

Technologies for Communities: *Managing Information from the Grassroots*



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The Rural Developing World

4.8B people live in developing countries (many in rural areas)

Rural developing world people have many information needs

- Manage finances
- Learn about business opportunities
- Access government services
- Access medical guidance
- Communicate with customers or suppliers

However, they also have constraints

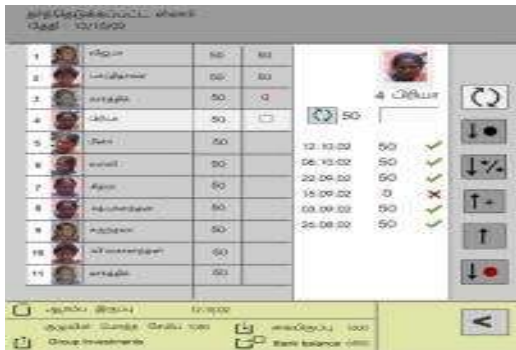
- Purchasing power
- Infrastructure (power, network, shelter)
- Education and literacy



Projects



Knownet-Grin
knowledge network for grassroots innovators



Hisaab
interfaces for semi-literate users



CAM Framework
paper programming for mobile phones

Knownet-Grin

Knowledge Network for Grassroot Innovators: A Honey Bee Project

- Honey Bee Network shares local knowledge and grassroots innovation
- Publishes regional magazines
 - agricultural practices and other innovations
- Interested in finding new ways to share content and facilitate multi-stakeholder communication
- Visual Basic app with multi-media distributed database with asynchronous updates and messaging
- Implemented at kiosks in Gujarat, Madhya Pradesh, Maharashtra and Tamil Nadu



8 Rules for Rural Computing

- Easy to Use: Deal with all classes of novice users
- Easy to Teach: Conveyed by *word of mouth*
- Easy to Distribute: Remotely, and person-to-person
- Easy to Share: Individuals can't afford devices
- Easy to Develop: Allow local content and applications
- Flexible: Language, culture, infrastructure varies
- Trusted: By both users and *non-users*
- Serving a Need: Technology is a big investment



SHGs: Microfinance Groups

- Self-Help Groups* are member-owned *microfinance* groups
- 12-20 members, over 1m SHGs in India (90% women)
 - Members from poor, disadvantaged classes
 - Save money during meetings, make small loans for starting a business, buying livestock, education, etc.
 - Repayment based on peer pressure
 - Similar groups exist worldwide – Grameen, Village Banking, Credit Unions, ROSCAs, etc.



