Computers and Communication in International Development:
The Internet in Africa and South Asia

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ICT4D is…

Researching the *sustainable development* potential of ICT's (in particular) in Africa and South Asia…

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Researching the *sustainable development* potential of ICT's (in particular) in Africa and South Asia…

… by inventing and critiquing (in particular) the Internet and Internet-enabled systems as well as studying and intervening within the business, social, and government milieu.

Integrated approach

Technology
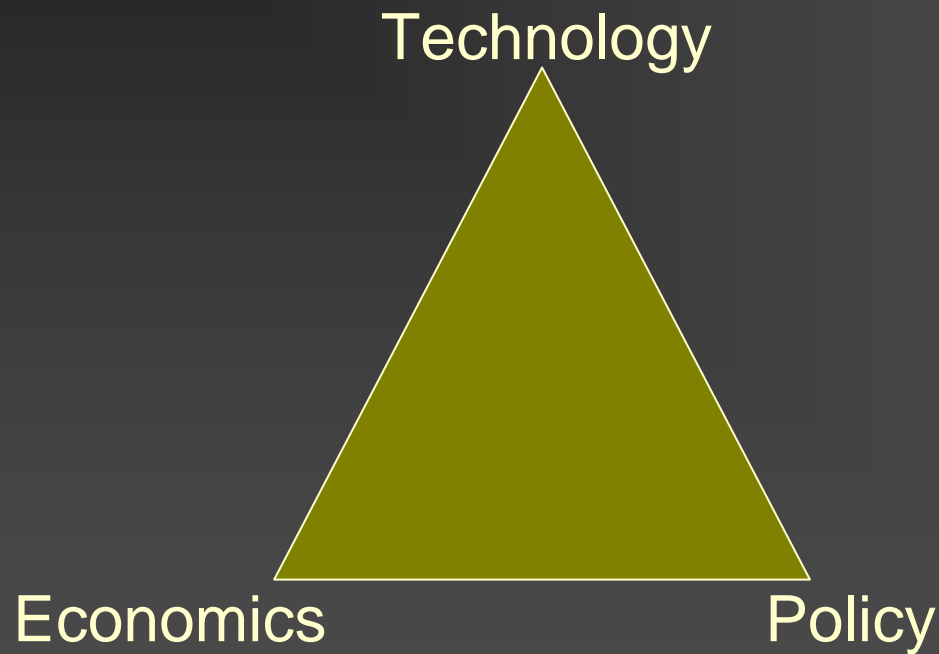
Economics

Policy

Talk Outline

Economics
    SARI

Technology
    Convivo

Policy
    Universal Access Provider

Talk Outline

Economics
     SARI

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SARI: Sustainable Access in Rural India

SARI aims to….

Demonstrate *economic self-sustainability* of the Internet and Internet-enabled systems and services.

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

SARI: Sustainable Access in Rural India

Hypothesis: The Internet is *POWER*

SARI: Sustainable Access in Rural India

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But need to do for the Internet what others have done for voice telephony, e.g. rigorous evidence of:

- micro- and macro-economics
- consumer surplus
- productivity gains
- earnings, wages, employment
- women's empowerment
- health and wellness
- education and literacy
- peace and security….

SARI: Sustainable Access in Rural India

SARI is a project of

- Me
- Ashok Jhunjhunwala
- Jayant Sinha
- Colin Maclay

- n-Logue Communications Pvt. Ltd.

WLL Village Tele-kiosks

- Provide Internet (via WLL/CorDECT), PC, and application suite (an Internet tele-kiosk) to villages - many that are off the phone grid

- Each village Internet tele-kiosk is locally owned and operated (franchise model)

