Computing and the Developing World

CSEP 590B, Spring 2008
Lecture 4 – Internet, SMS
Richard Anderson, Umar Saif

Administration

- Classroom Presenter IP Address
  - 131.107.151.68
- Book review one due April 30
- Schedule Shuffled
  - Next week: Video Based Education
- Upcoming Guest Lecturers
  - Tapan Parikh, Neal Lesh
- Readings: Authentication
  - User: csep590b
  - Password: student

Highlights from Lecture 3

- Telehealth [Telemedicine]
  - Martinez et al.
    - Basic communication
      - High/ Low bandwidth, Sync and Async
  - Emergency notification, supply management, combating isolation, training, reports, consultation
- Long distance WiFi
  - 3Mbps, 20 km, LOS, isolated environment

Tonight

- Rural Networking (Umar)
  - Poor Man's Broadband
  - TEK Internet Search
  - Inverse Multiplexing of Cellular Connections
  - Teleputer
- Agricultural Markets (Richard)
  - Robert Jensen
- SMS Applications
  - Warana Unwired

Umar Saif

- Associate Professor of Computer Science and Engineering, LUMS, Lahore, Pakistan
- B.Sc, LUMS, PhD, Cambridge, PostDoc MIT
- Research: Ubiquitous Computing, OS, Distributed Systems, Networking
- Dritte.org

Where are these flags from?

Umar's Slides

Warana Unwired

- High profile kiosk project to support agriculture
- After 7 years, the project had only achieved a fraction of its goals and had very high maintenance cost
- Main application was replaced by a cell phone/sms application

Warana Sugar Cooperative

- At harvest, farmers send sugar cane to cooperative for processing
- Farmers receive reports of the amount of sugar cane processed by factory
- Before Kiosk Project
  - Farmers visit central processing office
- After Kiosk Project
  - Farmers visit kiosk office
  - Kiosk operator places request
  - After one or two days, farmer gets report

Warana: Cell Phone Solution

- Low cost mobile phone at the kiosk
- Smart phone running server at processing plant
  - Messages translated into DB query
    - "TON 123456 0807"
  - Answer sent back to calling phone
- Farmers would have kiosk operator place the text message
- Set up as experiment to evaluate cell phone against the PC

SMS Applications

Country   Country

Domain   Domain

Problem   Problem

Key ideas for SMS Applications

1.

2.

3.

Markets and Development

- The key for solving rural poverty is greater agricultural income
- Improved markets are necessary for increasing income

Market Price Info

- Agricultural wholesale markets can have large price swings during the day
- Transportation costs and perishability limit producer options
- Advance notice of price information
  - Decision which market to use
  - Decision whether to bring goods to market
  - Decision whether to harvest
- Is there any evidence that this information actually is of value?

Robert Jensen

- Study of wholesale prices of fish markets in Kerala
- Data covered the time period when cellular coverage was introduced
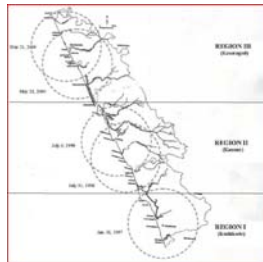
Main result
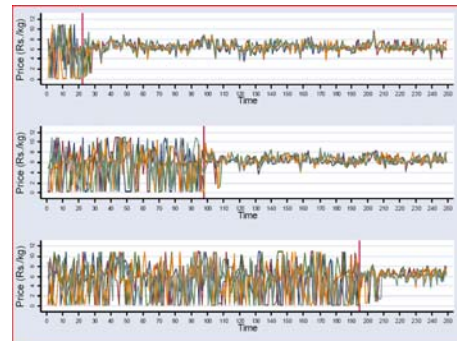
Importance of Agricultural Output Markets

- Significant portion of the worlds poor are in agriculture, fisheries, forestry
- Functioning of Markets important for well being of the poor
- Markets
  - coordinate dispersed consumers and producers
  - price coordinates allocation of goods
- Fundamental theorem of welfare economics
  - "Law of one price"

