

# ICT4WHAT?



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# ICT's, Poverty, and Development

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## 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

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Anecdotal argument:

- SARI project featured in Washington Post, CNN, New York Times, AP wire story, ....
- The Latin American farmer and his goat.



# From Theory to Empirical Results

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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

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- 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

4. Synthetic

3. Self-  
reflection and  
self-doubt

2. Discourse  
of success  
stories

1. Descriptive

*Time*

1980's

1990's

2003

2006?



# Towards synthetic scholarship

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- 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

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## ■ ICT4D 1.0

- mid/late-1990s to mid/late-2000s
- Telecentre as archetype
- failure, restriction and anecdote



# Heeks ICT4D 2.0 Manifesto

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## ■ 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

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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. Jhunjunwala, 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

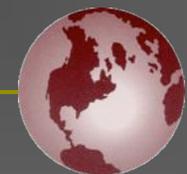
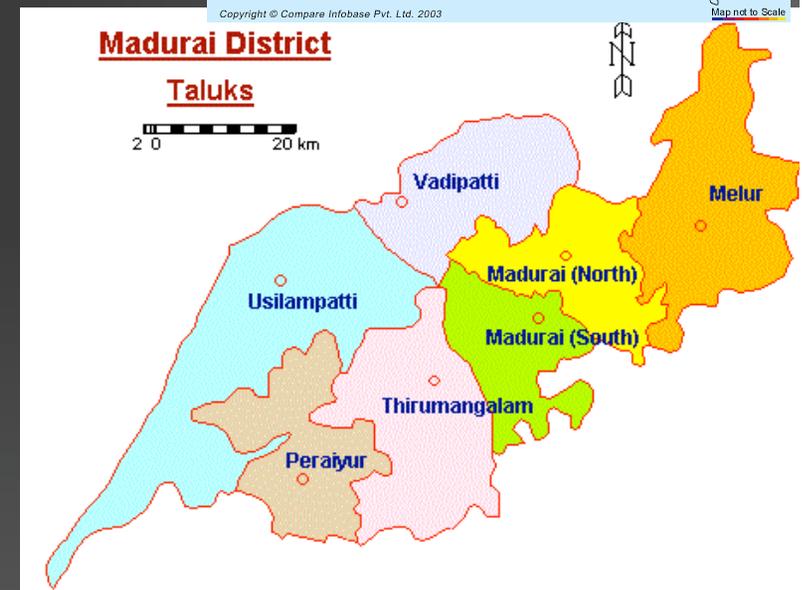
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- Provide Internet via WLAN, PC, and application suite to villages - many that are off the phone grid
- Each village information center is locally owned and operated (franchise model)



# 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

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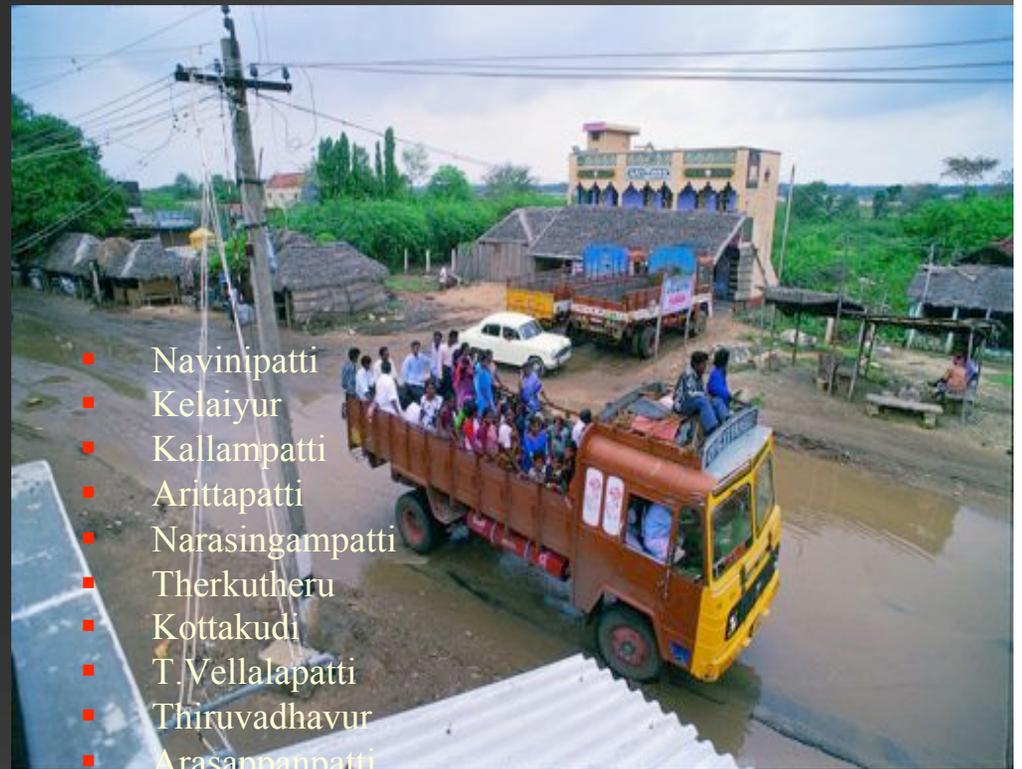
- 80 connections in over 50 villages
- Average village size of 1,000 households; smallest is 300 households
- Highest density of rural Internet kiosks connections anywhere
- In catchment area 23% of population has used the Internet (national average 1.5%, world 9%)



