The Impact of ICT in Bridging the Digital Divide

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agenda

- Understanding the Complexity of the Digital Divide
- Applications Enabled by ICT to Bridge the Digital Divide
- Technologies that Bridge the Digital Divide
- Summary
Understanding the Complexity
OF THE DIGITAL DIVIDE
Bridging the Great Divide

Ignorance
Poverty
Exclusion
Marginalization

Knowledge
Prosperity
Inclusion
Globalization
Implementing Innovations

- To information: market price, weather, supply chain information, news that benefit producers (farmers, fishermen, others) and the supply chains
- To services (financial, credit, funds transfer, savings, registration services)
- To markets (e-commerce via portals, email, virtual communities)
- To public services for rural populations (health, education, government)

Inequality in Access
- Low-cost, affordable, reliable communications needs to be built in rural areas.
- Substantial innovation in technological and business models required
  - Entry Cost of Computers, Cost of Access
  - Government needs to incentivize the expansion of affordable access to rural areas through policy, regulatory and investment measures

Inequality in Costs
- All sectors of society should have equal and full access to ICT services, even by those with limited or no knowledge of computers or English.
- Availability of relevant content online
- Better Customization of Services
- Address user skill gaps to access the information, process content and interact through e-means.

Inequality in Utilization

The Digital Divide is the socio-economic gap between industrialized and less developed communities due to the deployment of digital technologies
The Widening Gap – Key ICT Indicators

Source: Pyramid Research, 2007
Indonesia ARPU one of the lowest globally

Low ARPU puts CAPEX pressures
A 1% increase in mobile penetration is correlated to a GDP per capita increase of US$240 while a 1% increase in Internet penetration is correlated with a GDP per capita increase of US$493.

• Qualcomm Wireless Reach Initiative, 2006

In developing countries a 10% increase in penetration leads to a 1.2% increase in the annual growth rate in GDP

• GSM Association Study of 57 developing nations, 2007

In India, a 10% increase in mobile penetration contribution to GDP is 1.4% and 6.5% of GDP for China

• The GSMA together with McKinsey’s Global Institute, 2006

A 1% increase in mobile penetration is associated with 0.5-0.6% increase in FDI as a proportion of GDP

• Frontier Economics
Implementing Innovations

BY ICT TO BRIDGE THE DIGITAL DIVIDE

Applications Enabled
**Addressing the DD with ICT Applications**

**Changing the Way we do Business**
- The level and pace of the exchange in assets have been dramatically boosted by the ability to connect individuals across markets at a negligible marginal cost.
- Transport & Logistics, e-transactions, access to relevant and timely industrial information (market price of crops, new farming or fishing techniques and systems)

**Nurturing Human Capital through Education and Lifelong Learning**
- Access to knowledge is essential for development
- Open Universities, Internet broadcasts, Distance Learning ensure cost effectiveness and minimum human resource requirements owing to the inherent economies of scale

**Better Healthcare for Citizens**
- Bringing greater healthcare capabilities to rural populations in a viable and affordable way.
- Distance Healthcare efforts are instrumental in alleviating poverty and improving the general well-being of people.
- Live consultations between remote clinics and key medical centers

**Early Warning & Better Preparedness to Support Rural Livelihoods**
- ICT has a role to play in limiting environmental degradation and natural disasters. In doing so they can contribute in limiting poverty and food insecurity.

**A Government that now Delivers**
- Reporting, Payment Processing and access to other government services
- Governments can become more efficient, responsive and accountable
E-learning

Nurturing Human Capital through Education and Lifelong Learning

Access to Information and the Internet
Distance Learning and Collaboration
Online Academic Testing

- Access to knowledge is essential for development
- Open Universities, Internet broadcasts, Distance Learning ensure cost effectiveness and minimum human resource requirements owing to the inherent economies of scale
Implementing Innovations

E-health

Remote Screening and Consultation

Online Recording of Patient Records

Better Healthcare for Citizens

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• Distance Healthcare efforts are instrumental in alleviating poverty and improving the general well-being of people.
• Live consultations between remote clinics and key medical centers

Access to Online Health Information

Veterinary Care
Telemedicine System for Community Healthcare

- **Objective:**
  - To develop, implement, install & conduct Puskesmas medical stations (Puskesmas = Community Health Centre = CHC) in the Bandung area as well as an internet-based Digital Healthcare Infrastructure (by linking Community Health Centres, Health Office, & Referral Hospital).
  - To enhance day-to-day Primary Community health-care delivery
  - To assist in decreasing the MMR (Maternal Mortality Rate) in Indonesia.