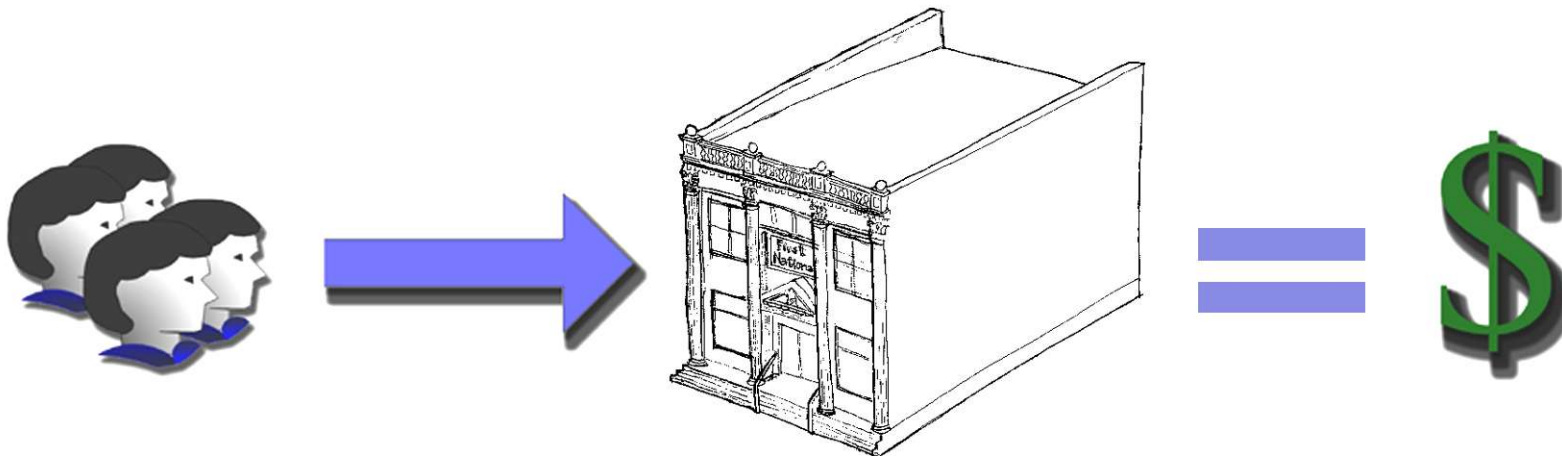
Scaling Microfinance in India

Banks would love to work with SHGs

- Demand for capital exceeds supply
- Excellent performance (90-98% repayment)
- Fulfill social (and regulatory) objectives

However, there are many obstacles

- Members have little or no education
- Many practices are inconsistent
- Groups spread across remote rural areas
- Expensive to collect information and money



Hisaab: Problem Statement

Information systems are key to scaling microfinance

- Transaction processing
- Monitor members and groups
- Analyse performance and impact
- Link to formal institutions

Can we design a UI allowing SHG members to document their own transactions?

- Accessible to semi-literate and illiterate users
- Accurate and efficient



context study



paper prototype



wizard of oz

தர்ந்தெடுக்கப்பட்ட ஏனாள்
தேதி : 12/10/02

1		விஜயா	50	50			
2		பாண்டிசாமி	50	50			
3		சாந்திதா	50	0			
4		பிரியா	50	<input type="checkbox"/>	50		
5		பீமா	50		12.10.02	50	✓
6		வாலி	50		05.10.02	50	✓
7		சிபுர்	50		22.09.02	50	✓
8		சுப்பிரமணியன்					
9		சுந்தரா					

4 பிரியா

final artifact

Hisaab: Design Observations

Parikh, Ghosh, Chavan et al. - CHI 2003, CUU 2003 (Best Paper)

Importance of Paper

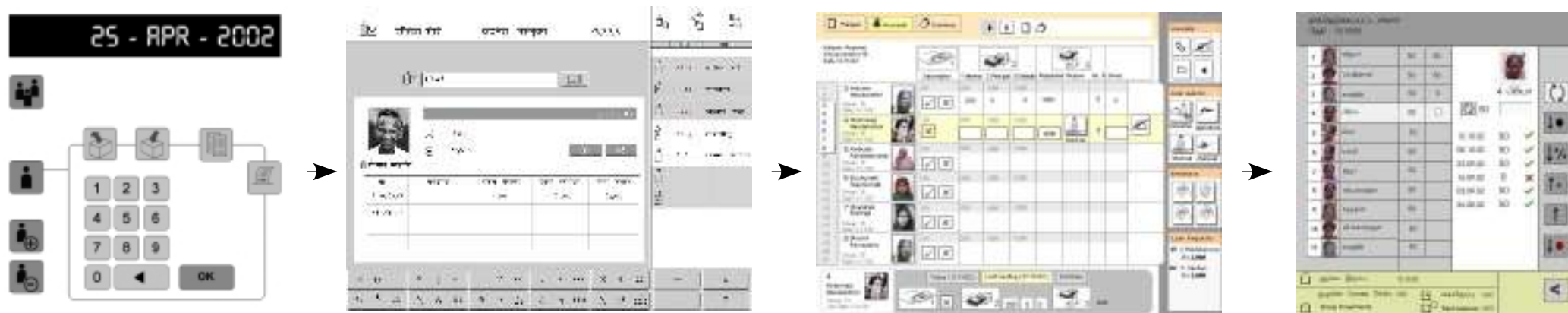
- Ubiquitous in existing work practice
- Understanding tied to current tabular formats

Numeric Input / Output

- Calculators are commonly used
- Even semi-literate users can input numbers
- Avoids local language input

Audio Output

- Local language audio great for rapport
- Accessible to semi-literate and illiterate users