Georgia Institute of Technology

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Pilot Project Scope

- Cover all the villages and small towns 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
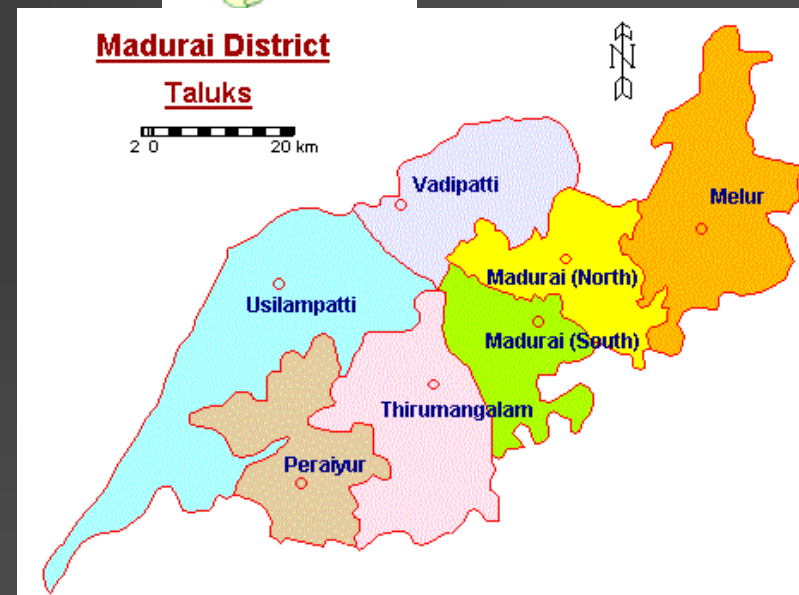
Pilot Status

- 80 connections in over 50 villages
- Average village size of 1,000 households; smallest is 300 households
- Will extend to over 200 villages
- Highest density of rural Internet kiosks connections anywhere
- In catchment area 23% of population has used the Internet (national average 1.5%, world 9%)
- Kiosks with local entrepreneurs as well as in government offices, schools, etc

Connected Villages

- 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
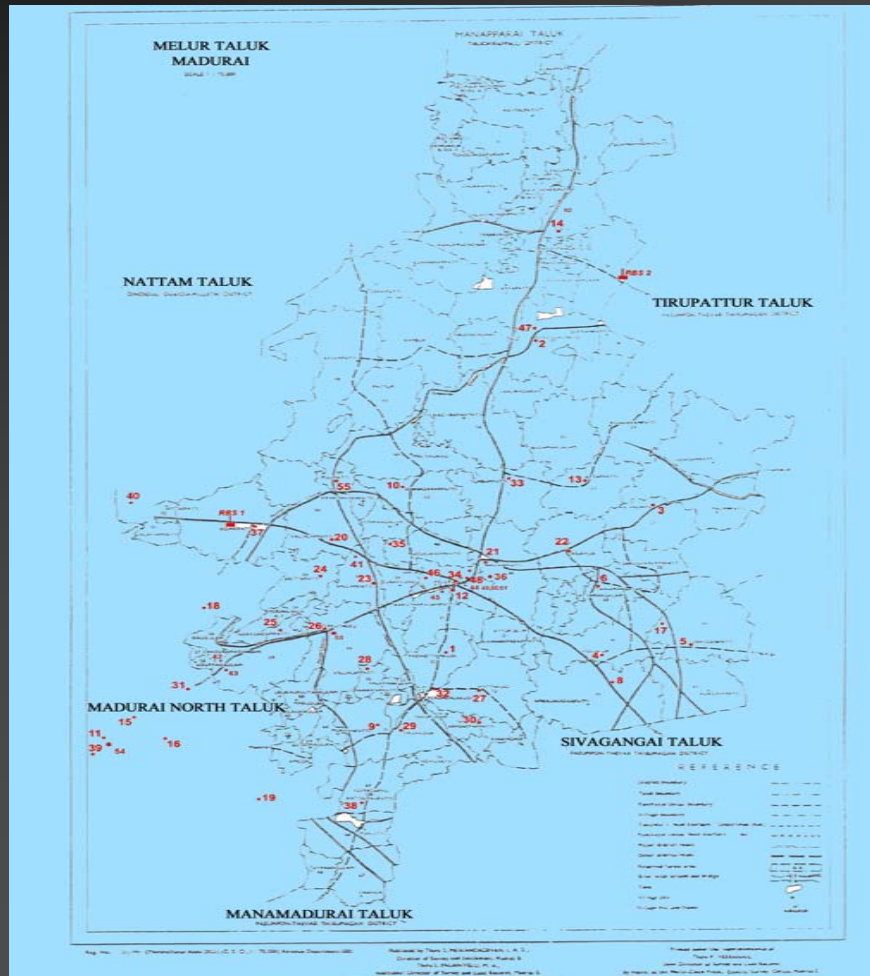
Current Research Inputs Include

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

Local 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)

Local Business Model

- Break-even revenue $2.70 per day

- Today average revenue $2.27 per day
- Average number visitors   25 per day

- Substantial under-reporting
  - We are using meter readings and monitoring software to help understand usage. (Average under-reported Internet usage at x13.)

