ICT For Development
An Indian Perspective

Tapan S. Parikh
University of Washington
December 2004

What is *ICT for Development*?

- In the "ICT4D" terminology, **development** usually refers to social and economic development in poor, predominantly rural areas of the developing world
- **Information and Communication Technologies** (ICTs) may be a way for rural people to access a variety of useful services, leading to local economic opportunity and community development

A Chain of Problems In Rural India

- **Access to clean water –** Industrial pollution, use of chemical fertilizers and over-exploitation for agriculture has made clean water hard to find
- **Lack of education –** Lack of qualified teachers and incongruence of curriculum with rural life lead many to abandon formal schooling
- **Poor health conditions –** Tainted water coupled with un-balanced diet lead to problems which are not reached by modern medical services
- **Government inefficiency –** Lack of access leads to corruption and inefficiency and make government interface with rural areas impotent
- **Unsustainable use of natural resources –** Use of dangerous pesticides and over-harvesting has depleted farmland and other natural resources
- **Lack of economic opportunities –** Increased competitiveness of farming, depletion of farmland and lack of rainfall lead many to seek alternatives
- **Rural migration –** Lack of livelihood leads many to seek work in cities, where they work for peanuts and live in squalid conditions

What do we have to offer?

- For many of these things, absolutely nothing (in some cases "we" caused these problems)
- But information is an important resource
- After basic necessities are met, can we use information technology to empower a rural village?
- Could this be a model for "leapfrogging" intermediate stages of development?
- Could this lead to more sustainable means of providing rural livelihoods?
- Some people think so.

Talk Outline

- Present the major application areas in ICT4D
- Explore recent policies governing rural financial services in India, highlighting the exploding activity in microfinance
- Present CAM, our vision of a lightweight, flexible information services architecture for rural India
- Discuss how CAM could help reduce current inefficiencies in microfinance
- Discuss some other public policy issues
- Concluding thoughts

Rural ICT Applications

- E-governance and E-services
- ICT training and general education
- Health informatics and education
- Business services
- Communications
- Financial services

E-governance and E-services

- **Idea:** Allow rural people to access government and commercial services through *tele-centres or kiosks*
- Save rural people time and effort in accessing important services
- Make government interactions more equitable and transparent
- Provide local business opportunities through the kiosk / tele-centre franchise model

Case Study: Bhoomi

- **Location: Karnataka, India**
- **Proponent:** State of Karnataka
- **Concept:** State has computerized all land records, making them easier for farmers to access through public, manned pc kiosks
- **Comments:**
  - Reduction in corruption, fraud and delays
  - Big Win: Computerization made mandatory at district-level

ICT Training and Education

- **Idea:** Improve quality and reach of education using modern information technology
- Allow a wider segment of population access to education, particularly in places where teachers are scarce
- Improve the quality of education through communications and access to online resources
- Provide training in modern ICTs, increasing economic opportunities for rural people

Case Study: NIIT

- **Location: Across India**
- **Proponent:** NIIT Pvt. Ltd, New Delhi, India
- **Concept:** Leading ICT training provider in India. Operates in a franchisee model, proliferating deep into cities and towns
- Developed innovative "Hole-in-the-Wall" project, which proved urban slum kids can learn about computers with no formal training
- Currently working on K-12 education initiative with Intel

Health Informatics and Education

- **Idea:** Use information technology to collect accurate data about rural health and provide timely advice and intervention
- Improve rural health conditions through better hygiene, sanitation and health practices
- Save rural people time and money in accessing important medical services

Case Study: HIV Confidant

- **Location: South Africa**
- **Proponent:** Dimagi, Inc., Cambridge, MA
- **Concept:** Allow secure, confidential storage and distribution of HIV test results in rural areas using a handheld computer
- **Comments:**
  - Allows anonymous health surveillance
  - Secure, discreet result disclosure
  - Individuals can choose to request additional counselling on their test results and condition

