Rural Entrepreneurship Models for Cellphone-Based Language Learning in India

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Education in India

- 87% of 900,000 schools are located in villages
  - 16% of children attend private primary schools in villages, largely due to English medium
- Only 25% of schools have electricity

Source: *India Today* (August 21, 2006)
Education in India

- 25% of government primary school teachers are absent from work annually
- 19% of primary schools have only one teacher
- 70% of schools have pucca buildings

Source: *India Today* (August 21, 2006)
Relevance of English as a Second Language (ESL) in India

- English is a global language: 1.2 to 1.5 billion people in >170 countries (Crystal 1997)

- ESL is taught in almost all schools in India

- Mastery of English is the “single most influential factor that determines access to ... important avenues of economic and social advancement” (Kishwar 2005)

- 90% of indigenous web content in India is in English
“World Language” Fluency

- Low-income populations in Africa, Asia and Latin America desire to improve command of an appropriate “world language” (Clegg, Ogange & Rodseth 2003; Faust & Nagar 2001; Kapadia 2005)

- English, Mandarin Chinese, Spanish, etc.

- National languages co-exist with regional dialects

- “World language” fluency opens the door to further education, “New Economy” jobs, higher incomes, social prestige, etc.
But Schools Are Not Delivering

- Many schools in developing countries have limited impact

- For example, in India:
  - ESL teachers felt uncomfortable speaking in English; communicated with us through interpreters
  - Non-regular school-goers comprise 43% to 61% of school-going-age children (Azim Premji Foundation 2004)
Our Envisioned Solution

- Mobile games that target learning anytime, anywhere
  - Make ESL learning resources more accessible
  - Make learning process more enjoyable

- Mobile games run on cellphones, the fastest growing technology platform in the developing world

- Target local language learning needs
  - Early literacy
  - Listening comprehension
  - Conversational skills

- Support reuse and scalability in localizing content for other communities
Case for e-Learning Games

- **Enhance motivation and learning** (Jenkins 2005)
- **Incorporate good learning principles** (Gee 2003)
- **Experimental results** (Banerjee et al. 2005)
  - 2 years, >10,000 urban slums students in India
  - Played math computer games twice per week
  - Significant gains in math test scores
Current Progress

- Five rounds of field studies in India
  - Children from rural areas and urban slums
  - Two weeks per study
  - Assisted by bilingual interpreters

- Summer 2004: needs assessment (rural + urban)
- Winter 2004: feasibility study (urban slums)
- Summer 2005: feasibility study (village school)
- Summer 2006: small-scale pilot (urban slums)
- Winter 2006: small-scale pilot (village school)
Approach to Instructional Design

- **Theory**
  - Second language acquisition
    (Bialystok & Hakuta 1994; Ellis 1997; Lightbown & Spada 1999; Krashen 1981; Nunan 2004)
  - Reading acquisition (Snowling & Hulme 2005)

- **Practice**
  - ESL teaching methods (Krashen & Terrell 1983; Larsen-Freeman 2000)
  - ESL teachers with 30+ years experience in India and USA
Best-selling Foreign Language Packages

- Avoid reinventing the wheel entirely
- Reuse **best practices** from most successful language learning packages
- Reviewed sample of >35 applications
- Distilled >50 best practices in the form of “design patterns,” or motifs
Lessons from Successful Games

- ~ 300 game design patterns
- Most successful mobile games and casual games
Cultural Relevance to India

- Relate game challenges to everyday tasks
- Adapt game mechanics from classical games
Example Game:
Phoneme → Grapheme association

- A shooter game is used to identify letters and sounds
  - The game plays the sound of one of the letters
  - Player must aim and shoot that letter
- Promotes spelling skills, letter-sound correspondences
Initial Results

- Significant learning gains over 1 week with small sample in Summer 2006 ($p < 0.001$, effect size = 1.16, $n = 11$)
- Test users found prototypes to be engaging
Next Steps

- Spring 2007: Redesign prototypes

- Summer 2007: Field trials and design revisions
  - 3 months in India
  - Longest study to date

- Mid-2007 to Mid-2008: Longitudinal evaluation
  - Supervised by Indian collaborators
  - Regular visits by Berkeley team
  - Develop complete curriculum
Taking it to Larger Scale

- Content development
  - NGOs
  - State’s textbook committee

- Distribution
  - Cellphone carriers
  - Web hosting

- Service delivery
  - Credentialing
Drawing Parallels

- “I think there is a world market for maybe five computers.” – T.J. Watson, IBM chairman, 1943
Inventing the Future