Information and Market Functioning

- Sigler, Economics of Information
  - Costly search for information leads to price dispersion
  - Especially if infrastructure is poor and markets are dispersed
- Without information, no reason to assume markets are efficient
  - Consumers, Producers, Intermediaries don't adjust to scarcity
- Price dispersion reflects inefficiency. Improved information might improve efficiency and help the poor.
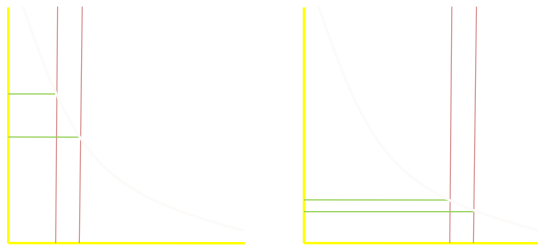
Information for Fishermen
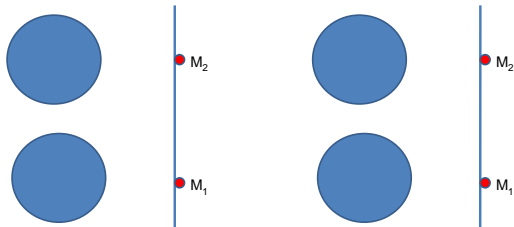
Welfare Economics

Mackerel Economics

Economics

- Welfare theory argues for a net gain for produces and consumers
- Gains depend on the shape of the curve
  - Price elasticities
- Reduction in waste potentially benefits both groups
- Impact of reduced price variability on consumers not clear

Study

- Beach Market Survey (N=15, 15 km apart)
  - Every Tuesday, 7-8 am, 1996-2001
  - All transactions
- Fisherman Survey (weekly, N=15*20)
- Fishing village survey (monthly, N = 15)
- Consumer price survey (weekly, N = 15)

Cell phone adoption

- Fishermen quickly adopted cell phones as they became available
- Fishermen would contact a large number of buyers while at see
- Other benefits of cell phones for fishermen documented by Abrahim (ICTD 2006)

Conclusions (Jensen)

- Poor information limits functioning of markets
- Information makes markets work, and markets help the poor
  - It's the I, not the T
- Fishing in Kerala probably not a special case
- This was not a development project
  - People figured it out on their own

SMS (Short Message Service)

- Protocol for text messages on GSM phones
  - 1120 bit messages
    - 160 7-bit, 140 8-bit, 70 16-bit characters

SMS Costs world wide

Country	SMS Cost, Local	SMS Cost USD
USA		$0.10
Pakistan	50 paisa	$0.008
India	10 paisa	$0.0025
China	0.15 yuan	$0.02
South Korea	10 won	$0.01
Namibia	0.40 NAD	$0.05
Bangladesh	1 taka	$0.015
Philippines	1 peso	$0.02
Cambodia	150 riel	$0.03
Bhutan	1 nu	$0.025
Botswana	0.40 pula	$0.06

Smart phone vs. Dumb Phone

- Should ICTD work target "Smart Phones" or "Dumb Phones".

- Why?

UW
MS
LUMS
Home

Warana Wired Village (1998)

- Case study of a failed kiosk project
- Very ambitious goals
- Funding split:
  - Central: 50%, State: 40%, 10% Cooperative
- 54 to 70 Village Kiosks
- Setup
  - Concrete building
  - PC (Pentium, Win95), UPS, Printer
  - Landline, 10 kbps connection

Planned applications

- Warana on Internet
- Database of farmer statistics
- GIS of 70 villages
- Local language interface
- Land record computerization
- Intranet site about crop pests
- Agricultural price info
- Personalized sugarcane information
- Internet connectivity