Business Services

- **Idea:** Empower rural people's participation in the market by providing timely information and services
- Provide local market rates, allowing rural people to get the best price for their produce
- Create new channels for introducing products to rural areas
- Disseminate best practices, improving agricultural performance

Case Study: ITC's e-choupal

- **Location: Maharashtra, India**
- **Proponent:** Indian Tobacco Company, Hyderabad, India
- **Concept:** ITC-supported kiosks allow farmers to access market prices, order supplies and learn best practices
- Farmers can get the best prices for their products, cutting out middle-men
- ITC gets a direct supply channel, and a new way to sell its seed, fertilizer and other products

Case Study: Knownet-Grin

- **Location: Gujarat and Tamil Nadu**
- **Proponent:** Sristi / IIM-Ahmedabad, Gujarat, India
- **Concept:** Create a multi-media information network supporting grassroots "innovators"
- Link rural innovators to investors and entrepreneurs
- Build a support network for grassroots creativity
- Protect indigenous IPR

Communications

- **Idea:** Provide communications facilities in a variety of modes (phone, VoIP, chat, email, video, etc.)
- **Comments:**
  - Has been the driving factor in several recent technology adoptions (STD, cable, mobile, cyber-cafe)
  - Chat and email are increasingly popular among many classes in urban areas
  - Network externalities?

Financial Service Delivery

- **Idea:** Support the operation of rural microfinance institutions, by providing MIS support and lowering the cost of cash handling
- Allow microfinance institutions to better manage their money through accurate data collection and timely reports
- Lower the cost of cash handling through automated, electronic transactions

Emerging Models for Microfinance Service Delivery in Rural India

Tapan S. Parikh
University of Washington
December 2004

History of Microfinance

- **Microfinance**: provision of small-scale loans, savings and other financial services to the poor
- **1950s – 60s**: Microfinance begins as highly subsidized rural credit programs in rural areas, part of larger development projects
- **1970s – 1980s**: Spurred by the idea of ***solidarity group lending***, and two notable success stories (Bangladesh and Bolivia), microfinance repayment performance improves globally
- **1990s – present**: As estimates of global repayment rates hover around 95%, many microfinance institutions (MFIs) commercialize into for-profit companies or become "real" banks
- **2003**: Microcredit Summit campaign reports microfinancial services reach 41 million poor people worldwide (> 9 million in India)

Solidarity Group Lending

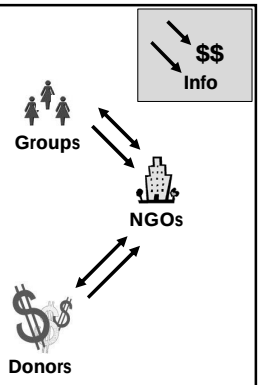
- No traditional collateral, only "social collateral"
- Repayment enforced by mutual liability, or peer-pressure
- *"If you don't pay back your loan, I can't get mine!"*
- Many varieties and operational models

"Flavours" of Microfinance

- **Grameen Model**: Pioneered by Grameen Bank in Bangladesh in the late 1970s, now extends world-wide through *grameen replicators.*
- **Village Banking**: Developed by John Hatch in Latin America in the mid-80s, focus is on forming independent *village banks.*
- **Self-Help Groups (SHGs)**: Savings-led approach pioneered by Myrada and PRADAN in India in the mid-80s. Similar to Village Banking, focus is on developing community-run Self-Help Groups.
- **ASCAs, ROSCAs, small Credit Unions, etc.:** Similar groups have been operating formally and informally around the world for hundreds of years.
- **Individual Lending:** Single client method (with or without collateral), suitable for larger loan amounts and more affluent clients. Currently in Eastern Europe and Latin America**.**

Traditional Model

- Non-governmental organizations (NGOs) provide microfinancial services as part of their social agenda
- Donors make grants to NGOs, which provide for loan capital and operational expenses
- Donors rarely expect repayments – focus was not on sustainability