# Connected Villages

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

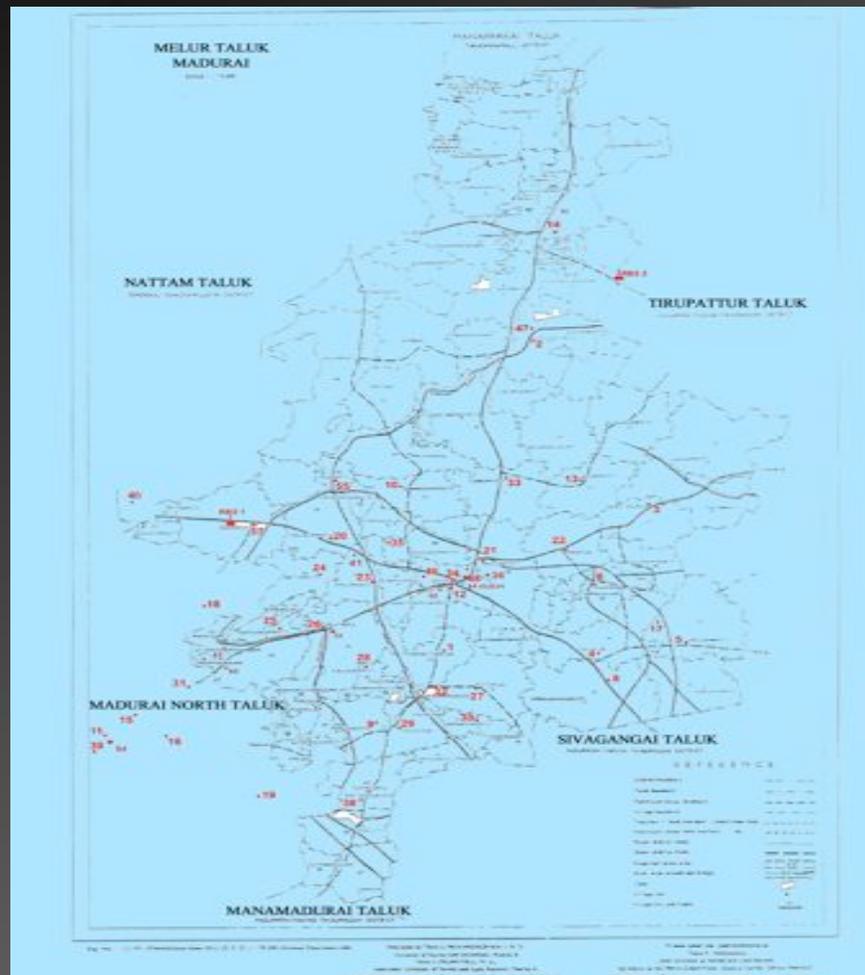


- Navinipatti
- Kelaiyur
- Kallampatti
- Arittapatti
- Narasingampatti
- Therkutheru
- Kottakudi
- T.Vellalapatti
- Thiruvadhavur
- Arasappanpatti
- Vellaripatti
- Andipattipudur
- Thumbaipatti
- Melur- Kalanjiyam Tr Centre
- Palayasukkampatti
- Kuthappanpatti
- Kidaripatti
- Kattayampatti
- Pullipatti



# Connected Villages

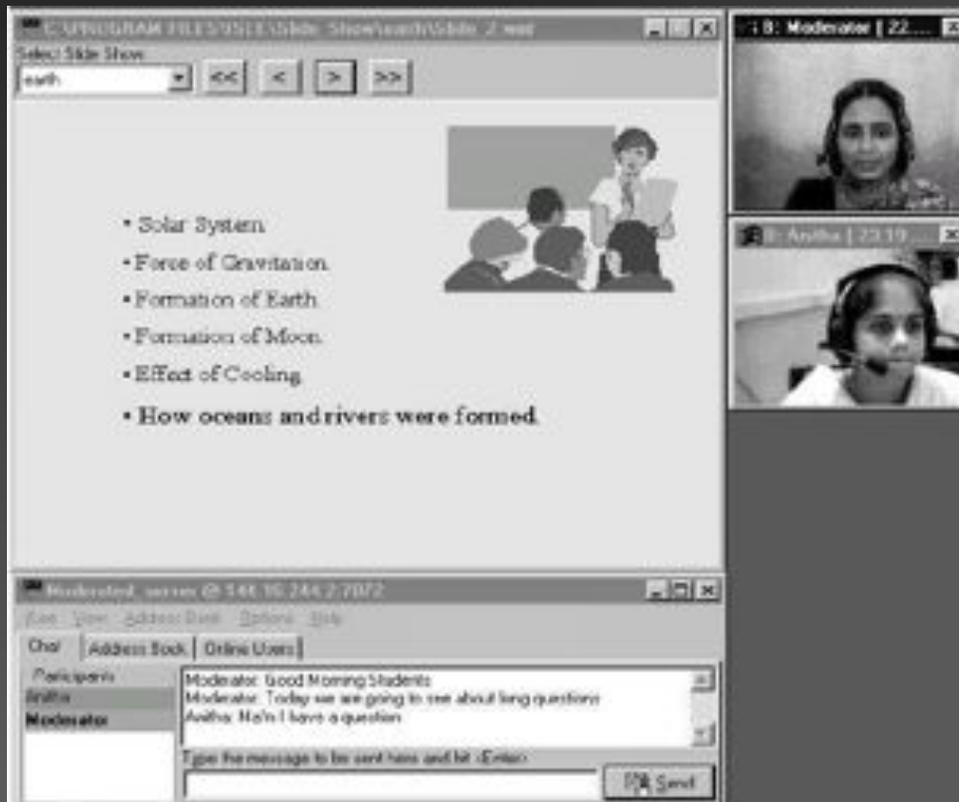
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# Deployed Applications