Current Applications

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

- Cybercafe applications (e-mail, voicemail, chat)

- E-government services (caste, income, birth, death certification, pension schemes, complaints and petitions) Over 600 applications processed in 10 months.

- Entertainment applications (Tamil movies, astrology, games)

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

Current Applications

Kiosk Computer Usage Data : Enitre Melur Taluk - October 2002
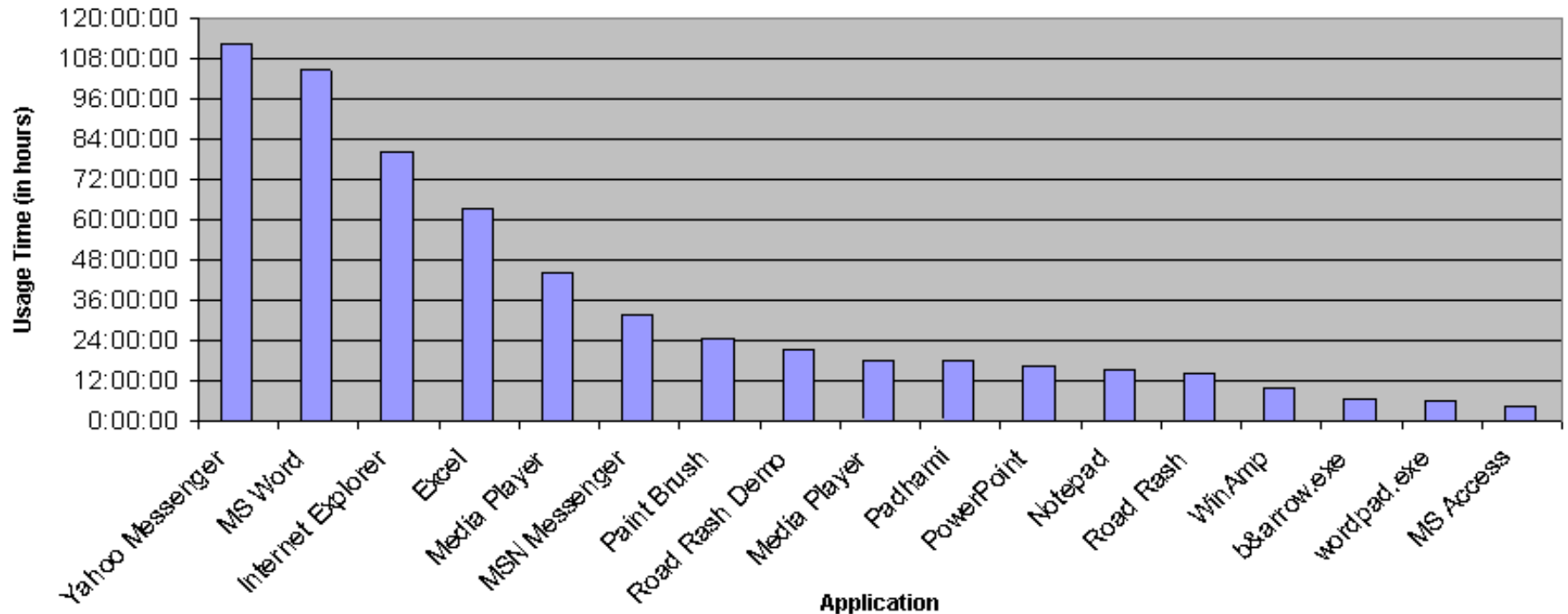
Tele-Agriculture Services

- 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

Scaling the Results

- Tamil Nadu's rural population density is 297 people per square kilometer

- Most of rural Tamil Nadu is within 50 kilometers of fiber backbone

- The quality of grid electricity in Madurai district is fair

- The physical terrain of the Madurai district is fairly favorable for terrestrial wireless systems

