

## Computing and the Developing World

CSEP 590B, Spring 2008

Lecture 2 - Kiosks

Richard Anderson

## Administration

- Signup for the mailing list
  - [www.cs.washington.edu/csep590b](http://www.cs.washington.edu/csep590b)
  - [mailman.cs.washington.edu/mailman/listinfo/csep590b](mailto:mailman.cs.washington.edu@mailman/listinfo/csep590b)
- Reading assignment
- Homework assignment
  - Submit online, .doc (not .docx) or .pdf

## Today's class

- Rural Computer Kiosks
  - Make shared access computing available through subsidized computer centers
  - Long term sustainability through revenue generating applications
- Homework discussion
- Connectivity
- Kiosk Case Studies
- Technology Case Studies

## Highlights from Lecture 1

- Can information and computing technology address global challenges?
  - Health, Education, Livelihood
- Design subject to constraints
- Sustainability
  - Long term deployment model
- Scalability
  - Potential to impact large number of people

## Kiosks

- Small computer centers aimed at providing computing services/internet connectivity
- Shared access model
- Kiosk Entrepreneur
  - Business Owner with financial stake in project
- Social goals and business goals

## Key Questions

- Technology
  - HW, Software, Connectivity
- Applications
  - Suite of applications to generate use
- Deployment
  - Business Model
  - Explicit and Implicit Goals
  - Funding/Subsidies
  - Governance

## Access to Computing and Internet

- Viewed as public good
- People have advocated designating access to the internet as a “human right”
- Economic arguments
  - Digital Divide: those without access will be left behind
  - Access to internet/computing will lead to development

## Technology First

- Make technology available
  - People will find uses for it
- Positive examples
  - Cell Phones
  - Electricity
- Chicken and Egg problem
  - How to generate sufficient use of a technology to make it sustainable

## Homework Discussion

- Research the feasibility and cost of providing at least one Internet kiosk per every 10,000 citizens.
  - What are the technical requirements of an Internet Kiosk for your target country?
  - What contingencies or constraints do you need to plan for?
  - Provide an overview of cost estimates for the kiosk project. Include hardware, software, networking and maintenance costs.
  - What recommendation would you make to the funders of your project in terms of kiosks feasibility?

What were the main issues you addressed? Is your project viable?



Which applications would you expect to bring in the most revenue in your kiosks?



## Technology Questions

- Computing Hardware
- Internet Connection
- Electricity
- Physical site (security, environment)
- Maintenance

## Kiosk Computing Hardware/Software/Infrastructure

- Low cost PC
- Windows/Linux
  - Basic applications
- Protection from the environment
- Power
  - Grid, backup, UPS (uninterruptible power supply)

## Internet Connectivity

## Internet Usage Per Country (Users per 100, 2006)

Afghanistan		Ecuador	
Albania		Eritrea	
Algeria		Iceland	
Argentina		India	
Australia		Kenya	
Belarus		Kyrgyzstan	
Benin		Mali	
Botswana		Pakistan	
Burkina Faso		Rwanda	
Cambodia		South Africa	
China		Thailand	
Congo		Yemen	

## Internet Connection Challenges

- Problem One: Getting bits from here to there
- Problem Two: The companies involved
- Problem Three: The countries involved

## Bits

- Optical Fiber
  - Under sea
  - Under ground
- Wires
- Wireless
  - Short range
  - Long range
  - Directional
- Satellites

## Africa: SAT3 / EASSy



## Pakistan: Fiber Connectivity



What is the difference between an Internet Kiosk and a Cyber Café?

- 1.
- 2.
- 3.
- 4.

## World wide cyber café costs

Country	One Hour (local currency)	One Hour (USD)

## Kiosk Applications

- Sustain an internet kiosk by applications that customers will pay for
- Provide a social benefit

Identify three potential Kiosk applications  
Rate commercial potential and social benefit

Application	Commercial Potential	Social Benefit



## Commercial Potential

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

## Social Benefit

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

## Kiosk Case Studies

- Kiosk Kits
  - n-Logue
  - Drishtee
- Akshaya - Kerala
- e-Choupal - ITC
- LinkNet - Zambia

## n-Logue

- Kiosk Kit (rs. 53,500)
  - Wireless corDect connection
  - Branded PC with 15" monitor
  - Speakers, microphone, printer, etc.
  - Cabling
  - Application suite
  - 6 month internet subscription
- corDect
  - 35kbps internet
  - 10 km los connectivity
  - Originated from IIT-M