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





# Deployed Applications

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



# Deployed Applications

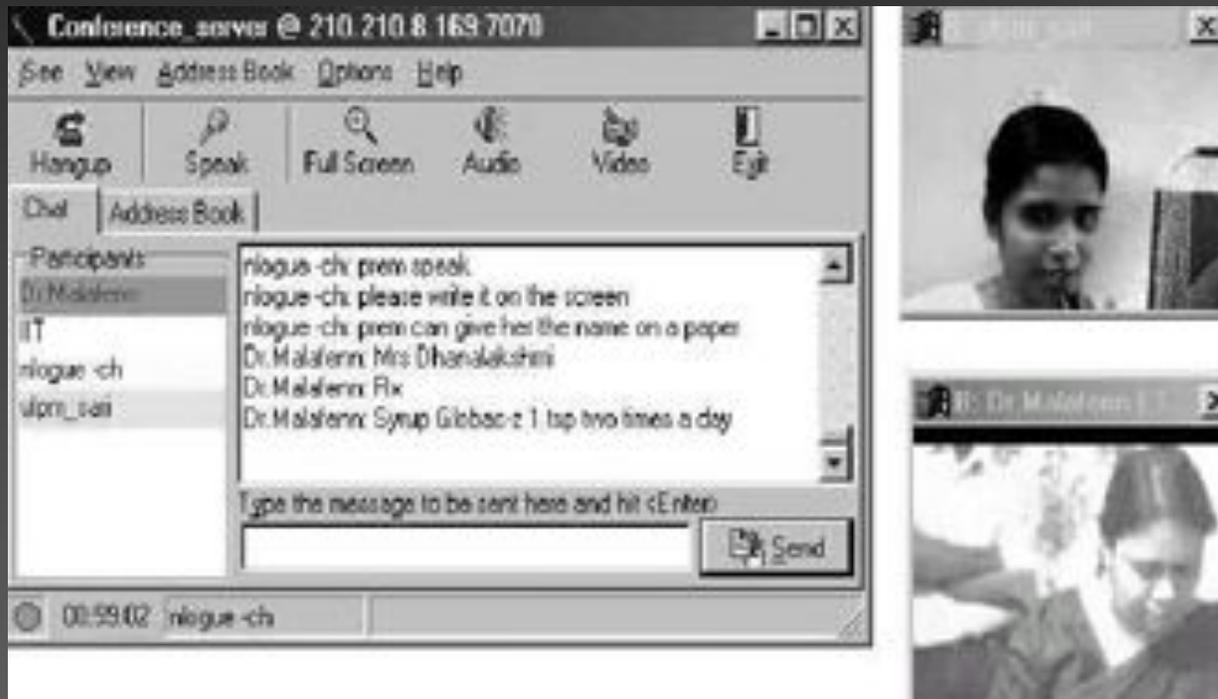
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- Entertainment applications (Tamil movies, astrology, games)



# Deployed Applications

- Tele-health, tele-agriculture, tele-veterinary services



# An Anecdote: Tele-Agriculture Services

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- 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

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- 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

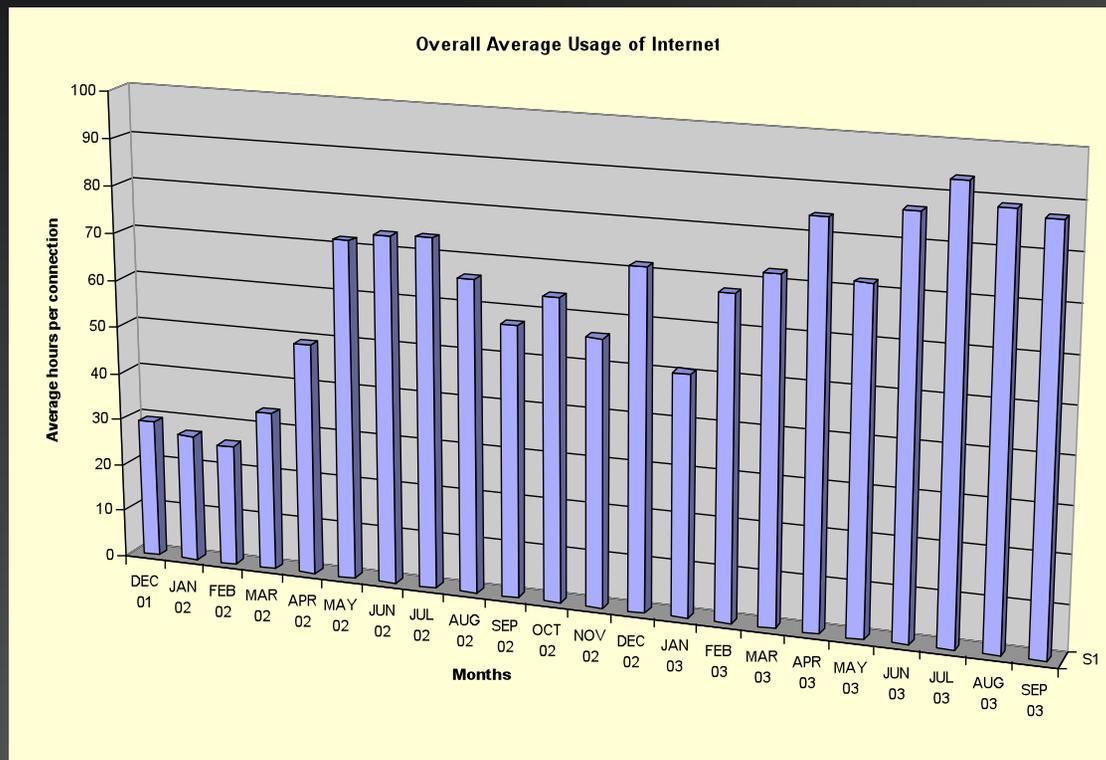
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- household surveys
- operator surveys
- user surveys
- instrumented PC's
- ISP meter reads
- maintenance logs
- daily usage reports
- government usage reports
- baseline surveys
- payment reports