- Although these communities are poor (with individual incomes averaging below $1 per day) and agricultural based, high levels of awareness and sensitization to the value of ICT's helps to drive interest in Internet services
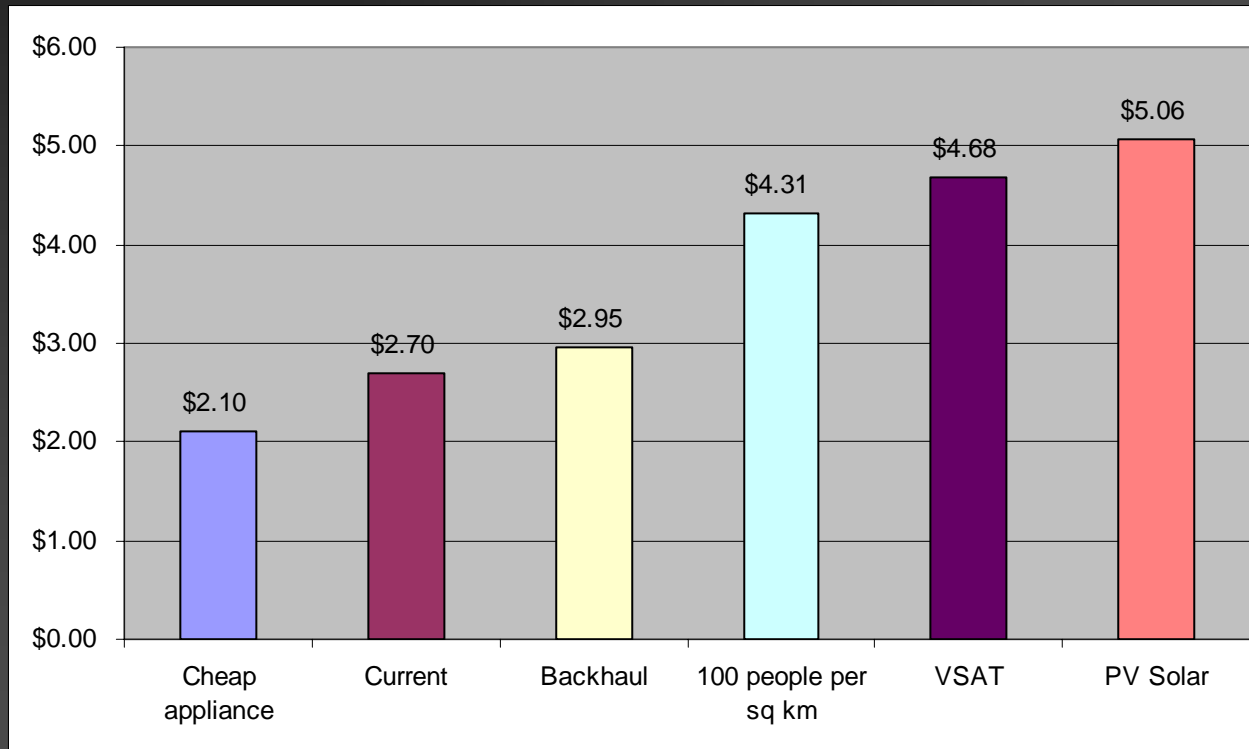
Scaling the Results