Central Government Approach to Rural Financial Services in India (1969-1991)

- **1969** : 14 major private banks are nationalized
- **1977** : Central government institutes regulation requiring all banks wishing to open branches in "banked" locations, to open four other branches in "unbanked" locations
- **1969 – 1994**: Number of bank branches in India grows from 7000 to 60,000 (2/3 in rural areas)
- **1977 – 1990**: Economists give analytic proof that rural branch expansion program has a positive correlation with poverty alleviation...
- But surely at a HUGE cost (rural infrastructure, subsidies, bad loans, poorly developed financial instruments, corruption, inefficiency, etc.)

Microfinance in India (1980s - present)

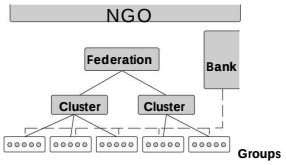
- **1980s - 1992**: Microfinance pursued largely by NGOs and social service organizations, based on "promoting" semi-indigenous SHG groups - early implementers of SHGs were MYRADA, Pradan, SEWA
- **1991**: Foreign exchange crisis in India, extensive economic reforms
- **1992 - present**: National Bank for Agriculture and Rural Development (NABARD), with support from RBI (Reserve Bank of India), commences SHG-Bank linkage program, where SHGs are directly linked to India's existing extensive rural bank network
- **2002 – present:** A number of NGOs themselves become commercial Micro-Finance Institutions (MFIs).
- **2001 – present:** Large private sector banks (most notably ICICI) entering the fray, financing both MFIs and SHGs directly. Several international banks and social venture funds are also interested.

Outline

- Discuss emerging trends in micro-finance
  - Commercialization
  - Competition
- Discuss existing gaps and inefficiencies
- Present technical approaches towards improving efficiency
- Present our work - a secure, lightweight information architecture for remote service delivery

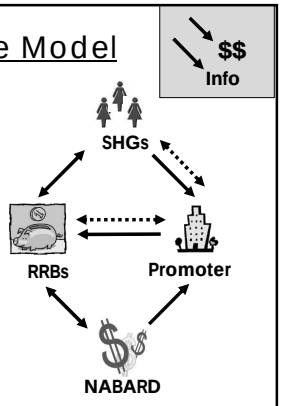
Self-Help Groups (SHGs)

- Semi-autonomous rotating savings groups
- Formed, trained and initially managed by some promoting agency (usually NGO)
- Members save fixed amount at regular meetings
- Capital lent to other members for some purpose
- SHGs can be federated into higher-level structures (clusters and federations)
- Each group has 15-30 members, with up to a 100 groups in Federation



SHG-Bank Linkage Model

- SHGs are *linked* to regional rural banks (RRBs), in some cases via promoter
- SHGs open savings accounts and receive loans
- NABARD refinances bank loans to SHGs at favourable interest rates
- Profitable for both RRB and NABARD (use SHG as retailer)
- NABARD provides limited assistance to "promoters"



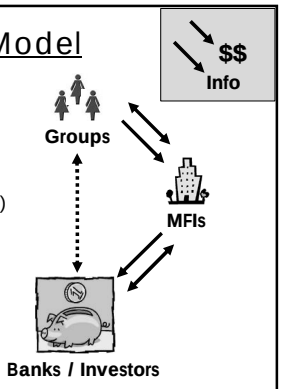
SHG Promoters

Govt (state, district, etc.)	52% (AP)
MFIs / NGOs	30%
Banks (RRBs, cooperatives, private)	17%
VVV (farmers clubs)	1%
Individuals	?
Federations	?
Self-promoted	?