*There is an extraordinary challenge in collecting solid data on usage, outputs, and outcomes from rural facilities.  
(Colle & Roman)*



# User Surveys



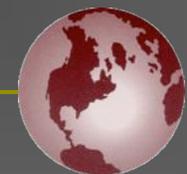
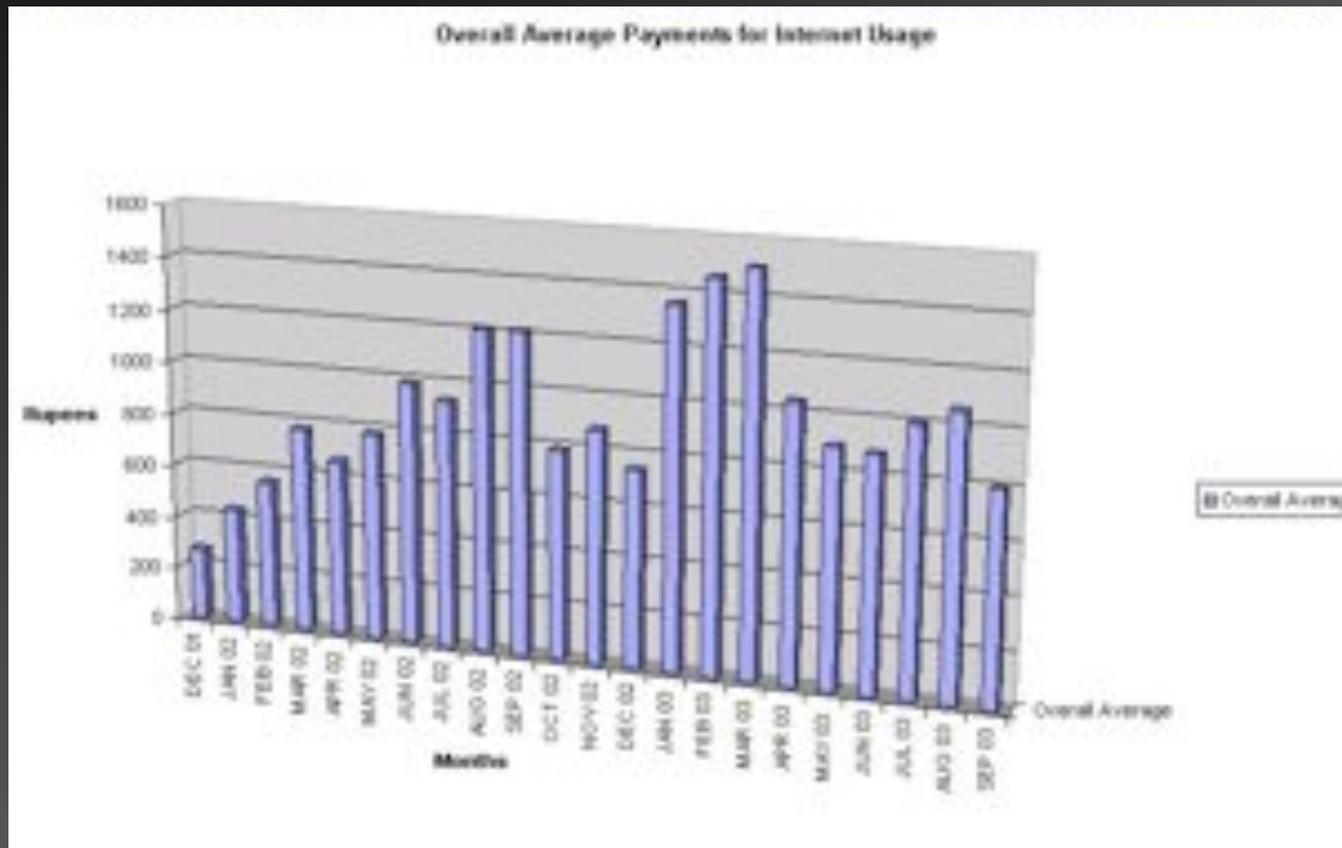
*We performed a 22 month study of over 50 village information centers.*

(with J. Thomas)



# Revenues Indicator

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# Some Usage Results

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- 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

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- 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

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- 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

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- 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