Warana Experiment

- Question: can the Kiosk functions be replaced by SMS.
- Method: have Kiosk operators use cell phones instead of the PC. Other operations remained the same.
- Issues:
  - Physical space: kiosks and computers left in place
  - Printouts: handwritten and stamped receipts given by kiosk operator
  - Security and privacy: not a worry for the farmers. Access restricted to registered phones

Warana Results: Cost Savings

- Compared to what?
  - Existing PC System
  - New PC System
  - Mobile SMS with Kiosk
  - Mobile SMS without Kiosk
  - GPRS with Kiosk
  - GPRS without Kiosk

Study results

- 7 village pilot
- Training of kiosk operators on SMS system
- Usage comparable to kiosk
- Query time: 2 minutes
- Favorable response from farmers
  - Requests to expand the pilot
  - Use from phones outside of kiosks

Other SMS based projects

Zambian National Farmers Union

- ZNFU
- http://www.farmprices.co.zm/prices.php

Market Price Queries

tradenet.biz

- Agricultural trading in West Africa
- Primarily web based, but supports sms notifications

www.dam.gov.bd

- Web portal with price information for agricultural commodities in Bangladesh

Why things fail literature

- Richard Heeks
  - Information systems and developing countries: Failure, Success, and Local Improvisation

Failures

- What percentage of startup companies fail?
- Leading cause of failure _____ _____

- What percentage of IT projects fail?
- Leading cause of failure _____ _____

Design-Actuality Gaps

- Components from the designers' own context
- Conceived assumptions about the situation of the user

- "Information systems per se have a tendency to be designed according to models of rationality"

Hard vs. Soft Models

Dimension	"Hard" rational design	"Soft" political actuality
Information	Standardized, formal, quantitative information	Contingent, informal, qualitative
Technology	Simple enabling mechanism	Complex, value-laden, status-symbol
Process	Stable, formal; outcomes as optimal solutions	Flexible, complex, constrained, informal
Objectives and values	Formal organizational objectives	Multiple, informal, personal objectives
Staffing and management	Staff viewed as rational beings	Staff viewed as political beings
Management systems and structures	Formal, objective processes	Informal, subjective processes
Other resources: time and money	Used to achieve organizational ends	Used to achieve personal ends

KACE: Kenya Agricultural Commodity Exchange

- Private sector firm collecting and distributing market information to smallholder farmers
- Market information to help small holder farmers
  - Reduce power of middleman
  - Marketplace arbitrage
- Exchange of goods through offers to buy and sell

KACE MIS

- Rural market based Market Information Points (MIPs)
- District-level Market Information Centers (MICs)
- Mobile Phone Short Messaging Service (SMS)
- Interactive Voice Response (IVR) service
- Internet based database system
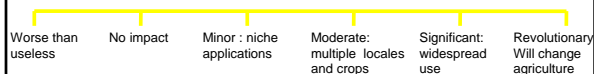- Mass media (radio)

Mobile Phone

- Branded service with Safaricom
  - 7 Ksh per message ($ 0.10)
- Simple SMS interface
- Prices updated daily
- Separate voicemail system
  - Pre-recorded in English and Kiswahili
  - Menu based
  - 20 Ksh

Status

- 2004 – 2 MICs, 11 MIPs
- Support from foundations
  - USAID, Rockefeller, etc.
  - Long term model – user fees, revenue sharing with phone companies
- Moderate SMS, and website use
  - End of study an upswing in Voice use
- Possible improvements in market conditions

Mobile phone based market information systems

- How important do you expect these to be?

| Worse than useless | No impact | Minor : niche applications | Moderate: multiple locales and crops | Significant: widespread use | Revolutionary Will change agriculture |

- Why?

Lecture summary

- Dealing with networking constraints
- Asynchronous web access
- Importance of Markets
  - Jensen, Sardine fishing in Kerala
- SMS based applications
  - Agricultural queries for sugar processing
- Other agricultural deployments unclear

- Research challenge – expand reach of networking
  - Internet and Cellular