- **Sponsors:** APIP and APNIC
- **Timeframe:** end 2002 – mid 2004
- **Reach:** Bandung, Indonesia

- **Program:**
  - Deployment of healthcare systems for:
    - Medicine Data recording
    - Patient Data recording
    - Web-based community health education
  - Patients who live in rural areas could be given a routine check up by using mobile phone. Severely injured patients can be managed locally and have access to medical specialist accessed by wireless telemedicine,
  - The system provides a fast response to critical medical care in spite of geographic barriers.

- **Benefits:**
  - Day-to-day Primary Community health-care activities have shown significant improvements
  - Awareness on the use of PCs in CHCs, Health Offices and Referral Hospital have increased significantly
  - All the web-based information for the CHC can be accessed through the internet, and SMS
  - Development of Biometrics/Fingerprint Identification system for patients

- **Technology:** Fixed-wireless microwave LAN and PSTN dial up services
ICT has a role to play in limiting environmental degradation and natural disasters. In doing so they can contribute in limiting poverty and food insecurity.

Source: World Bank Seminar, June 07
Timely Weather Information can Mitigate Loss

Floods

- One hour of notice is estimated to reduce flood losses by 10%
- Damage reduction due to forecast improvements can range from a few percentage points to as much as 35% of average annual flood damages.

Severe weather and drought

- A good forecast can indicate need to re-configure irrigation, fill or empty the reservoirs, harvest or don’t harvest yet. Plant, or don’t plant yet. Spray, or don’t spray yet. Use the tractor, or don’t use it. Protect seedlings from frost and so on.

Source: World Bank Seminar, June 07
E-Government

A Government that now delivers

• Reporting, Payment Processing and access to other government services
• Governments can become more efficient, responsive and accountable
Implementing Innovations

E-Business

Changing the Way We Do Business

Access to Finance
Mobile Banking, Remittances, Credit

Online Technical Assistance

Relevant information, timely updates

• The level and pace of the exchange in assets have been dramatically boosted by the ability to connect individuals across markets at a negligible marginal cost.
• Transport & Logistics, e-transactions, access to relevant and timely industrial information (market price of crops, new farming or fishing techniques and systems)
Managing Risks for farmers

A video conference was conducted to connect a farmer to government agricultural experts to consult on crop disease.

In a Village in Madurai, the Lady’s Finger (Okra) crop was turning white.

The problem was sent to the experts at the Department of Rural Extension, Madurai Agricultural College and Research Centre who diagnosed it as “Yellow Mosaic disease”.

Source: A. Jhunjhunwala, World Bank Seminar, June 07
Impact of Mobile Phones on Fish Selling in Kerala

Fishermen calling in auction prices from off shore to pick best market to deliver to
Outcome: Wastage Minimized

Wastage down from 5-8% to 0%

Source: Dixie (attributed to Jensen), World Bank Seminar, June 07
Outcome: Efficient and Rational Markets

Price volatility down dramatically

Source: Dixie (attributed to Jensen), World Bank Seminar, June 07
The Enabling Environment to Stem the Digital Divide

Enabling Environment

- Government And Policy Framework
- Build Capability & Capacity
- Develop Infrastructure
- Generate Relevant Content

LEGAL
- Setting Complete Legal framework for e-gov, e-biz and digital exchange
- National Policy to promote ICT devt
- Comprehensive revision of public universities curricula to reflect a new ICT focus
- Standards for HW/SW

ECONOMIC
- General ICT literacy and language skills
- Promoting Awareness for ICT
- Develop technical training in the use of technology
- Subsidies for PCs and Terminals

INFRASTRUCTURE
- Develop telecoms networks and provide high quality access to communications that are:
  - Affordable
  - Secure
  - High Speed
  - Reliable

CONTENT
- Local Language
- Services adapted to Local Requirements

Consistent Collaboration across all Stakeholders is Vital
## Profile of Rural Users