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



# Focused User Study

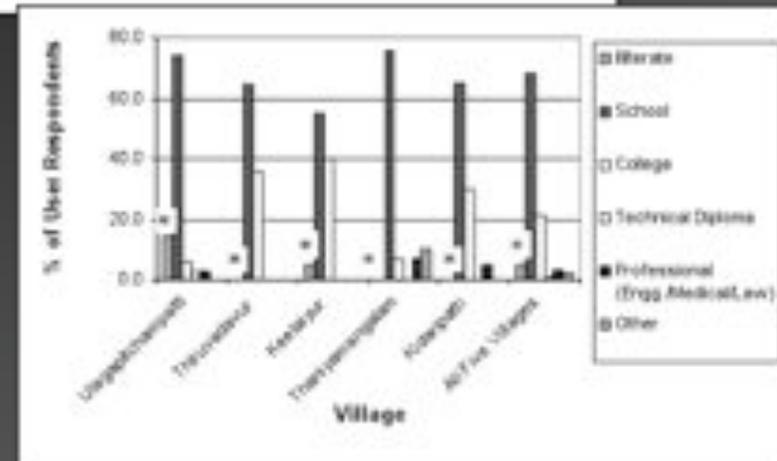
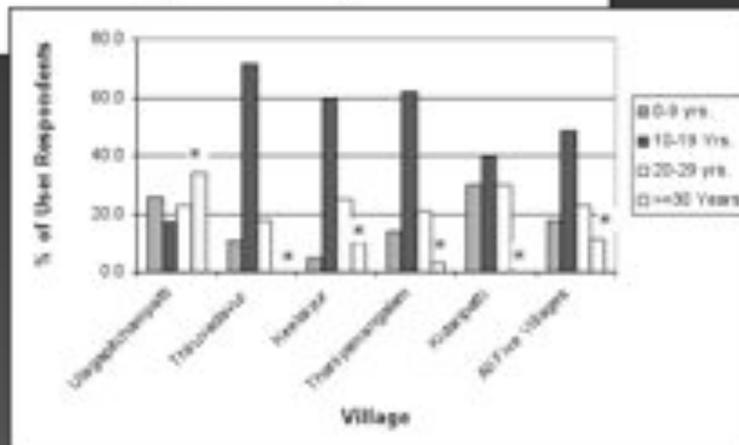
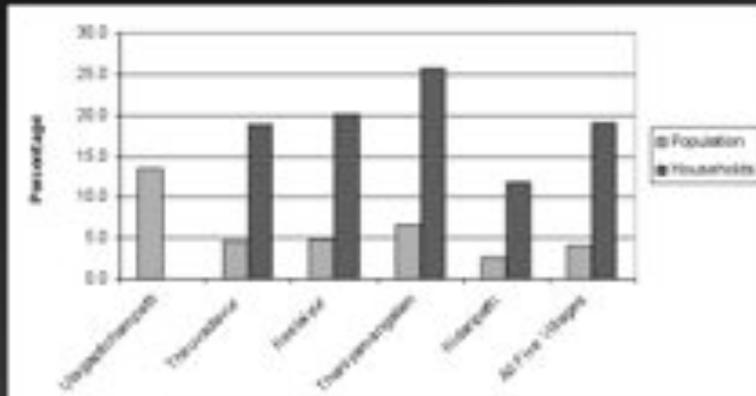
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- Innovation qualities

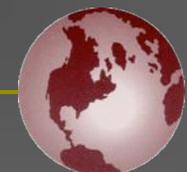
- Perceived attributes (relative advantage, compatibility, trialability, observability)
- Adoption decisions (optional, collective, authoritarian)
- Communication channels (mass media, interpersonal)
- Nature of normative social environment



# Users from Four Villages



(with R. Kumar)



# Characteristics of Innovation & Users

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- 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)



# Focused Gender Study

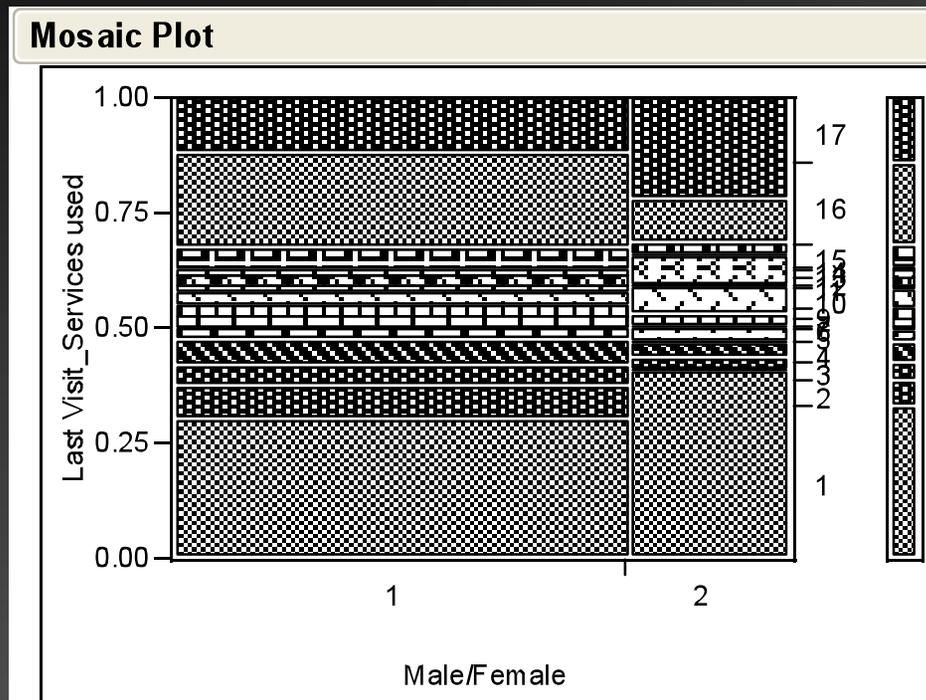
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- Women are more likely to report that the Internet was *not* useful ( $\chi^2=6$ ,  $p < 0.001$ ,  $n=119$ )
- Women average 65 Rs per visit, men average 36.4 Rs. per visit ( $F=6$ ,  $p<0.01$ ,  $n=109$ ). True when controlled for type of service performed.
- Women are also more *willing* to pay larger amounts ( $\chi^2=10.8$ ,  $p=0.05$ ,  $n=92$ )

(with S. Maier)



