Mobile Applications for the Next Billions: A Social Computing Perspective

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INTRODUCTION

We are interested in designing mobile social computing systems for the next billion users.[1] Our aim is to create systems that are appropriate (and appropriable) within their social, cultural, infrastructural, economic, and political settings. In this paper, we discuss our emerging work on mobile applications and the social computing approach that underlies it. We note the growing interest in applying ICT to transform the "digital divide" into the "digital provide." Addressing perceived gaps between people who lack access to digital information – heavily concentrated among poor people in developing nations – and those who do have access [14,15,222], however, involves more than solving technical challenges surrounding infrastructure or electrical power. A social computing perspective emphasizes the crucial nature of social, cultural, and other non-technological factors. It draws attention to people and their social practices as critical resources in designing successful information and communication systems [2]. We take heart and inspiration from the many emerging examples of mobile applications in the next billions space, and show how the framework of social computing can provide insight for the design of viable next billion applications.

SOCIAL FACTORS AND THE VALUE OF INFORMATION

"Information is power. Nowhere is the aphorism truer than in developing countries." [1]. So begins Abraham's analysis of the economic impact of mobile phones on fishermen in the southeastern Indian state of Kerala. Interestingly, his findings only partially support the "information is power" hypothesis. In Abraham's data, about 75% of the fishermen using mobile phones to get market price information before deciding where to sell their fish reported lower business risk, and 50% reported fewer losses due to unsold or spoiled fish. About 40% also reported an increase in income after adopting this practice. In spite of these gains, though, few reported consistently going to markets with the highest prices; instead many chose ports where their "commission agent" had a presence. Commission agents are middlemen who invest in fishing boats in exchange for a cut of each catch; they are in a supply chain relationship with the fishermen. From an "information is power" perspective, the fishermen's behavior can be seen as somewhat disappointing – Abraham's analysis shows that the pricing information is reliable, so why do the fishermen fail to take full advantage of it? He concludes that social factors change the impact that market information has on behavior [1]. Because an agent cannot easily verify or collect his commission from a port in which he has no presence, he has an interest in having catches in which he has invested sold only in ports where he does. Because the agent has invested in his business, the fisherman feels a social obligation to bow to his wishes, even when doing so may prevent him from maximizing his income.

Narayan and Glinskaya [17] also highlight the influence of social context on behavior in their introduction to a collection of case studies addressing poverty in Southeast Asia. In their summary of what contributes to successful projects, they identify four elements that can impact "institutional climate, power relations, and the incentives of actors engaged in unequal power relationships" [which, they argue, characterize the plight of many of the world's poor]. "[These] are: access to information, mechanisms of inclusion and participation, social accountability, and local organizational capacity." [17, p. 15] Note that all of these factors are frankly or arguably social in nature.

EMPIRICAL OBSERVATIONS FROM THE FIELD

A growing number of reports from the field, primarily studies of Indian farmers, add support to and illustrate specific ways that social factors affect the actionable value of information. For example, Srinivasan [22] analyzes farmers' use of web-connected kiosks (telecenters) fielded by the Parry sugar factory in the southern state of Tamil Nadu. Srinivasan compares mediated communication between strangers with face-to-face interactions between familiar interlocutors through the lens of an encapsulated

[1] A variety of phrases to refer to people from sub-Saharan Africa, the Indian sub-continent and/or South/Central America who do not have regular access to the 'standard' platform of an Internet-connected desktop computer seems to be in current use. These include the "next billion users," "next billions," and users at the "bottom of the pyramid" or "BoP." We use these terms interchangeably here.

interest model [5, described in 22]. In this model "trust exists when one party of the relation believes the other party has incentive to act in his or her interest" [22, p. 346]. For example, farmers seem to trust the Cane Sub-Inspectors (CSIs), who are employees of Parry, in matters regarding the treatment of diseased plants because they believe the CSIs share their own interests in producing a high yielding crop, but will not ask them to recommend varieties of sugarcane to plant. Sugarcane varieties differ in time to maturity, with slower to mature varieties producing higher sugar content yield (of interest to Parry) and faster maturing plants attain higher crop weight (of interest to the farmer). The conflict of interest leads farmers to ask fellow farmers rather than CSIs for recommendations. Similarly, farmers will use the telecenter to only ask "simple" (i.e., low-stakes) questions of a purported agricultural expert who is not known to them, saving "high-stakes" questions for successful farmers with whom they have some relationship.