- Bill Gates’s bold vision in the 1970s:
  “A computer on every desk and in every home.”
Inventing the Future

- How about this vision for our work?:
  “A mobile language lab in every underserved learner community.”
Community Learning Center

- Local entrepreneur given loan to start computer-equipped training center
- Community members attend regular classes
  - English as a Second Language
  - Computer literacy
- Community library that loans resources such as books
Brainstorming Question

- How can the community learning center be a starting point for delivering cellphone-based language learning in developing regions?
  - Profitability?
  - Accessibility by the poorest?
  - Educational attainment?
  - Replicability?
Space of Service Providers

Government | Non-Government
---|---
Mission 2007 | Internet kiosk
Government school | Community center
Government-aided school | Private school
Tutoring center

Technology focused | Education focused
Market Size

- What is a reasonable clientele to sustain the delivery model?

- Typical village population: 150 people
  - 50% people are children age 6-14; there are also adults interested in learning ESL
  - Landless laborers comprise >50% of village population
Revenue

- What is an appropriate pricing model?
  - Price discrimination? Cross-subsidization?
  - Bulk discounts?
  - Loyalty programs?

- Monthly income for farming family: Rs.3,000 per month
- Private school fee: Rs.100 to 200 per month
- Internet kiosk charges Rs.10 per hour
- External funding and subsidies? How long?
Technical Requirements

- Color screen
- Programmable
  - J2ME
  - BREW
- Headphone jack
- Micro/Mini-SD expansion slot
  - ~15 MB memory per game
- Speakerphone for group interaction
- Supports over-the-air / cable downloads

Motorola C975 (US$70 used)
Nokia 3595 (US$10 used)
Ultra-Low Cost (ULC) Handsets

- GSM Association’s Emerging Market Handset Program (EMHP)

- Motorola has largest market share (~80%)

- Motorola C113a
  - Monochrome screen (96 x 64 pixels)
  - Pre-loaded games and screensavers
  - Pre-loaded applications, i.e. calculator, alarm, stopwatch and currency converter
  - Does not appear to support programmability

Motorola C113a (US$40 new)
Ultra-Low Cost (ULC) Handsets

- ULC handsets prices expected to drop to $28 in 2010 from $40 in 2005 (Wireless Watch, Mar 27, 2006)
- TTPCom’s Sub-$20 cellphone (Mobile Magazine, Feb 9, 2006)
- UC Berkeley’s $10 cellphone (EE Times, Apr 10, 2007)
  - How come none of us know about it?!?!
- Tension b/w market share and profit margin
  - Less enthusiasm in ULC segment from Nokia
  - Can market share be eroded by depreciation?
Cellphone Shared Ownership

- >1 billion people still can’t afford cellphones in near future (GSM Association press release, Feb 13, 2006)
- Local entrepreneurs sell airtime on cellphones
  - Grameen Village Phone (Bangladesh, Uganda, etc.)
  - SharedPhone (South Africa)
Total Cost of Ownership

- In addition to prices of cellphones
- Recurring costs include
  - Updating phones with new content
  - Maintenance and technical support
  - Tutoring
  - What else?
Train the Trainers

- Digital StudyHall
  - Help motivated teachers improve teaching skills
  - Facilitate peers to conduct classes

- Digdarshan
  - Courseware for science lessons in rural school
Low Power Consumption

- Problem of power shortage is over-hyped
  - Cellphone power consumption is minimal compared to desktop computer

- Alternative sources of power
  - Bicycle dynamos
  - Wind-up cellphone charger
  - Solar energy
Educational Attainment

- Learning outcomes: demonstrate that average participant performs well on major exams
  - Indian Certificate of Secondary Education (ICSE)
  - Central Board of Secondary Education (CBSE)
  - State board syllabus
- Higher school attendance rates
My Two Cents on Some Myths

- **Myth #1: Commercial sustainability is everything**
  - Positive spillover effects justify government subsidy
  - How should social ROI be computed?

- **Myth #2: Technology replaces or undermines teacher**
  - Technology augments the teacher’s ability and authority
  - What would be appropriate relationship b/w child learner and adult facilitator that technology mediates?

- **Myth #3: Technology promotes learning at all stages of learning trajectory**
  - Technology develops foundational skills
  - What’s an appropriate end-point?
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