# Female vs. Male Services Used

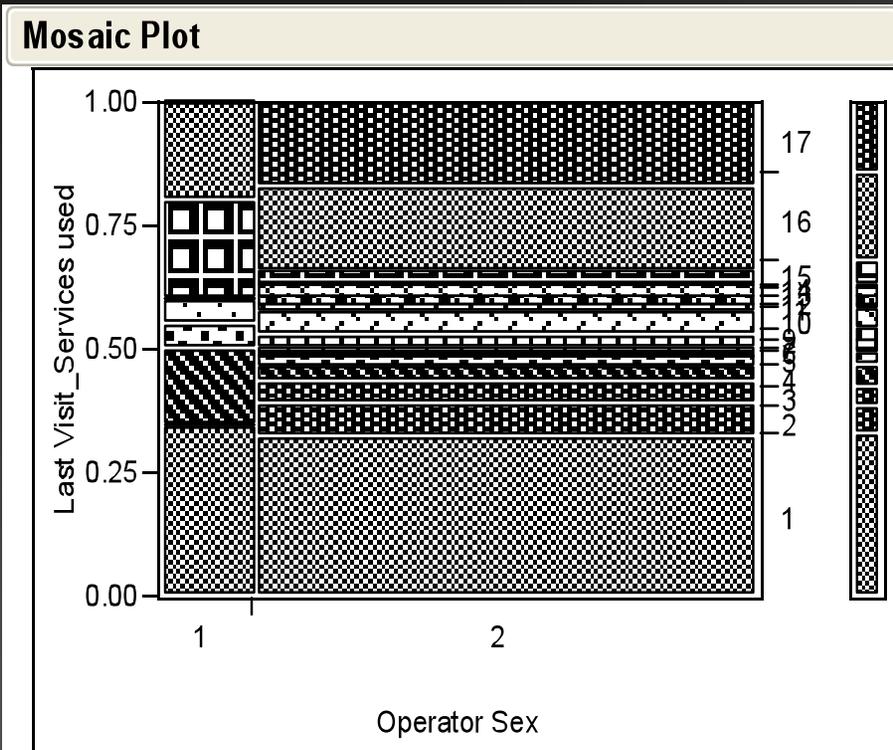


( $c2=23$ ,  $p<0.08$ ,  $n=125$ )

Women are more likely to engage in training or report “other” as their activity. Men are more likely to play games.



# Operator Gender



( $c^2=32$ ,  $p<0.006$ ,  $n=125$ )

- 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.



# Explaining Low Usage and Hurdles to Women

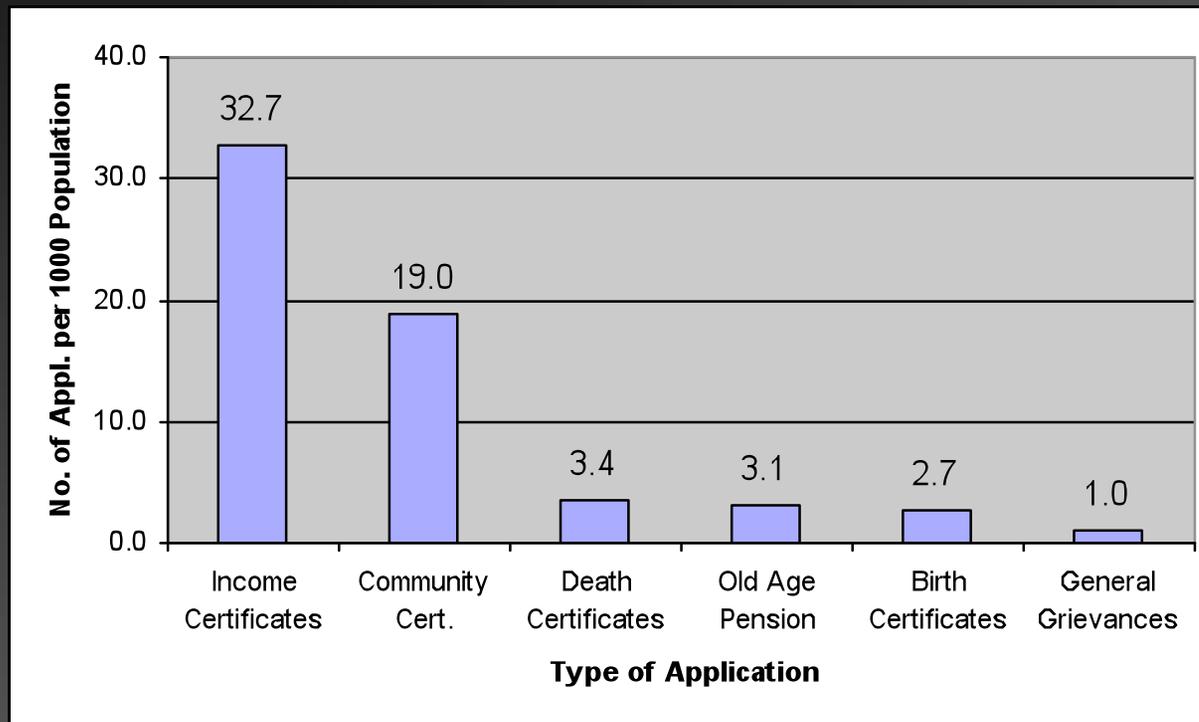
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- Lack of interest is given as reason for low use by older users (mean 38 years). Younger users report location or time (mean 21 and 19 years).
- If she reports hurdles to use she is much more likely to use it with infrequency.
- If she does not perceive 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