Recall current break-even point is $2.70 per day

- $300 Internet appliance $2.10
- 100 km Microwave backhaul   2.95
- Population density of 100 people per sq km   4.31
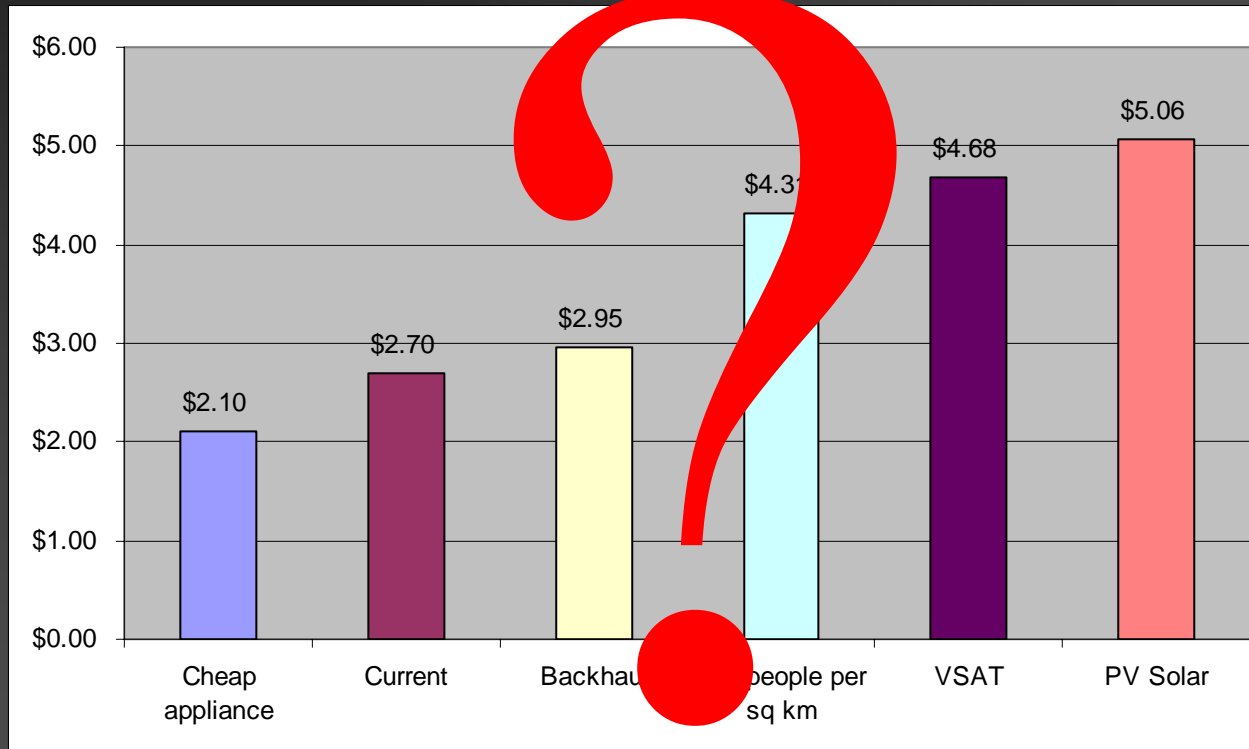- VSAT   4.68
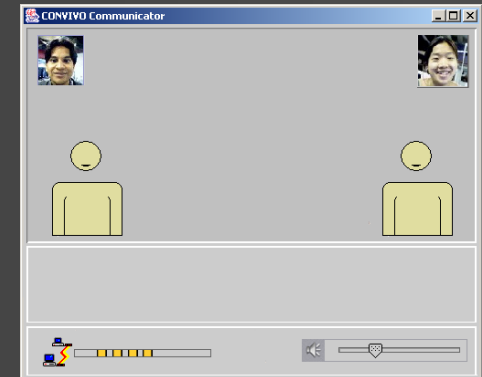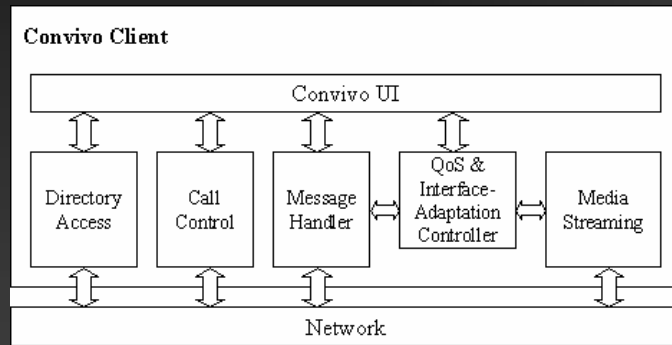- PV Solar Cells   5.06

Scaling the Results

A bar chart with the y-axis labeled in dollars from $0.00 to $6.00 and the x-axis showing categories:

Category	Value
Cheap appliance	$2.10
Current	$2.70
Backhaul	$2.95
100 people per sq km	$4.31
VSAT	$4.68
PV Solar	$5.06

Scaling the Results

	Value
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Talk Outline

Entrepreneurship
   SARI

Technology
   Convivo

Policy
   Universal Access Provider

Convivo: VoIP For Rural Networks

Convivo Client diagram: Convivo UI connected to Directory Access, Call Control, Message Handler, QoS & Interface-Adaptation Controller, Media Streaming, all connected to Network.