## Drishtee

- Drishtee
  - Rural services + Kiosks
  - Services
    - Computer Courses
    - English Proficiency
    - Agri-queries
    - E-Governance
    - Rural e-commerce
- Income
  - Sales 25%
  - Subscriptions 9%
  - Setup 40%
  - Contributions 26%
- Donations
  - Sponsor a kiosk \$1750
- Extending to support mobile business
  - [www.drishtee.com](http://www.drishtee.com)
  - [www.drishteehaat.com](http://www.drishteehaat.com)

## Akshaya Project



- Kerala
  - Strong emphasis on human development
  - First state in India to achieve “100% literacy”
  - Akshaya goal: “100% e-literacy”
  - Densely populated
  - Good infrastructure
- Malappuram District, Kerala
  - High rate of overseas workers
  - Poor district
  - Home district of the Information Technology Minister

## Akshaya Project

- Small computer centers – 5 computers per site
- 600 Centers set up
  - one per every thousand households
  - everyone with 3km of a computer center
- Wireless network
- Established to promote eLiteracy
  - Offered cd-rom based courses
  - Educate one member of every family
- [www.akshaya.net](http://www.akshaya.net)

## Setup

- Private / State partnership
- Entrepreneur
  - purchased equipment \$4500
  - ran center as a business
- State
  - design and branding
  - provide network connectivity
  - heavily subsidized e-literacy training (rs 100 out of rs 120)
  - facilitated loans

## eLiteracy

- Centers required to offer eLiteracy courses
  - 15 hours to teach about computers
  - Basic computing applications NOT covered
  - Target: one member of every household
  - Strong financial incentives
  - Approx. 80% of households reported to receive training
- After eLiteracy phase, centers were to be self sustaining (but with state provided internet)

## Evaluation

- After initial phase, approx 200 kiosks closed
- Expanding to other districts
  - Lower density (1/3000 vs 1/1000)
  - Increased beneficiary contribution
  - Broader mix of services
- Interview studies
  - Socially driven vs. Business driven entrepreneurs
  - Subsidized training brought in poor people – but did not keep them
  - Conflicting role of state and business

## Log results

Chat	17.99
Software	16.03
Downloads	
Portals	11.62
News	10.17
Spyware	8.78
Entertainment	8.31
Email	3.94
Search	3.57
Education	2.75
Government	2.26
General Information	2.03
Adult Content	1.81
Matrimonials	1.25
Job Search	0.74

Language Use:	
English	74.27%
Malayalam	10.49%
Portuguese	6.82%
Other/Unknown	8.42%

Language for news:	
Malayalam	96%
English	4%

Country hosting content	
United States	72.25%
India	6.70%
Sweden	4.92%
Brazil	3.06%
China	1.69%
Other/Unknown	11.38%

## Survey results

- Survey of general public about Akshaya
  - Since the goal of Akshaya was to reach entire population – general surveys were appropriate
- Has a member of your household taken the Akshaya course?
  - Survey results: 30% [8% - 50%]
  - Entrepreneurs figure: 80% [59% - 100%]
  - Discrepancy: 50% [23% - 81%]
- Majority of people introduced to computing by Akshaya would not have had access without it
- Median age 16 for course takers
- Low use rate of kiosks after course completion

## Online services



[www.akshaya.net](http://www.akshaya.net)

## e-Choupal



- Deployed by ITC-IBD (Indian Tobacco Company) Agri-business Division
- 5200 Kiosks in 6 Indian States
  - MP, AP, UP, Karnataka, Rajasthan, Maharashtra
- Support farmers growing soy beans, wheat, pulses, wheat, coffee
  - Price information
  - Set up transactions

## Optimizing Agriculture Supply

- Traditional Mandi System
  - Farmer carries crop to wholesale market
  - Negotiates Price
- eChoupal System
  - Farmer gets future price from Kiosk
  - Sends good directly to processing plant
- Advantages to farmer and ITC
  - Cut out the middle man
  - Arrange sale prior to transport

## Kiosks

- Established and capitalized by ITC
- Run by entrepreneur
- Customers not charged for computer services
- Business Model
  - ITC gains by more efficient supply
  - Farmers gain by setting up transactions
  - Entrepreneur gains from selling other services

## eChoupal Kiosk Costs

- |            |            |         |            |
|------------|------------|---------|------------|
| • Computer | 42,000 rs. | • VSAT  | 90,000 rs. |
| • Printer  | 7,000 rs.  | • UPS   | 8,000 rs.  |
| • UPS      | 8,000 rs.  | • Solar | 9,000 rs.  |
| • Solar    | 9,600 rs.  |         |            |
| • Other    | 12,500 rs. |         |            |

Total cost 186,000 rs. (4500 USD)  
VSAT 21,000 rs. per year  
Maintenance 12,000 rs. per year