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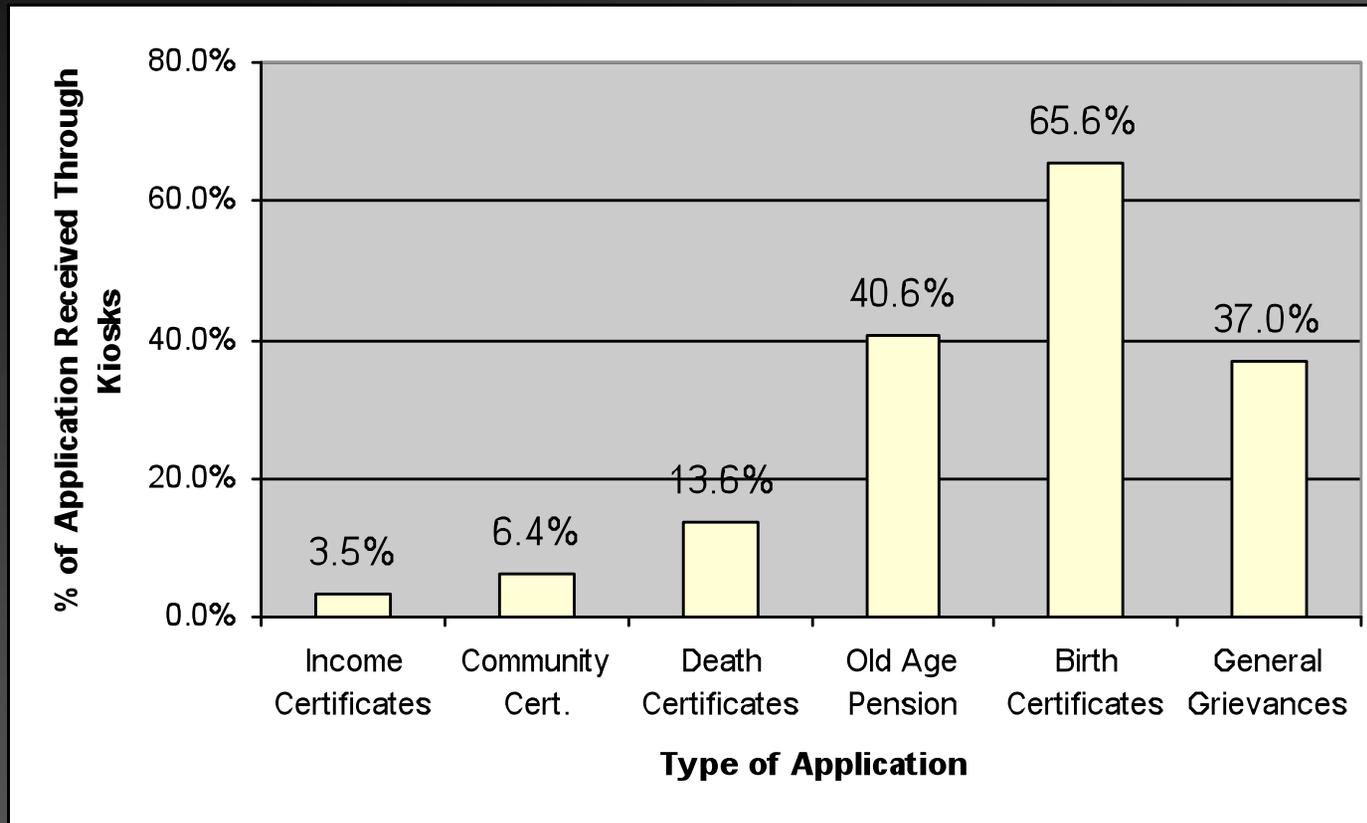


(with R. Kumar)

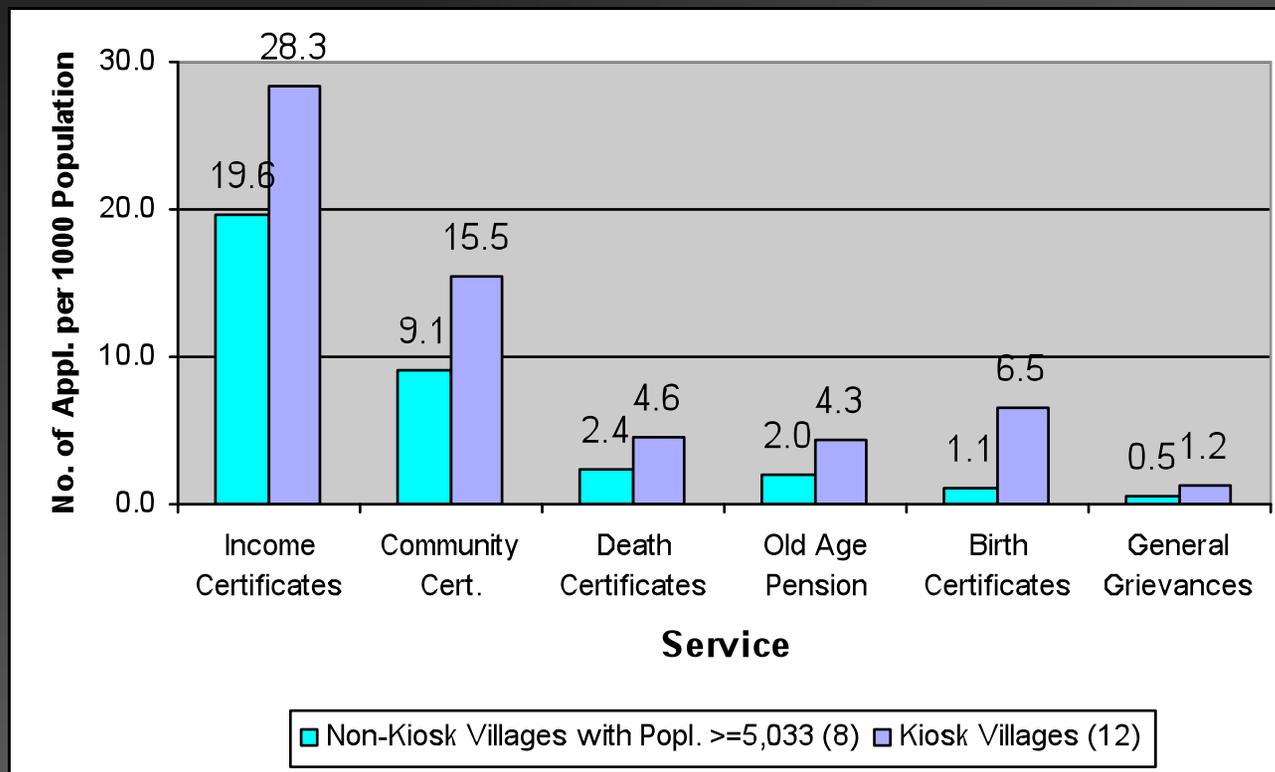


# Percentage of Total Applications Received From Kiosks

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# Applications in Big Villages: Kiosk vs Non-Kiosk