Ideally SHGs will eventually become independent, but this is not always the case

Commercial MFI Model

- As microfinance proves profitable, NGOs spin-off or transition to commercial for-profits (MFIs)
- Registered as NBFC (Non-banking Financial Company)
- Receive loans and investments from donors, international banks and social venture funds
- In India, primarily Grameen replicators (but some promote SHGs also)



Grameen Methodology

- Organized into 5-member *groups*, with 5-6 groups in each village *centre*
- In first loan cycle, 2-3 members receive loans, which is entire group's responsibility for repaying (or others don't get loans)
- Rigid operational guidelines and institutional structure (filters down from Grameen Bank)
- Clear distinction between institution and client
- Much quicker to form than SHGs (institution-driven)
- Less emphasis on savings, local independence

Race to 300 million: Berkeley, Got a graph?

	SHG-Bank Linkage	*Commercial MFIs*
Outreach	> 8 million	< 1 million
Wholesaler	NABARD, Private Banks	Donors, Social Venture Funds, Private Banks
Distributer	Regional Rural Banks	MFI (via RRB)
Retailer	SHGs	MFI
Methodology	SHG	Grameen, SHG
Pros	· Government support · Existing physical infrastructure · 10 years and 10x head start · Local empowerment and independence · Savings first	· Dynamic, entrepenuerial management · International capacity inputs and financial support · Focus on efficiency · Focus on poverty alleviation
Cons	· Government / RRB inefficiency · Government agencies working at cross purposes · **SHG capacity**	· Lack of experience and capacity in managing financial operations · **Lack of rural delivery channel**

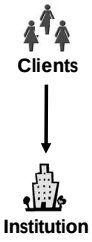
Key Questions

- What are the major current gaps and inefficiencies in microfinance service provision?
- Who will leverage existing strengths to deliver cheaper, more accessible services?
  - Both models currently growing exponentially
- Will commercial MFIs (and private banks) be able to develop inexpensive new service channels to cut out existing RRBs?
  - RRB branch or agricultural co-op exists within 5km of almost 99% of people (different the rest of world)
- What will happen to the social agenda???

Gaps and Inefficiencies

- The Client **Information** Gap
- The Institutional **Information** Gap
- The Rural **Money** Gap

The Client Information Gap

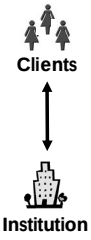


- Collection of information from clients often cited as an "information gap"
- Numerous experiments w/ PDAs, Palm Pilots
- In reality, *standardization* and *systemization* of data collection processes can address this issue
- Technology is usually <u>not</u> warranted
  - Data entry is cheap
  - Unfavourable cost / benefit ratio

The Institutional Information Gap

- MFIs and NGOs (and *especially* SHGs) lack the capacity and experience to manage financial operations
- Implementation of MIS is difficult and time-consuming
  - Lack of capacity
  - Lack of software and support
- Cannot effectively monitor portfolio and performance
- External reporting done on a *demand-driven* basis

The Rural MONEY Gap

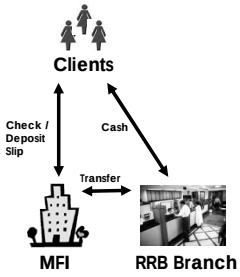


- Money is expensive to store and transport
  - Storage and handling
  - Transport
  - Security
  - Fraud
  - Cash inactivity

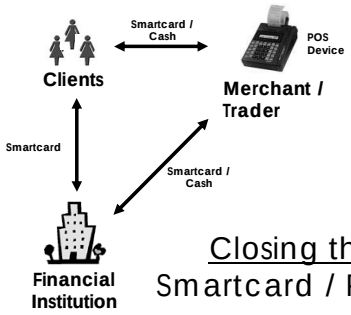
Traditional Cash Model

- Cash is most flexible medium for clients
- Cash delivered to doorstep best for clients
- But cash is **very** expensive to store and transport
  - Security
  - Idle time

A More "Efficient" Model?



