Comparative study of “first mile” and “first inch” technology in different low density contexts.

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Overview

• Access in South Africa
• The Challenge
• The FMFI Philosophy
• FMFI Projects – Overview
• FMFI Projects – Technical
• Technical Development
• Challenges and Next Steps
• Conclusions
Access to ICTs in South Africa

- South African market $ 7 billion
- Unequal distribution
- Fixed lines @ 25 per 100 households
  - Benchmark 50 per 100 lower-middle income households internationally
- 19 m cell phones
- Poor broadband access
  - ITU 2003 comparative study for e-commerce
The Challenge

• How can rural communities overcome weaknesses in regulatory policy by implementing innovative, low-cost connectivity solutions in order to promote sustainable development?

• “…we have to ensure that as many of our people as possible master modern technologies and integrate them in their social activities, including education, delivery of services and economic activity. This relates in particular to communication and information technology.” (President Thabo Mbeki, SA National R&D Strategy, January 2002)

• “The AAllCT will undertake world-class, needs-based and applied research in ICTs, leading to development and innovation-for the-benefit-of the economy, to advance the quality of life of all South Africans and advancement of the region as a whole …”
The “first mile first inch” Philosophy

• A different mindset – put end-user first, empower communities, create new demand for ICTs
• The Indonesian example – Dr Onno Purbo
• Vision
  • “To have social and technical innovation on service delivery models in different contexts of communities with low-density telecommunications.”
Definitions: “first mile & first inch”
FMFI Projects & Partners

- Paradigm shift from traditional “last mile” & “last inch” thinking
- Nine project partners, Ten implementation sub-projects
- Implementation of innovative first mile technology solutions
- Research of social issues, the user interface and the context of the first inch
- Establishment of a network of regional researchers
FMFI Projects

- Assist the repatriation of displaced families and communities through the use of internet over VSAT and WiFi networks in war torn Huambo in Angola
- Equip tele-centres with voice mail boxes for voice and or pictures of loved ones for improving sustainability of telecentres in Maputo
- Connect rural teachers in Pemba and Chiure districts in Cabo Delgado Province to their tutors at the Catholic University of Mozambique, Pemba
- Improve communication between doctors, health workers and clinic sisters in the Eastern Cape and Mpumalanga provinces of South Africa
- Improve education in remote parts of Namibia by providing internet access to schools using WiFi technologies, refurbished PCs and open source software
- Use Human Language Technologies to create an authoring environment for a telephone-based information systems at tele-centres (Open Phone).
Indicators

- Changed behaviour in the use of ICTs – how the use of ICTs has changed community life
- Cost and benefits of solutions – to quantify what is meant by low cost connectivity
- Scalability and replicability of technologies – the viability of rolling out the solution
- Influence on policy and regulation – demonstration of project benefits to the regulator
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Tsilitwa project: Eastern Cape, SA
Rural Health Network Concept

Key Components:
- VSAT
- Bi-directional Links
- Shared BW

Network Nodes:
- Nessie Knight Hospital Cluster Base
- Kalankomo Clinic
- Clinic II
- Clinic I
- Health Centre Cluster Base
- DoH / UNITRA / Other
- Government Health Link

Communication Methods:
- Via Wireless (802.11b/g) or other First Mile Technology

Additional Notes:
- DoH / UNITRA / Other
- Government Health Link

Institutional Logos:
- meraka Institute
Applications

Tele-Consultation

Send site

Receive site

Tele-dermatology
Wireless Network Types

• “Hub-and-spoke” wireless systems connect users with line-of-sight antennas to a centrally-located broadcast tower. Clients who cannot see the hub from their building cannot join the network.

• Mesh wireless systems offer multiple points of connection to the network and no central tower. Mesh users can bypass obstacles like hills and trees by using different signal paths.
Mesh Networks

- Self-forming, self-healing and self-routing
- No large masts typical of a hub and spoke architecture
- Adding subscribers increases coverage and robustness
- Omni directional antennas simplify installation, maintenance and reconfiguration
Mpumalanga Mesh Network, Peables Valley, White River
What is PLC?

- Uses existing optical fibre and copper wire to provide telephone and internet connections to homes and businesses
- Makes it possible to communicate through the power outlets in each room of the home or business
ACCESS BPL

High Voltage
~ MVolts

Medium Voltage
~ 1kVolts to 40 kVolts

Low Voltage
~ 120/240 Volts

Power Generation Plant

Substation

Coupler

Backhaul Point (Gateway)

Coupler

LV Distribution Transformer

Power Line Interface Device Located In Home

Internet

Aggregation Point

BPL signals are extracted here & converted into/from traditional communication packets for appropriate communication direction

In some Access implementations, these physical links are replaced by wireless links
Technical Development
OpenPhone

- OpenPhone is an open source telephony based information dissemination environment.
- Address the significant African need related to the information empowerment of its people
- Human language technologies
- HCI research
- Social research
- Open source principles
Solution – Authoring tool

- An information provider can design an information dissemination application using the authoring tool.
- The prompts for the various phases will be recorded.
- The designer will be guided by the use of templates.
- Information users will access the designed solution by phoning a (toll-free/sponsored) number.
- Will listen to the voice prompts and interact with the system entering requested key presses (DTMF/touchtone).
Technology

- Mobile devices: GSM phones, multimedia/smart phones, Internet tablets
- Wireless networks: GSM, 3G, WLAN
- Voice, speech and language technologies: speech interfaces, audio information systems etc.
- Social software: Mediawiki, blogs, Knowledge Building tools.
Pilot 1: Cornwall Hill College

- The MobilEd platform was used to assist in a lesson re HIV/AIDS
- Students could get information via the MobilEd server and
- Contribute information back by adding voice clips with their contributions to existing articles.
Pilot 1: Cornwall Hill College
Stage 1

- A mobile audio wikipedia can be accessed by sending an SMS with a key word.

- The service calls back and plays the information, making use of text to speech conversion.
Learners could make their own audio castings on related topics.

This information is added to the audio wikipedia for other people to listen to.

This resulted in a wonderful and exciting learning experience and the opportunity to contribute to the knowledge society!
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Challenges and Next Steps

• Community ownership – “bottom-up” approach
• Understanding the benefits of technology
• Sustainability models
• More research in understanding the human/technology interface
• Scalability and replicability
• INFLUENCE
Conclusions

• Innovation is key to Africa
• Empowering regulatory policy
  • Health, education, community development
• Understand how people interact – not technology “push”
• The journey
• Publication 2006
Thank You

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