CONVIVO Communicator

Provides reliable voice communication for poor quality networks via an interface-adaptation mechanism that adjusts the user interface in order to reduce the impact of high latency and low bandwidth networks.
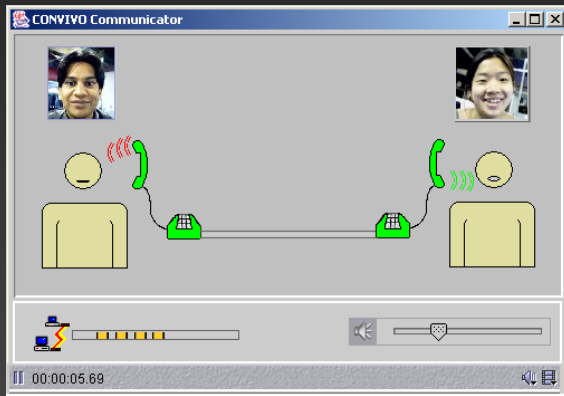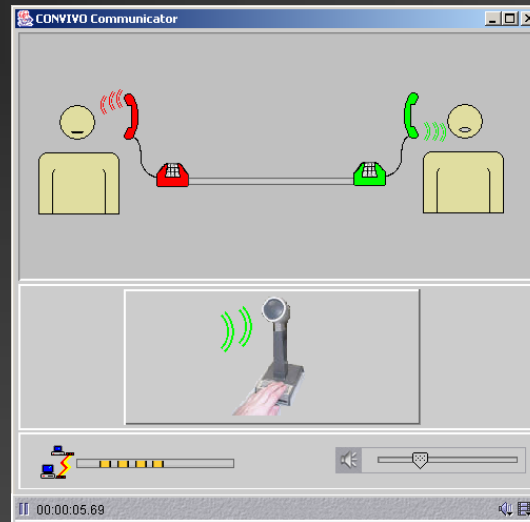
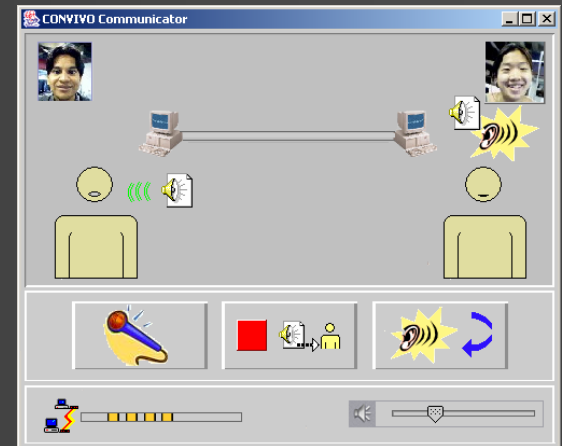(with M. Escobedo)

Interface-adaptation
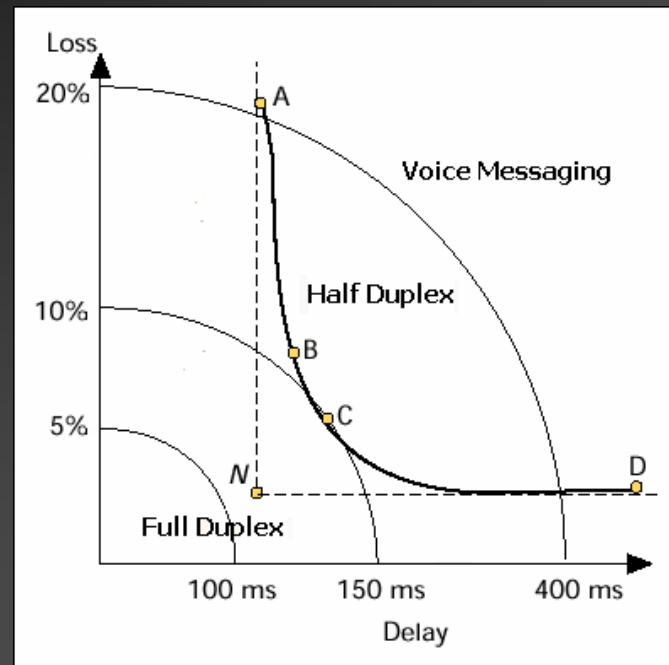
Interface-adaptation

full-duplex

half-duplex
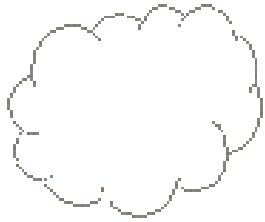
voice messaging

Bohechio, Dominican Republic

Village Area Network

Summary of User Results

Transition Mechanism	Satisfactory	Not Satisfactory	Neutral
	14	4	7
Transitions	Necessary	Not Necessary	Neutral
	11	3	9