# Political Liberties Model

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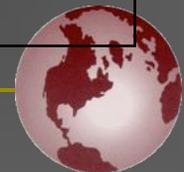
By offering e-government services through a kiosk leads to an increase of 4.950 and 2.925 in the average number of applications (per 1000 population) received for birth certificates and old age pensions respectively, when compared to that when the village has no kiosk, keeping other factors constant.



# Consumer Welfare Results

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



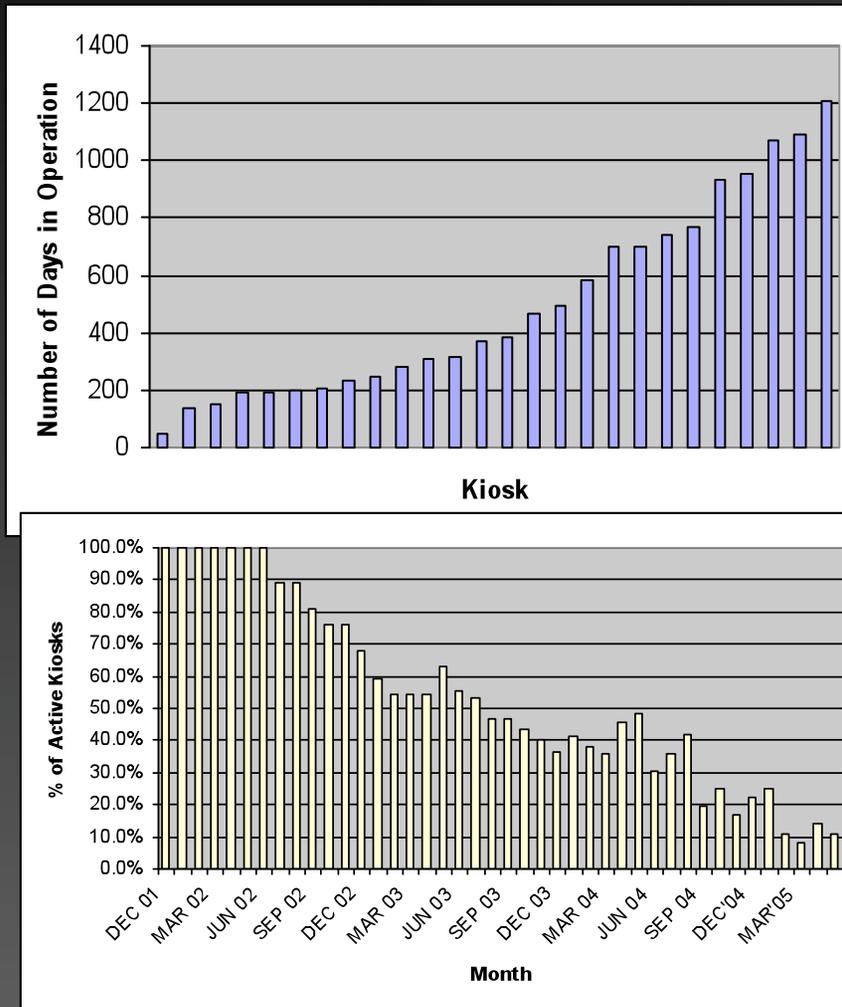
# An ICT4D Sustainability Framework

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- 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

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- Capital costs:

▪ wiring, furniture	\$ 300
▪ kiosk equipment	1,000
▪ other	300

- Recurrent costs (monthly):

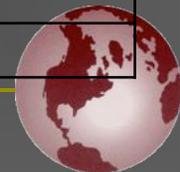
▪ rent, electricity, maintenance	25
▪ Internet	15
▪ Interest and depreciation	28

- Break-even revenue      \$68 (per month)    \$ 2.70 (per day)



# Multivariate Analysis of Sustainability Factors

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



# Failure Factors

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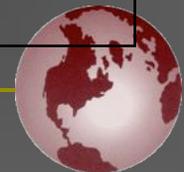
- Financial Sustainability Failure
  - Lack of adequate technical support
  - Lack of voice telephony services
  - Lack of new relevant content/services
- Institutional Sustainability Failure
  - Termination of e-government services
  - Lack of sustained institutional partnerships for service delivery
  - Differential treatment by program managers



# Heeks & Bhatnagar Factors

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Critical Failure	Heeks & Bhatnagar “Factor”
Lack of institutional support	Management, cultural, and structural factors
Lack of technical support	Technical factor
Lack of institutional partnerships	Management, process, and strategic factors
Lack of new and relevant content	Information factors



# Some Conclusions from India

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- 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

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- 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*?



# Acknowledgments

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# Sustainable Access in Rural India

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(D. Desouza)



# An Invitation to the *Technologies and International Development* Laboratory

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HCI4D



SARI & sustainability



Policies & assessments



# ICT4WHAT?



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Computing for Change

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