Computing for the Underserved*

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ABSTRACT

We make the case for focusing on economically disadvantaged and for developing technological solutions to address their needs. We then discuss compelling computing applications for the underserved: (a) viewing mobile phone as the first computing device (b) democratizing access to education.

1. WHY FOCUS ON ECONOMICALLY DISADVANTAGED

The "bottom of the pyramid", consisting of more than 4 billion people who live on less than $2 a day, presents a huge businees opportunity. In his book [3], Prahalad argues that there is money at the bottom of the pyramid as the large number of economically disadvantaged people represent a significant latent purchasing power. The poor people pay a preium for products and services as they tend to reside in high-cost ecosystems even within developing countries and thus there is huge potential for businesses to unlock this poverty premium.

We list a few key types of products and services that are desirable for the poor people.

- Commerce: Basic financial services including savings, microcredit, and insurance should be provided in a cheap, efficient and convenient manner.
- Healthcare: Efficient treatment models and remote medical services are desirable.
- Education: Currently there are fewer number of good quality teachers when compared to the huge (underserved) demand for good quality education. We would like to use ICT to address this asymmetry in demand vs supply.
- Agriculture: Access to timely and correct information about weather, crop patterns, commodity prices, etc is crucial. Similarly access to efficient marketplace is needed.
- Communications: Technologies such as mobile phones enable improved connectivity and access to the outside world.
- Governance: ICT can be potentially used to provide efficient government services and improve transparency in governance.

We next discuss a few computing applications focused on the economically disadvantaged that could have significant impact.

2. MOBILE PHONE AS THE FIRST COMPUTING DEVICE

Today there are about 4 billion mobile phone users worldwide out of which an estimated 64 percent live in the developing world. By 2012, half of all people in the developing people will have a mobile phone. An overwhelming majority of these people have not used a PC before and thus get connected to the networked world for the first time, through a mobile phone. For example, the number of domestic PCs in 2008 is about 85 million in China and 10 million in India. In comparison, the number of mobile phone users in 2008 is 547 million in China (up from 317 million in 2004) and is 305 million in India (up from 34 million in 2004). Given such rapid growth and the large reduction in the cost of mobile phones and services, mobile phones can soon become economically feasible for the poor to afford. We pose the following question: *"What is the most compelling application we can provide, given that a mobile phone is the first computing device for most people?"*

We propose a few potential compelling applications on the mobile platform. In each of these applications, there is a huge potential to reduce the asymmetry in access to timely and relevant information. The asymmetry arises due to the fact that there is unequal access to information, especially in the rural developing world. Lack of information leads to higher costs in money and time, competitive disadvantage, poor health and sometimes even death. With the rapid growth of mobile phones and services, we now have a way to provide access to the relevant information in a timely fashion.

- Local Marketplace: The goal is to build a mobile-based platform for the exchange of goods and services amongst the poor. We would like to focus on goods and services that are produced as well as consumed by the poor as these represent a market segment that is underserved today. It is desirable for the platform to support self-help groups and new payment mechanisms.

  Once such a platform is in place, we can augment to support even a marketplace for locally relevant infor-

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mation. Sharing of information such as estimated demand and commodity prices can be valuable for local entrepreneurs. ICICI's e-Choupal and mobile phone usage leading to improved market performance and welfare in Kerala fishering industry [1] provide evidence to the potential of mobile phones for improving efficiency in local commerce.

- Healthcare: The goal is to build a mobile-based platform for localized content creation and dissemination related to healthcare. Further cell phones can be used to provide more efficient healthcare services such as early/remote diagnosis. We can develop applications that enable dissemination of relevant localized health related information to the end users and similarly let the patients as well as health workers manage health records. This platform can also enable data mining towards early detection of disease outbreaks and greater understanding of health trends at a granular level.

- Education: We envision a platform for collaborative sharing of educational content. This platform need not necessarily be mobile-based. We discuss further in the next section.

3. PLATFORM FOR COLLABORATIVE SHARING OF EDUCATIONAL CONTENT

Today there exists an asymmetry between demand and supply for educational content. There is a huge demand for good quality education which is underserved due to the absence of enough good quality teachers. This problem becomes more acute as we proceed earlier in the education level (e.g. high school level compared to college level). For instance, well-qualified teachers are usually concentrated in cities in emerging markets such as India and China. Consequently students from rural areas (especially those from underprivileged socio-economic backgrounds) receive poor quality education and are not in a position to compete for opportunities with those in cities.

Our goal is to provide a platform for collaborative sharing of educational content, thereby democratizing access to education. We want to provide a level-playing field for access to educational materials in developing countries, bypassing barriers such as urban/rural divide and economic and social disparities, by using internet as a means to deliver such materials. Our platform will help to: (1) improve the quality of teachers in rural areas as they can learn from say, lectures of more qualified teachers (2) provide better resources to students from rural areas.

We would like to support collaborative creation, sharing and management of educational content, using tools and easy interfaces on top of a wiki system. In this aspect, the platform shares common aspects with wikipedia. However, unlike wikipedia, we can have multiple content on the same topic and hence rating and ranking of materials on the same topic is important (eg: How do we rank all lectures on "quadratic equations" for Class IX?). For this purpose, we can make use of the reputation of the contributor (eg: professor at a top ranked university), ratings provided by users for a specific article and the overall user rating of the contributor based on all articles from the contributor. Further we need to support search and intuitive navigation to enable discovery of relevant materials. We also need to address problems such as how to seed content initially to bootstrap the platform and how to incentivize "producers" of content to contribute their materials. We need to study the factors that led to success of wikipedia in order to determine the incentives and the regulations (including moderation) needed for our platform. Initially most of the high quality educational content is likely to be available only in English. Hence we would like to enable translation into other regional languages. We plan to use the wikiBABEL framework [2] in which machine translation is performed first, followed by collaborative editing to correct the errors. We have to also ensure that the content is localized for the region or the social background (for example, "pancakes" may not make sense in India). Hence we may need to classify the available materials into natural hierarchies. We can also support a social network so that the users can form study groups, or interact with teachers and other students. We also need to filter adult, offensive or other inappropriate content and devise ways to discourage misuse of the service. Finally we need to explore ways of broadening the reach of the service. How do we reach out to people with no or very poor internet connection? We can consider other means such as mobile phone network, cable television network or offline access using DVDs. To address the bandwidth constraints, we should make the same multimedia content available in multiple formats such as audio only, low quality video, and high quality video.

4. REFERENCES

[1] R. Jensen. The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector. Quarterly Journal of Economics, Vol. 122, No. 3:879–924, August 2007.

[2] A. Kumaran, K. Saravanan and S. Maurice. wikiBABEL: Community Creation of Multilingual Data. In WikiSym, 2008.

[3] C. K. Prahalad. The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits. Wharton School Publishing, 2005.