1.75) )</td>
</tr>
<tr>
<td>Gender of Operator</td>
<td>63.66 ( (0.71) )</td>
</tr>
<tr>
<td>Support from n-Logue</td>
<td>326.60** ( (2.35) )</td>
</tr>
<tr>
<td>Support from elected representatives</td>
<td>53.15 ( (0.29) )</td>
</tr>
<tr>
<td>Constant</td>
<td>172.75* ( (1.93) )</td>
</tr>
<tr>
<td>Observations</td>
<td>26</td>
</tr>
<tr>
<td>R(^2)</td>
<td>0.481</td>
</tr>
<tr>
<td>F-Statistic</td>
<td>4.30***</td>
</tr>
</tbody>
</table>
Failure Factors

- Financial Sustainability Failure
  - Lack of adequate technical support
  - Lack of voice telephony services
  - Lack of new relevant content/services

- Institutional Sustainability Failure
  - Termination of e-government services
  - Lack of sustained institutional partnerships for service delivery
  - Differential treatment by program managers
## Heeks & Bhatnagar Factors

<table>
<thead>
<tr>
<th>Critical Failure</th>
<th>Heeks &amp; Bhatnagar “Factor”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of institutional support</td>
<td>Management, cultural, and structural factors</td>
</tr>
<tr>
<td>Lack of technical support</td>
<td>Technical factor</td>
</tr>
<tr>
<td>Lack of institutional partnerships</td>
<td>Management, process, and strategic factors</td>
</tr>
<tr>
<td>Lack of new and relevant content</td>
<td>Information factors</td>
</tr>
</tbody>
</table>
Some Conclusions from India

- Collaborative *local* design is central
- Human aspects trump engineering aspects
- Public policy really matters
- The unit of analysis is simultaneously the “village” and the “nation state”
- WIMP interface and desktop design is flawed
- Entrepreneurial skills and capacity is most central
- Monitoring, assessment, and evaluation is key
- Especially as hype and over-statement is common
In Conclusion: Some Big Research Questions

- What are the links between the Internet and social and economic development in low-income countries?
- What are the main challenges in the sustainability of village information centers?
- How can we ensure equity of access and empowerment and reduce risks?
- How should states intervene, and in what ways do public policies interface to ICT’s?
- What are the right design methodologies and system designs?
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Sustainable Access in Rural India

(D. Desouza)
An Invitation to the 
*Technologies and International Development Laboratory*

end user sharing

SARI & sustainability

Policies & assessments

HCI4D

SARI & sustainability

Policies & assessments
ICT4 WHAT?

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Computing for Change

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