<table>
<thead>
<tr>
<th>Rural Consumer</th>
<th>Equipment Requirement</th>
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<tbody>
<tr>
<td><strong>Traffic</strong></td>
<td></td>
</tr>
<tr>
<td>• Low Traffic</td>
<td>• Capable of Serving Wide Coverage Area</td>
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<tr>
<td><strong>Power</strong></td>
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<tr>
<td>• Poor Availability of Power Supply</td>
<td>• Cost efficient despite low traffic volume</td>
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<tr>
<td><strong>Cost</strong></td>
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<tr>
<td>• Cost of Provisioning triple Urban</td>
<td>• Low Power Consumption</td>
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<tr>
<td>• Consumers’ Ability to Pay is limited</td>
<td>• Must withstand power fluctuations</td>
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<tr>
<td><strong>Terrain</strong></td>
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<tr>
<td>• Special arrangements may be required: radio repeaters, special antennas, solar panels</td>
<td>• Must work without AC</td>
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<tr>
<td><strong>Technology</strong></td>
<td></td>
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<tr>
<td>• Limited Availability of Technology and Trained Manpower Locally</td>
<td>• Operable with Alternate Power (solar)</td>
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<tr>
<td>• Few Users are Digitally Literate</td>
<td>• Additional Equipment required must be cost effective to deploy and maintain</td>
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<tr>
<td></td>
<td>• Must suit local conditions</td>
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<td></td>
<td>• Provides service grade suitable to rural service</td>
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THAT BRIDGE THE DIGITAL DIVIDE
Recommended Options......

Ordyn research has determined that two technologies can best address the Digital Divide:

- WiMAX
- Broadband Over Powerline (or PLC)
WiMAX vs. ADSL vs. 3G

- Bandwidth
- Coverage
- Mobility
- Cost Effectiveness

WiMAX
ADSL
3G
Implementing Innovations

WiMAX

- QoS
- High Spectral Efficiency
- High Security
- Low Cost
- Open Standards
- All-IP Architecture
- Wide Coverage
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Moving Forward with WiMAX

- **802.16j**: Multi Hop Relay
- **802.16g**: Network Management
- **802.16e**: Fixed and Mobile
- **802.16d**: Fixed
- **802.16i**: Mobile MIB
- **802.16m**: 4G, Fixed and Mobile

802.16e with j enhancement improves the throughput up to 40%
WiMAX Network Architecture for Rural Deployment

IEEE 802.16j for Relay Stations for extending the coverage and capacity

Wireless backhaul for Base Stations
WiMAX: 802.16j Mobile Multi-Hop Relay

802.16J: Improving Capacity and extended coverage range without compromising backward compatibility with 802.16e
WiMAX Access

- Indoor/Outdoor SSs for each household
- Support for WiFi/Ethernet/Analog Telephone Interfaces for SS
- Triple play services
Recommended Options……

Ordyn research has determined that two technologies can best address the Digital Divide:

- **WiMAX**
- **Broadband Over Powerline** (or **PLC**)
Broadband Power Line (BPL)

A technology that uses the existing powerline infrastructure to bring broadband to the home
Implementing Innovations

Which technology can bridge the gap?

Wireless Technology

Rural or Sub-Urban Areas

Urban Area

Broadband Power Line
Drivers for BPL

- Existing Infrastructure
- Costs
- Rural Access
- Fiber Backbone
Comparison of BPL to DSL and cable

**Speeds**
- Speeds up to 45 Mbps shared among multiple homes.
- In practice, most customers see speeds in the 300-Kbps to 3-Mbps range.

**Symmetry**
- BPL’s uploading and downloading speeds are symmetric, unlike cable and DSL (excluding SDSL), which typically limit uploading speeds so that downloading speeds are faster.

**Shared Bandwidth**
- Like cable, BPL operates by sharing the broadband connection.
- Data that is carried over a medium-voltage Powerline will be routed to a low-voltage line that services approximately 5 to 10 houses in populated areas.

**Distance Sensitive**
- Like DSL, BPL speeds lose momentum over distance. A signal can usually be carried between 0.5 mile and 1 mile from the point of injection.
Comparison of Access Technology Capex

Source: Arthur D Little, 2002
Implications

- Appropriate technologies have been developed that effectively address the needs of emerging economies
- These technologies are available today
- A number of emerging market specialists who have a proven expertise in deploying cost-effective solutions have recently come into prominence.
What will it take?

- Develop **ICT Solutions** for the marginalized, isolated and disadvantaged communities which are:
  - Innovative
  - Affordable
  - Accessible
  - Sustainable (Technical and Social Aspects)

- **Empower** the poor, especially women and youth, through community access to ICTs and relevant content
  - Enhanced knowledge and skills in ICT = enhanced opportunities
  - Improved social standing
  - Better economic opportunities

- Participation of all Stakeholders Required (Government, Private Sector, ICT Industry, Local Communities)
Thank You