Hisaab: Limitations

Scalability

- PCs and Laptops are too expensive
- Affordable if shared by many groups
- Infrastructure - power, network, shelter
- Must be kept at a central place
- Excessive travel and inconvenience

Accessibility

- Users developed understanding of the system
- But can't provide efficiency or accuracy



The Next Step: Mobile Phones



Mobile phones are an attractive alternative

- Exponential growth in Africa and Asia
- Numeric Keypad, Audio, Network

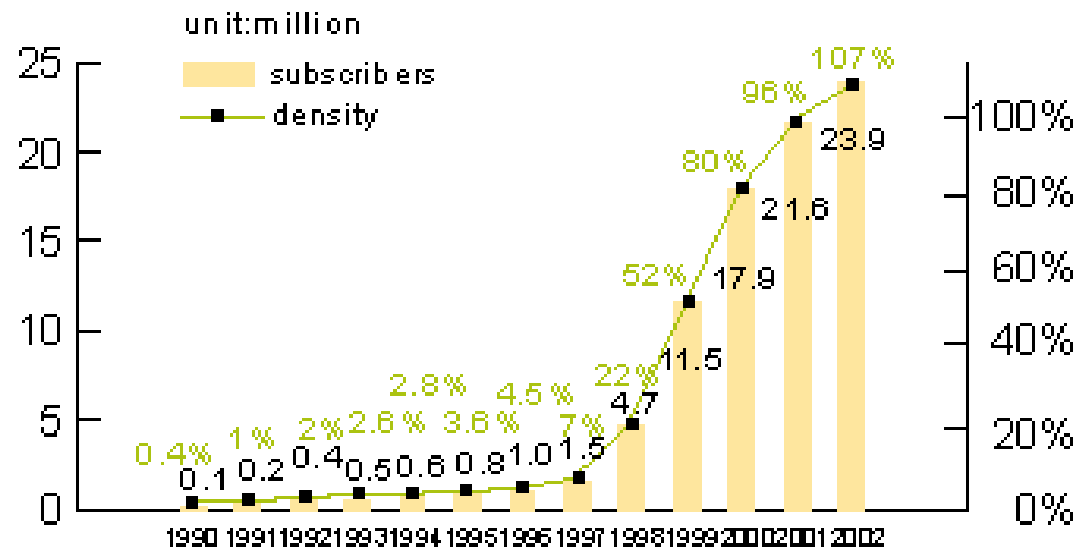
Mobile device supports *Agent Model*

- Travelling agents collect money and data
- Common motif for many rural services
- Most convenient for members / clients

Mobile UIs are hard to use - Can we develop a suitable UI?



The Economist, Mar 10, 2005

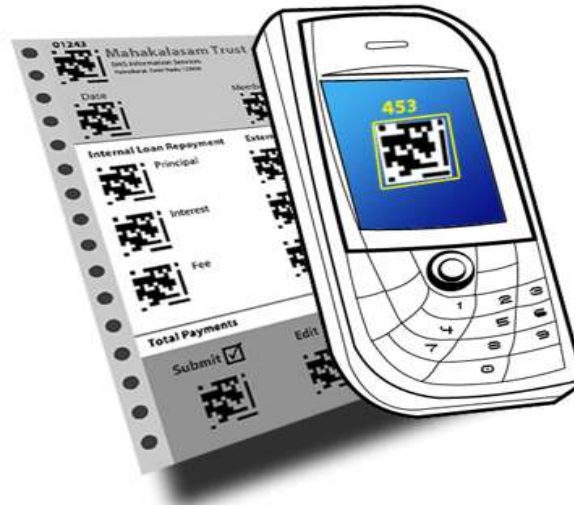


CAM: Paper Programming for Mobile Phones

Parikh et al. - IEEE Pervasive 2005, CHI 2006, WWW 2006

CAMForms interactive forms

(452) 5552589-101 Record ID _____	
Loan Application Mahakalasm SHG Trust 7	
1 Date _____	3 Loan Amount _____
2 Account No. _____	4 Installments _____
5 Loan Purpose _____ _____	6 Submit
STAFF USE ONLY	
8 <u>Approved?</u> Yes / No	9 <u>Comment</u> _____ _____