Gopakumar [10] argues that local people play a critical intermediary role in the success of telecenters providing e-government services to the rural poor (e.g., information on agriculture, health and education, support for transactions between citizens and government). He argues that factors such as living in the same village led target users of the Akshaya telecenter, in the Indian state of Kerala, to develop trust in the entrepreneurs and intermediaries who ran the centers. By extension, they thereby developed trust in the abstract systems of medicine and government that are the ultimate sources of information. Kumar and colleagues [16] conducted interviews with consumers of "microbusiness" services such as carpentry and plumbing, which are part of the large informal sector of the Indian workforce. Consumers locate such services largely by informal means, such as word-of-mouth. They found that the single greatest pain-point for consumers was "…the lack of accountability and quality of service guarantees that exist in these unorganized sectors." [16, p. 937].

To summarize, these studies demonstrate the power that access to information can have in improving people's lives, but also how the impact of information is gated by social factors like trust, accountability, and social and institutional pressures. The question we address in the remainder of this paper is how do we come to grips with these factors, especially in going about designing appropriate systems for the "next billion"?

THE SOCIAL COMPUTING PERSPECTIVE

We believe that social computing is uniquely well-suited to contribute to effective ICT applications for next billions populations, because of the great leverage it can provide on trust and other social issues. In this section we describe the social computing perspective and briefly review some of the techniques that have emerged over the last ten years. Social computing makes the claim that people are fundamentally social; therefore their use of information and communication technologies cannot be understood separate from social considerations. This means that people access, evaluate, and consume information in a social context, such as the judgment in the CSI example as to whether an opinion expressed by an individual on a particular topic is trustworthy. Our perspective is that even when no ICT is involved, people through their social interactions are effectively making social 'computations' all the time – for example, collective judgments, recommendations, decisions, etc. The key for applying a social computing perspective to next billions applications is to understand how to employ social computing techniques to enable social dynamics such as establishing norms, imitation, self-organization and empowerment around goals next billions users already have.

The set of social computing techniques is by now quite large with many proven examples. Common ones on the Internet include Amazon's book recommendations [3] and eBay's buyer feedback rating system [6]. The research roots of social computing can be traced to ideas presented in, for example, the Hill and colleagues' seminal paper on "edit wear" and "read wear" [12], which was later elaborated in the concepts of "history enriched digital objects" and "social navigation" [13]. This body of work noted the utility in everyday life of traces of individuals' behavior and set out to implement similar affordances in the electronic medium. Hill and colleagues [12] designed "read wear" scroll bars that reflected how often a page in a document had been read – an analogue to a "well-thumbed book." Social navigation drew on the "well worn path" as a metaphor for providing electronic information traces of visits to information spaces.

Another focus of social computing techniques can be seen in the explosion of "social software" and "Web 2.0" mechanisms for aggregating and sharing social information. A wide variety of "architectures of participation" have emerged, from the crowd sourcing of product ratings, to maintaining personal relationships on social networking sites, to the viral spread of widgets, games, and more. These techniques often motivate use and draw people in (e.g., the recent "25 things" meme on Facebook). Some social computing interactions, for example, freerice.com, can be highly motivating. Blogs and wikis have created new ways to collect, share, and improve information through social contribution, extending pre-Web 2.0 forms of discussion (such as bulletin boards, newsgroups, forums) which lacked the openness of today's social applications [19].

Social computing mechanisms play a valuable role in directing attention to, vetting and remembering valuable content on the web. From "karma points" on Slashdot [21], to automatically generated recommendations based on massive analysis of user posts, such as PHOAKS [18], to social bookmarking and tagging on sites like del.icio.us and Flickr, to the "friending" and "following" enabled through social networking sites such as Facebook [9] and Twitter [23], it is not too far fetched to say that information on the net has literally become besotted with social information.

One further aspect of social computing that we believe will be useful for addressing the next billions space is the concept of social translucence [7,8] that our group began developing over a decade ago. The fundamental claim of social translucence is that it is possible to design digital systems that support coherent behavior by making participants and their activities visible to one another. In socially translucent systems, three characteristics – visibility, (mutual) awareness, and accountability – enable people to draw upon social norms and experience to effectively organize their interactions with one another.

In summary, we note that many social computing techniques have been forged in the hothouse of Web 2.0 on the nearer side (to us) of the digital divide. Where these rely on assumptions and familiarity with the web and its ways, there will be gaps that must be bridged or circumvented in order to apply social computing in the next billions space. Nevertheless, where there are people, there are social practices and goals that good social computing design can enhance and support. And if anything there is already ample evidence that the next billions population is wasting no time creatively appropriating communications technologies to their own ends. We particularly like the example of *sente* in Uganda reported by Jan Chipchase [4]: a city dweller buys a phone card, calls the village "phone lady" and gives her the code, who takes a small commission and delivers the rest of the value of the card in cash to a relative living in the village. We may have as much to learn from emerging uses of technology in developing nations as we have to bring to the table in mobile social computing offerings.