## LinkNet: Zambia



- Donor supported "Proof-of-concept"
- GDP Per person:
  - Zambia \$1400 (198)
  - India \$2700 (165)
- Macha
  - Small town
  - Irregular power
  - Mission hospital / research institute
- Income
  - Subsistence Farming
  - \$1 per day
  - Bus to nearest town \$7

## Large scale kiosk

- Computer center
  - \$120,000 investment
  - Wireless LAN
  - VSAT
    - 1,024 kbs downlink, 256 kbs uplink
    - 512 kbs downlink, 128 kbs uplink
    - \$1700 per month
  - Trained local people
  - Challenges
    - Power
    - Environment
    - Network management
    - Billing

## Sustainability

- Selling services to hospital/research center
- Agriculture information
  - Case study on adoption of sun flower farming
- Pilot for village outsourcing
  - Data entry
- Telemedicine
  - Remote consultation
  - Reduction of isolation
  - Ordering medicine
- eMail

## How would you conduct a study to determine kiosk usage?

- Cost effective information to understand viability



## Kiosk Logging Studies

- MSRI: Rajesh Veeraraghavan
- What applications do Kiosk's really run?
- Methodology – software logging
  - VibeLog
- Details
  - Users identified if there is a 10 minute gap
  - Privacy/Security
    - GUID for identify of machine
    - Encrypted log files
    - Signs posted

## Study

- Seven kiosks in Uttar Pradesh
- Six kiosks in Maharashtra
- 120 days worth of data
- Much better power/internet for Maharashtra kiosks
- Substantial differences between survey data and logged data
- Use per day: UP 2.3 hrs, Mah 3.9 hrs

## Financial Viability

- Rs. 20-30 per hour, Rs. 10 per printout
- Revenue estimates from usage logs

4800 3500 1500 400 2100 7200 1400 2300 1300 1800 2400 1400

- Monthly operating costs, Rs. 3000-5000

## Usage

UP Applications		Mah. Applications		Mah. Browsing	
MS Office	17	Graphics	28	Newspapers	23
Graphics	19	Internet	26	Email	19
Photography	21	Explorer	18	Exam results	15
Explorer	43	MS Office	15	Adult content	13
		Photography	9	Misc	9
		Multimedia	4	Sports	7
				Search	5
				Music	4
				Jobsites	3
				Agriculture	2



## Kiosk Issues

## Success Cases [Kuriyan]

- Computer education centers
- Regular Internet Cafes
- Government Service Centers
- Photo shops

Conflict of Business/Social  
Development goals

Villager goals conflict with  
external goals

Kiosk Entrepreneur and  
Champion



## Traditional Crafts Marketing



- Is a “direct from the village” internet based traditional craft business viable? Why or why not.

Importance of full supply chain

Single service model

Transaction Cost Model

Demographic Attracted to  
Kiosks

Technology Case Studies

Sneaker Net

- What is the bandwidth of a single DVD carried between Africa and the US?



## DakNet

- MIT Media Lab, First Mile Solutions, United Villages
- Ideas
  - High latency connectivity sufficient for many applications
  - Vehicle based transport
    - Rely on regularly scheduled transport
  - Automatic wireless data transfer

## System model

- Vehicle has “Mobile Access Point”
- Kiosk has wireless access
- When vehicle in range of kiosk, data is exchanged
- Cost and power are low
- Leverage existing transportation routes

## Orissa Pilot, Busses

- Advantages of public busses
  
- Disadvantages of public busses

## Cambodia Pilot

- Internet connectivity for AAfc/JRF schools
  - 250 schools with computers
  - Pilot for 15 schools
- Motor scooters used to carry MAPs
- Costs
  - 15 schools with VSAT: USD 260,376
  - DakNet to share 1 VSAT: USD 39,979

## Design Problem: Minimum Cost Kiosk

- What is the minimum cost of setting up a Kiosk in \_\_\_\_\_ (your home town)?

## KioskNet

- S. Keshav, University of Waterloo
- Minimum cost kiosk
- Target: \$100 PC (aka recycled PC)
- Address
  - Low cost
  - Low power
  - Recycled PCs
  - Minimum maintenance
  - Connectivity

## Full system deployment

- Kiosks
  - Low cost computers with Kiosk Controller
- Ferries
  - Mechanical Backhaul
- Gateway
- Proxy
- Legacy Server

## Technical Challenges

- Implementation of Delay Tolerant Networks (DTN), Integration with services
- Security model, Public Key Infrastructure
- Support boot from Kiosk Controller
- Maintenance
  - Secure software update integrated with data ferry