CAMBrowser
mobile phone app
to process forms

```
<function name="a_click">
  d = input_date("Date", "date.wav");
  i = input_int("Interest", "int.wav");
  p = input_int("Principal", "pri.wav");
  if (d & p & i)
    http_put("...");
</function>
```

CAMScript
scripting language
for form interaction

CAM: System Features

Navigation

- Barcodes and printed numeric strings used to access records and functions



Content

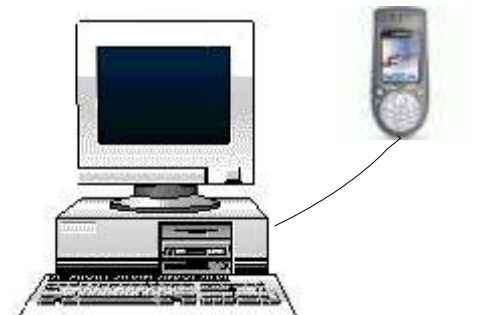
- XML scripting language
- API for accessing phone features
- Multimedia – play and record



```
<function name="a_click">
  date = input_date("Enter Date" "date.wav");
  amt = input_int("Enter Amount", "amount.wav");
  message_note("Say your name", "sayname.wav");
  record_audio("name.wav");
  if (amt != 0)
    email("tap2k@yahoo.com", "a="#amt, "name.wav");
</function>
```

Networking

- Synchronous - HTTP
- Asynchronous - SMS, MMS, E-mail



Usability Testing

Task: Record transactions during SHG meeting

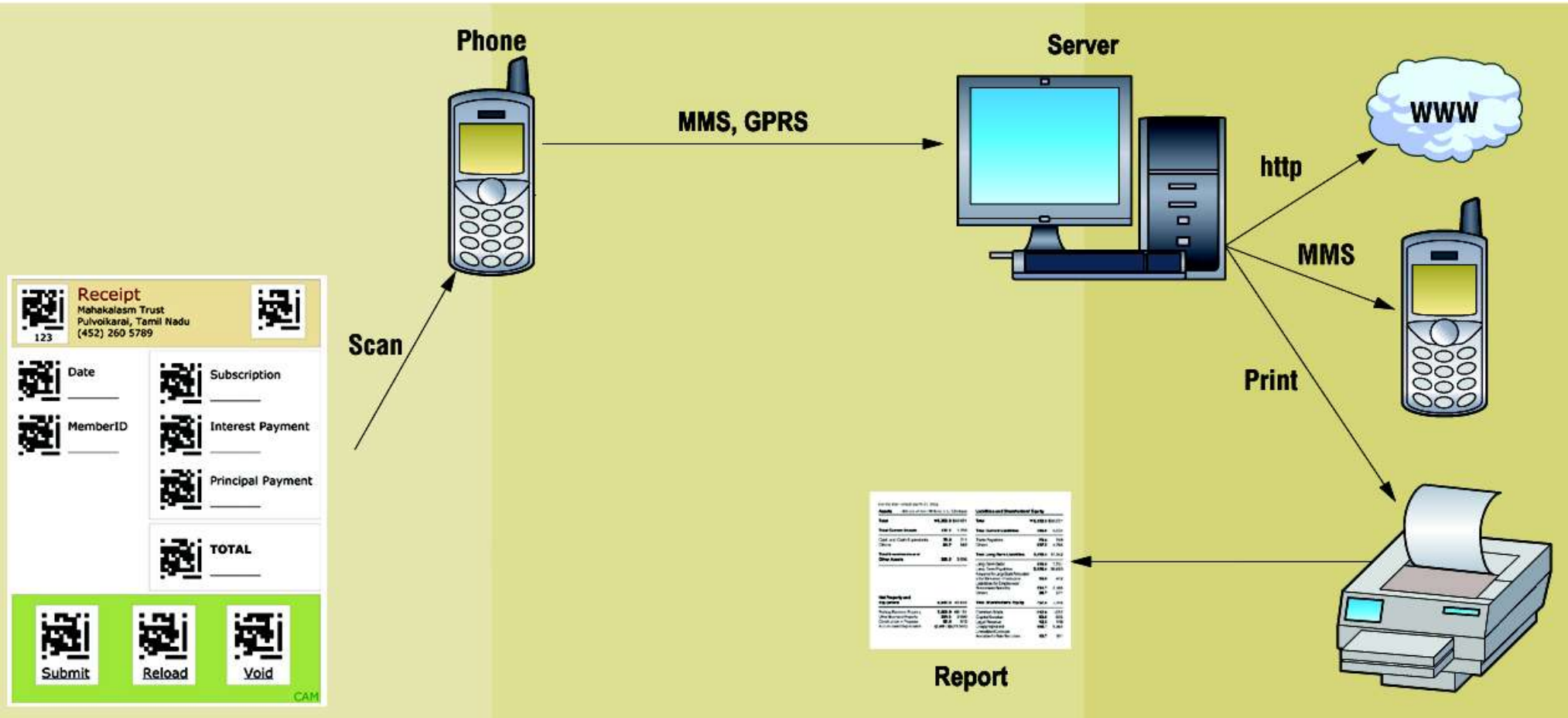
- 'Laboratory' and in-situ testing
- Using barcode navigation
- Users: 14 NGO field staff from villages
- Literate - 7th grade to college education