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Universal Access

Universal Access is usually about extending
the base of *users* of ICT's…

Universal Access

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… but I am also looking at ways to extend the base of *providers*.

Universal Access Provider License

- Low entry barriers

- Support of diverse value-added services
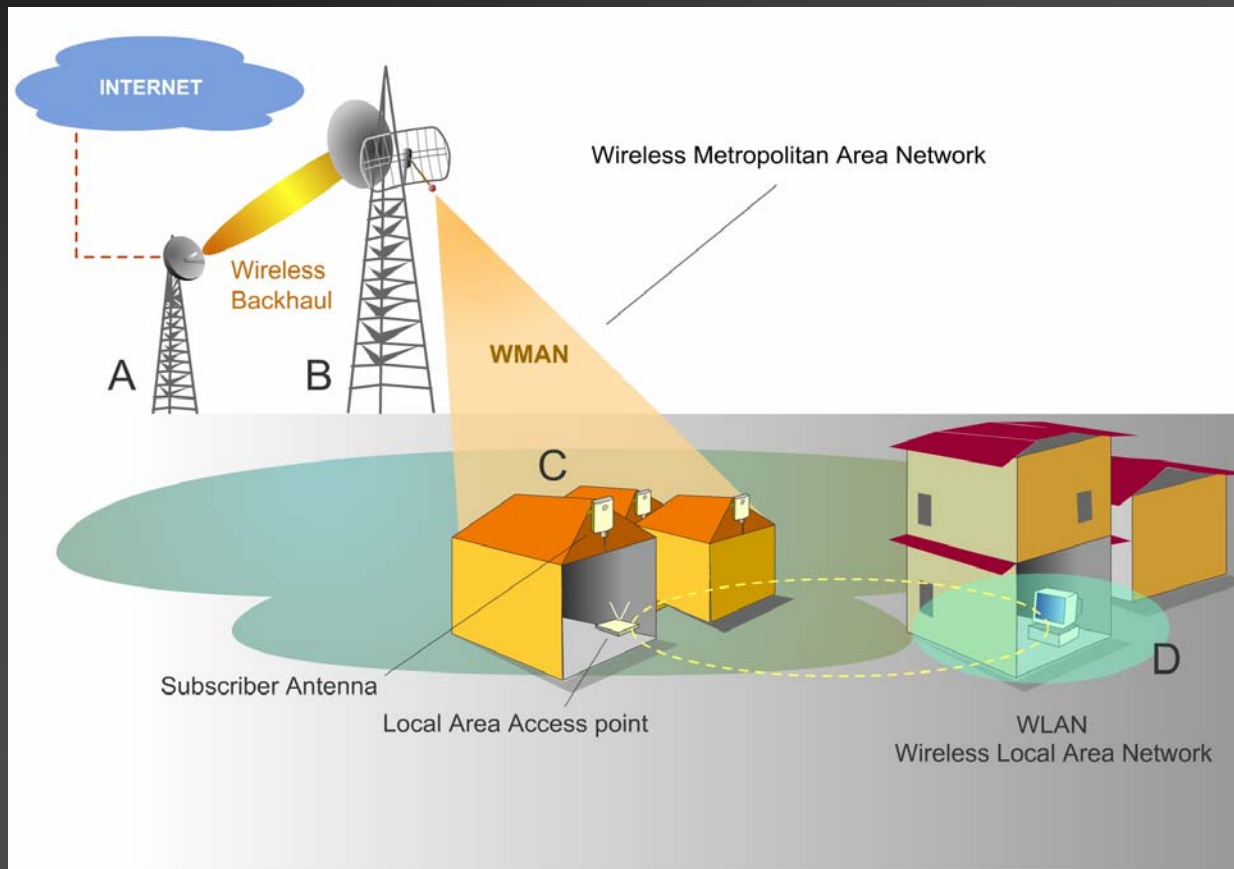
- Encouragement of micro- and small-business

(with ITU-D)

Low Entry Barriers

- License-exempt use of ISM (2.4 GHz) and U-NII (5 GHz) bands (and others!)