THE MOBILE WEB PLATFORM

Advances in cellular technology and the rapid penetration of cell phones in non-urban areas make them an attractive platform for reaching next billions populations, where reliable power and wired infrastructures cannot be assumed. While other approaches are being explored that depend on "desktop" models (e.g., thin clients, and the one laptop per child initiative [24]), the proliferation of cell phones provides an alternative that can be used widely now to experiment and develop and test a repertoire of examples. The UN's International Telecommunication Union reported worldwide penetration of cell phones to have reached 50% in 2008, representing a four-fold growth since 2001 [19]. In Africa wireless phone usage has leapfrogged landlines, with over 200 million subscriptions in 2008 compared with 10 million in 2004 [11]. Overall, 68% of the world's wireless subscriptions are in developing nations.

While a significant proportion of cell phones deployed in next billions countries are believed to be lower-function units (e.g., voice and text messaging but no camera or graphical visual display), cost is expected to decrease significantly over the next five years. This means that future applications can be designed for deployment on something akin to current high-end phones. In addition to having at their disposal the computing capabilities of the personal computers of the mid-90s, these applications can leverage a wealth of social computing and Web 2.0 innovations. However, as noted, social computing did not primarily evolve in this space. Whereas social computing on the web could depend on large populations of literate users with relatively large screens, and high bandwidth connections, that isn't the case here.

THE "PICTURE TALK" APPLICATION

An important focus for our work over the next decade, and for the global community, including the next billion users, is to create technologies, practices and solutions that will drive bottom-up solutions to the vexing problems of poverty, illiteracy and disease that are so widespread in developing countries.

Our own work over the past six months has focused on building an infrastructure that will enable the deployment of mobile social computing applications under the current assumptions of mobile device capability, and to support likely future growth in device capability. In our first application, "Picture Talk," we aim to enable users of mobile phones to participate in "conversations" composed of voice posts, focused (optionally) around a picture or graphic. Picture Talk will be designed around present technical capabilities – primarily low-end phones lacking data capabilities and offering only voice and key presses as UI methods, along with a pc-based option appropriate for telecenters.

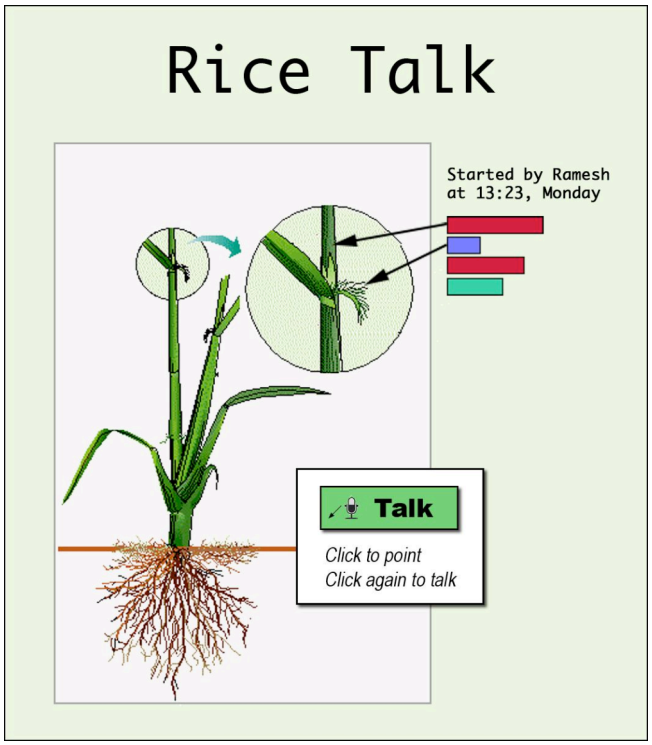

Figure 1. A conception of the Rice Talk interface, a specialization of Picture Talk that allows a structured voice conversation around a picture or graphic of a rice plant.

But we are planning also for the near future in which smart phones combining voice, data streams and richer interface options like touch will become widespread. We are also in the process of identifying appropriate field sites through which we hope to come to better understand the needs and characteristics of next billions users. In selecting sites, we are hoping not only to work in one or more developing countries, but also to find at least one site close to our lab that can serve as an "analogue" but more accessible representative population.

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