Results: Mobile phones are a usable solution

- Learned system within 3 days
- Avg 30 secs per form, 8-10 mins per meeting
- Less than 1% error rate
- All users described interface as *very easy* or *easy*

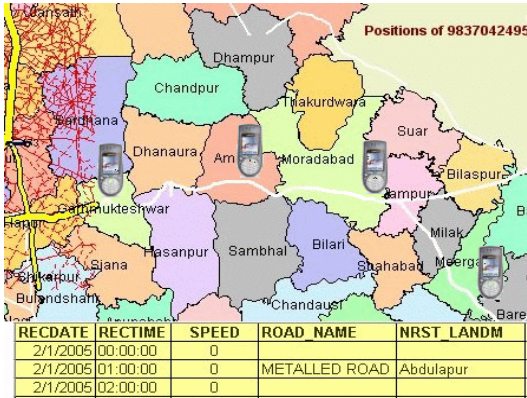


SHG MIS using CAM



- Pilot planned with 24 staff / 400 SHGs / 6000 members
- Reports will be provided to NGO and banks
- Many other NGOs and MFIs are interested

More Applications



Supply Chain Javid and Parikh - ICTD 2006

- Track distribution of products
- Manage inventory at rural warehouses
- Integrated with GSM / GPS tracking



Rural Cash Register

- Cash Register + Scanner + POS
- Track sales and inventory
- Linked to credit, accounting



Health Monitoring

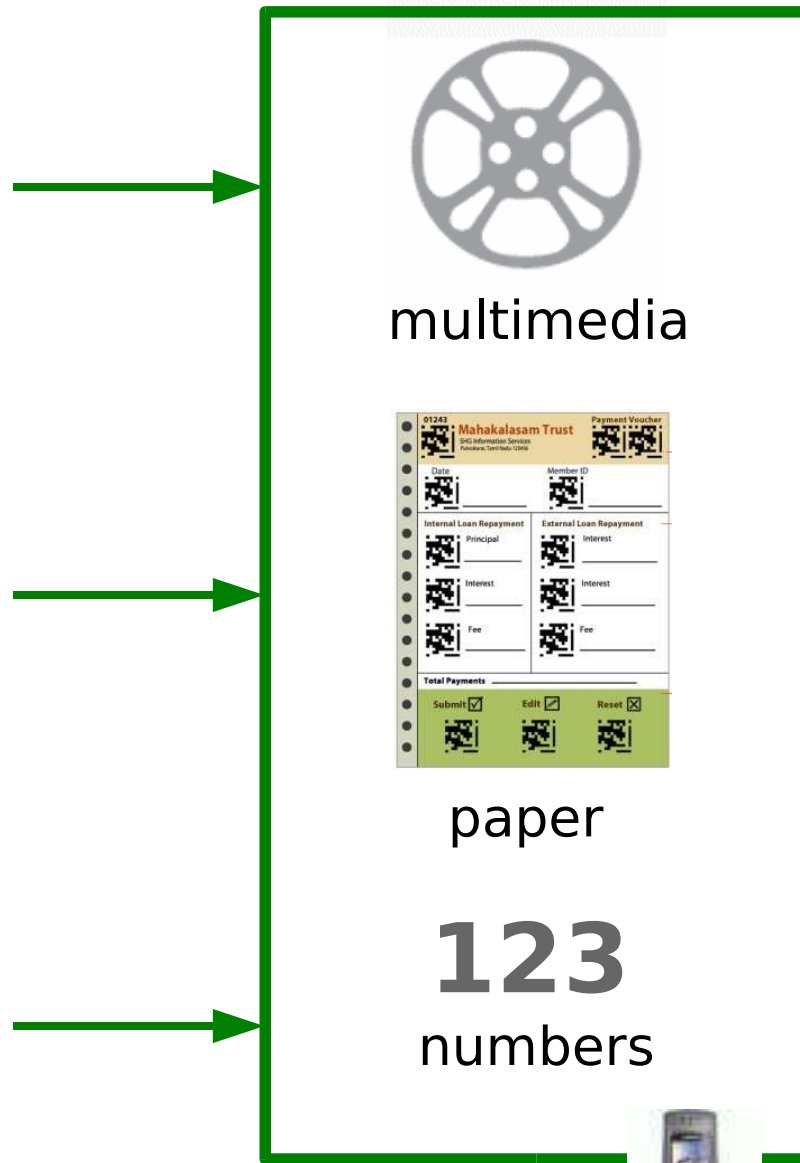
- Access to electronic patient records
- Unified history