- Low or reduced operator licenses and performance guarantees

- Rationalized and reduced excise, sales tax, custom and import duties

The Wireless Revolution

License-exempt Radio Bands

Country	Position
Bahrain	No license required for Wi-Fi.
El Salvador	Free use as long as systems are within power and coverage limitations.
Ghana	All users of public frequencies are required to seek authorizations that are associated with fees.
India	De-licensed use of 2.4GHz for "indoor" use.
Ireland	License-exempt unless the operator intends to provide public telecom services, in which case they must apply for a General or Basic telecoms license.
Korea	A policy is in place but has yet to be implemented.
Lithuania	No authorization is required for WLANs used in certain frequency bands and under the usage conditions specified in the secondary legislation.
Malta	License required for fixed-wireless services.
Mauritius	Transmissions within a radius of 500 meters are license-exempt.
Togo	Approved for use by ISP's.
USA	ISM and U-NII bands are license-exempt.

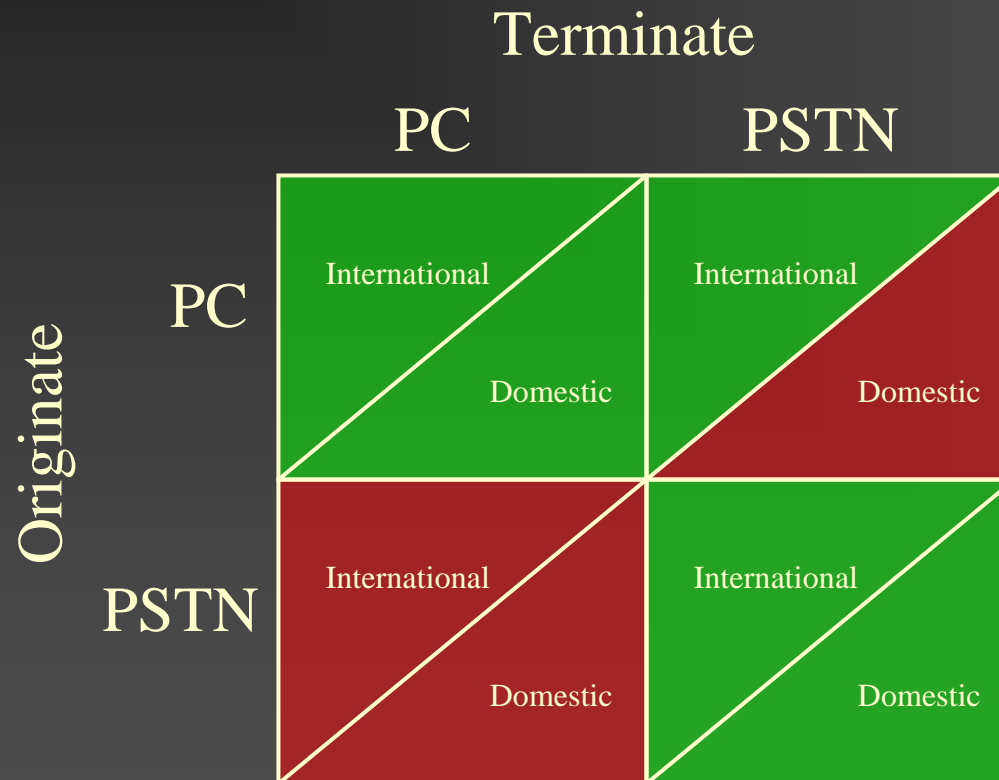# Diverse value-added services

- VoIP

- Public payphone

- Market set cost-based tariffs

VoIP in India

Micro- and Small-business

- Fair, transparent network inter-connection that may require asymmetrical termination charges

- No required network-build out levels

- Use universal service funds to support zero or low interest loans

Lessons from ICT4D

- 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

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Thank you!