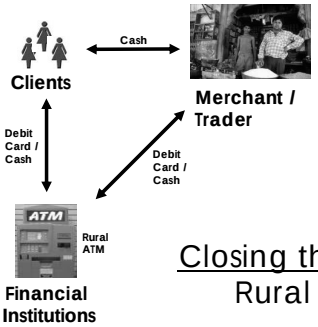
- MFIs "piggy-back" on existing infrastructure
- Clients travel to local RRB branch
- Local bank account used as a transfer point
- Shift risks / expense
- Unsustainable - physical infrastructure of branch must be supported



Closing the Loop: Smartcard / POS Device

Smartcard / POS Device

- Pilot-tested by
  - ICICI bank in Karnataka, India
  - Warana Sugar Co-op in Maharashtra, India
  - HP Rural Transaction System in Uganda (under development)
  - Various G2P, P2P and P2B efforts in Africa
- Main constraint has been cost of POS device and merchant acceptance
- Successful in closed-loop economies



Closing the Loop: Rural ATM

Rural ATM

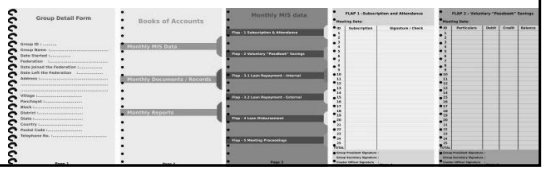
- Current initiatives
  - ICICI / IIT Madras in Tamil Nadu, India
  - Prodem in Bolivia
  - Widespread *urban* use in Africa
- Constraints
  - Cost of ATM Machine
  - Security / Identity verification
  - Power / Connectivity
  - Interface design for illiterate clients
  - Policy issues

Our Work

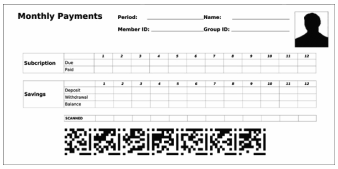
- Mahakalasm MIS
- CAM
- SHG-Notebook
- SHG-Checkbook

Mahakalasm MIS

- Working on MIS with SHG Federation in Pulvoikarai, southern Tamil Nadu
  - Specially designed ledgers for rural SHG members
  - Web-based software for accounting and loan tracking
  - Consistent colour-coding between ledgers and screens
  - Based on earlier work designing computer user interfaces for semi-literate users
  - How simple and intuitive can we make accounting?

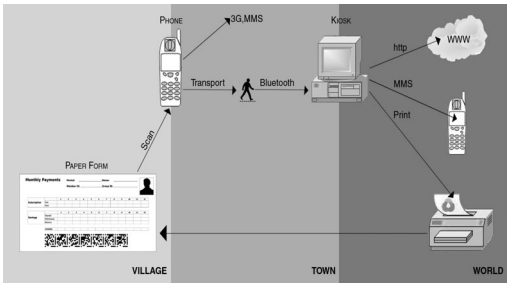


CAM: the Camera as Interface



- ***CamForms*** are documents containing embedded data and processing instructions
- ***CamBrowser*** is a mobile phone application that can interpret these documents
- ***CamShell*** is the embedded scripting language that ties the two together

CAM: Rural Information Services



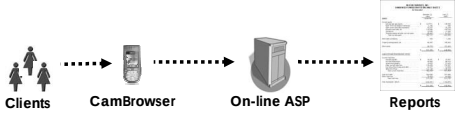
the appropriate information medium for every context

Potential CAM Applications

- Micro-finance
  - SHG-Notebook
  - SHG-Checkbook
- Others
  - E-voting
  - Health information
  - Communications
  - Other Services