8 Rules for Rural Computing

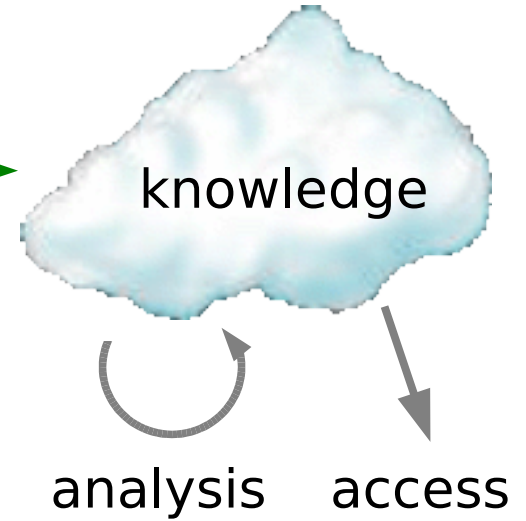
- Easy to Use: Demonstrated for novice rural users
- Easy to Teach: Simple, directed interaction model
- Easy to Distribute: Messages, paper references
- Easy to Share: One agent can serve many users
- Easy to Develop: XML scripting language
- Flexible: Mobiles, SMTP, Numbers, Audio, Images
- Trusted: Vernacular audio, linked to paper records
- Serve a Need: Economic opportunity



Vision: Breaking the Information Chains



CAM



Pending Questions

Which CAM Applications can have the most Impact?

- Huge potential in microfinance and related areas
- Accountability, Security, Trust, Privacy

Can results be applied for other naïve users?

How would we design a Server?

How about a new Device?

Can we measure our long-term Sustainable Impact?



Conclusions

Lots of interesting UI research

- Each iteration has led to novel insights
- Results may be more generally applicable

Lots of compelling applications

- Need significant time to understand
- “the dawn of the digital age”

Lots of potential value

- Communities will benefit by managing information better
- Systems will succeed with community investment



ekgaon technologies

ekgaon was founded in 2002 and works in providing technical, managerial and strategic support to community-led initiatives around India and the world. Currently we are based in New Delhi with a field office in Madurai, Tamil Nadu.

Current Partners and Supporters

Covenant Centre for Development / Mahakalasm Federations
University of Washington, Dept. of Computer Science
Community Enterprise Forum International (CEFI)
CARE International
Oxfam-Great Britain
Deutsche Gesellschaft for Technische Zusammenarbeit (GTZ)
Small Enterprise Education and Promotion Network (SEEP)
International Development Research Centre (IDRC)
Sarai New Media Initiative

<http://www.ekgaon.com>

Thanks for all the Fish

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