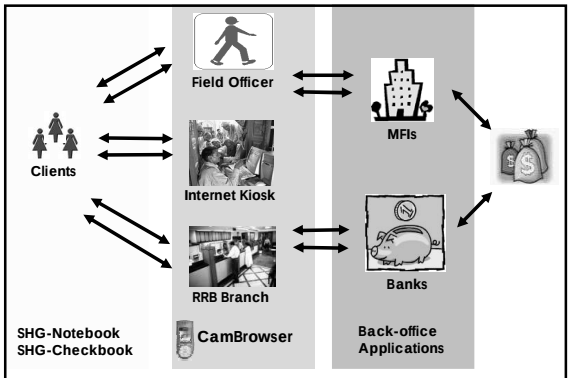
SHG-Notebook

- SHG-Notebook is an augmented notebook used to maintain SHG records
- Transcribed and uploaded to the server with the CamBrowser
- The group can request financial reports and account statements
- Service is provided through an on-line application service provider (ASP)
  - via a Cam-Browser enabled kiosk, or by
  - via a field officer who visits SHGs and collects data



SHG-Checkbook

- SHG-Checkbook is an electronic checkbook for SHGs
- SHGs can write checks to members, and use deposit slips to make payments
- CamBrowser allows real-time transaction processing and authorization
- Each check contains a digital security key ensuring it is used exactly once
- CAM-enabled ID cards for alternate security conditions



CAM Microfinance Architecture

Proposed CAM Benefits

- Secure, low-cost, mobile information architecture using mass-market hardware (mobile phones, pc's)
- General design allows leverage across diverse paper-based "applications" with same infrastructure - no special purpose software between server and form
- Paper, camera and audio-based interface proposed to be accessible and trust-worthy for rural users
- ***Bring the services to the people*** **-** Mobility allows service delivery where it is most convenient and affordable for end users

Partners

- Covenant Centre for Development: Madurai, India
- Mahakalasm SHG Federations: Madurai, India
- Community Enterprise Forum India (CEFI): New Delhi, India
- Medicinal Plant Portal (medplant.com): New Delhi, India
- **ekgaon** technologies: New Delhi, India

Current Status

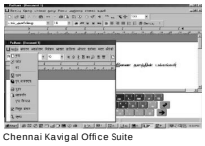
- Functional prototype developed
- January 2005: Initial usability trials
- August 2005: Field implementation
- Also working on
  - Other application concepts
  - Extending the functionality of the architecture

Public Policy Issues in ICT4D

- Local-language computing
- Open source
- Tele-centre / kiosk model
- Network infrastructure

Local-language Computing

- What is the role of government in supporting local-language computing?
  - Standards
  - Technology
  - Content



Chennai Kavigal Office Suite

Standards

- Indian language character encodings are still somewhat of a mess
- 18 official languages, and thousands of sub-languages and dialects
- Character encodings set by central government, which has historically had the only Unicode representation
- Leads to fragmentation between character encodings, font encodings, etc.
- Lack of standardization in input methods also

Standards: CDAC, Pune

- Set encoding standards for Indic-language software, and sold software for indic-language computing
- Conflict between public and commercial interests
- Resulted in a state monopoly which developed bad software
- Has seen the error of its ways, and is now publishing its research, encodings, and open-sourcing some of its software

Technology: TDIL and NCST

- Technology Development for Indian Languages (TDIL): Indian government funds machine translation, text to speech, OCR, and other research through a network of research centres and universities
- National Centre for Software Technology (NCST)
  - First fully functional renderer for Indic languages (Indix)
  - Worked with Microsoft on rendering and fonts
  - XP first MS version with Indic support (9 languages, + 2 more with SP2)

Content and Applications

- Besides the kinds of government services we have already discussed, there has not been as much work at a national level in providing local-language content and applications
- State-level and district-level provision of content varies greatly – lots of good examples, and lots of inactivity also

Open Source

- Open source has become a political issue in India
- **IndLinux**: A loose federation of state-level localization teams that have succeeded in producing indic-language versions of most of Gnome and KDE
- **Indic-computing**: An open resource site for issues related to indic processing, rendering, standardization and indic-computing in general
- **Simputer:** Simple Multi-lingual People's comPUTER - an experiment in open source hardware

Tele-centre / Kiosk model

- Create PC-based rural info-centres or kiosks, which act as a provider of various basic information services
- Internet browsing, chatting, printing, scanning, training, and other more specialized services
- Notable implementers:
  - Drishtee
  - Akshaya, Kerala
  - MSSRF, Tamil Nadu

Information Kiosk in Every Village?

- In July 2004 M.S. Swaminathan Research Foundation and One World South Asia launched an ambitious national alliance to extend the reach of ICTs to all 600,000 villages in India by 2007
- Does it make sense to invest so much in a country's IT infrastructure without a sound application base and economic justification?
- Is the PC the right mode of delivery? Some estimate that the cost of an info-centre exceeds a village's gross yearly output

Network infrastructure

- Various options in providing rural connectivity
  - WiLL
  - CDMA vs. GSM
  - 802.11 vs. 802.16
- This is as much a political / economic decision as it is a technical one
- How will each country decide to wire itself?

Problems Revisited

- Access to clean water
- Lack of education
- Poor health conditions
- Government inefficiency
- Unsustainable use of natural resources
- Lack of economic opportunities
- Rural migration

ICT4D: Hope, Hype or Hip?

- ICT4D is here to stay
  - Developing country governments have a right to be optimistic and ambitious
  - Technology companies have a vested interest in making it happen
- However, serious questions remain and must be addressed

Questions

- Top-down vs. Bottom-up
- To be successful in its stated goals, ICT4D has to be driven by demand from potential users
  - Which applications will rural people be able to access?
  - Which applications will they find germane to their lives?
  - Which applications will contribute to development, and which will merely be "consumed"?

More Questions

- What is the rural condition?
- What do people want? What do people need?
- How are rural areas changing? What is improving? What is not? What will be the future?
- Does the modern world have something to help rural people?
- Do rural people have something to help the world??

Our "Motivating" Ideas

- ***Communication is a two-way street -*** Communities are built upon underlying networks of person-to-person communication and interaction.
- ***Ownership is important -*** Communities stand to benefit from information services in a proportion roughly equal to the proportion they "own" the services they are using.
- ***Applications are even more important -*** Accessible, useful content and applications are the most important component in empowering people with information.

Case Study: Drishtee

- **Location: Several states in India**
- **Proponent:** Drishtee.com pvt. ltd., New Delhi, India
- **Concept:** Drishtee partners with local governments to develop web-based service portals. Access is provided through internet kiosks, owned and operated in a franchisee model, where Drishtee provides hardware, software and services.
- **Comments:**
  - Allows franchisees to share in economic benefits
  - Close coordination with local governments

Case Study: Schoolnet Africa

- **Location: across Africa**
- **Proponent:** Independent NGO network
- **Concept:** "support national schoolnets to enhance learning and teaching through the use of ICTs"
- **Comments:**
  - Improve cross-cultural learning through communications in the classroom
  - Provide access to novel learning tools and technologies

Case Study: Aravind Eye Hospital

- **Location: Madurai, Tamil Nadu, India**
- **Proponent:** Aravind Eye Hospital, Madurai, India
- **Concept:** Already famous for providing low-cost eye operations, Aravind is now using digital images and video to remotely diagnose rural patients
- **Comments:**
  - More cost-effective than conducting costly and time-consuming "eye camps"
  - Saves valuable doctor time
  - Save healthy patients an unnecessary trip

Case Study: SKS

- **Location: Andhra Pradesh**
- **Proponent:** SKS Microfinance, Hyderabad, India
- **Concept:** Used PDAs and smartcards to keep microfinance records in rural areas
- **Comments:**
  - Noted improvements in accuracy and efficiency of data collection
  - Time savings was not found to be worth the financial investment

Case Study: Rural ATM

- **Location: Tamil Nadu, India**
- **Proponent:** ICICI Bank and IIT-Madras, Chennai, India
- **Concept:** Low-cost ATM machine for rural areas, huge cost savings ($700 vs $15,000)
- Fingerprint authentication
- Connected with proprietary CorDECT WiLL solution
- Provide services without expensive branch infrastructure