

Going Wireless: Dialing for Development

How Mobile Devices are Transforming Economic
Development at the Base of the Pyramid

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1. Introduction

The mobile phone has established itself as the communication and networking platform of choice for billions of the world's consumers, most of whom are at the base of the global economic pyramid. Worldwide, mobile phone subscribers outnumber Internet users almost 3 to 1,¹ with much of that gap coming from skyrocketing mobile phone use in Africa, India and China. Analysts estimated that sixty-five percent of all handsets made in 2007 would be sold in emerging markets.² As mobile services are pulled increasingly into rural and low-income communities, mobile phones are riding the strength of rapidly growing networks, low power and maintenance requirements, and increasingly affordable pricing.

The ubiquity of mobile phones has led social sector organizations to begin leveraging this communication tool in pursuit of their missions. Businesses and organizations serving the low end of the market find themselves with a powerful latent capacity and revenue generating opportunity—mobile phones in the hands of billions of potential customers as well as the agents and merchants with whom they conduct business. Entrepreneurs, investors and practitioners should continue to encourage advances in technology, regulation and solutions around mobile applications as they look to improve the economics of serving customers in low-income markets.

This paper describes emerging trends and possible constraints to help understand the implications and opportunities for social sector organizations, development experts and service providers who can hardly ignore the billions of consumers who are, quite literally, waiting for their call. The question of whether or not these consumers can be reached has been asked and answered. Now it is time to start delivering the data, services and economic development they demand.

The discussion that follows will benefit social entrepreneurs; technology innovators; economic development agencies; incumbent service providers and emerging commercial ventures. In order to address this broad audience, we begin with an overview discussion of the key areas where mobile phones are being applied

in Base of the Pyramid (BOP) settings. Within that context, we then examine many of the practical lessons derived from past, current and emerging projects involving mobile phones. Finally, we provide a project implementation checklist and evaluation framework that project leaders and stakeholders can use to guide development and measure the impacts of their work.

2. Versatility and Accessibility for Service Delivery

Like the explosive growth of the Internet several years ago and the subsequent rise in new ways of doing business, mobile network growth is fueling a rapidly emerging application space. The increased mobility and accessibility of the mobile phone has the potential to have an even greater impact than broadband Internet, particularly in low-income rural areas where alternative communication platforms remain scarce. Access to the network through relatively inexpensive phones and low denomination prepaid cards that allow for the purchase of air time in small increments also closely matches the budgeting and payment needs of many low-income customers.

Since low-income consumers have limited disposable income, they must see a clear value proposition from the service provided, offered with a billing plan that matches their cash flows (discussed further in Section 3.1). One such proposition is convenience, a word that has significantly more meaning in many BOP settings. Having access to information may save a few minutes in the developed world; in rural areas, it may save a day's travel time, lost wages or an entire year's vegetable crop. With fewer or no comparable alternatives, mobiles have the potential to provide 'game changing' services.

High BOP demand for Information and Communications Technology (ICT) in general was illustrated dramatically in a recent World Resources Institute study, which determined that "Except in the very lowest BOP income segment, average ICT spending per household generally exceeds spending on water—and in the upper BOP income segments sometimes exceeds spending on health."³

We have identified six broad and sometimes complementary uses for mobile devices in social enterprises. While there are overlapping features among the segments outlined below, each one presents distinct challenges and opportunities both for

consumers and for the product and service providers who operate in these markets.

1. Shared-Access Telephony
2. Improving Market Efficiency
3. Delivering Critical Information
4. Aggregating Enterprise Data
5. Public Reporting and Data Collection
6. Facilitating Financial Services

Each segment, and several associated ventures, is discussed in the section below. To aid entrepreneurs and stakeholders in understanding how their own projects and innovations may relate to opportunities in BOP settings, this document concludes with a Mobile Application Assessment Framework intended to provide a practical lens through which to view and evaluate potential undertakings.

2.1. Shared-Access Telephony

BOP consumers are not merely deprived of access to potentially valuable products and services — they often pay a poverty penalty⁴ and may be completely uninformed regarding emerging technologies that could benefit them. Shared-access telephony has provided a critical first step in introducing consumers to information and services they were previously not aware of. The same mechanism can continue to allow initial exposure to nascent and increasingly sophisticated services.

When emerging markets began to deregulate their telecommunications sectors, a number of private carriers quickly stepped in to meet the latent demand for telephony that government-run phone companies had failed to address. As mobile access grew, initial handset and airtime prices were high and coverage was limited. One of the first business models to emerge was the simple and typically informal resale of mobile air time among end users. Under this shared-access model, an entrepreneur bought a phone and allowed others to make calls on a fee-for-call basis, earning a margin on the units of airtime sold.

In India, as in most places in the world, the “village phone” first started in the form of land-line services provided by private Public Call Offices, or PCOs, which are essentially small booths with telephones run by local shopkeepers. Where telephones were not affordable to individual homes, PCOs brought

telephony to the middle and lower-middle classes by selling phone time to multiple local users on a per-call basis.

With the growth of mobile networks, PCOs later also became mobile and most notably formalized by Grameen Phone in Bangladesh. Through affiliated microfinance organizations Grameen Phone offers a mobile phone, discounted service rates, an external antenna for better coverage, and a financing package to village entrepreneurs, the majority of whom are women. The program has not only boosted incomes for these entrepreneurs, but also elevated their social status within their communities.

The original program has since been replicated in Rwanda, Cameroon, Uganda, Indonesia and the Philippines, with non-Grameen variants and informal adoptions of similar models. In Uganda, where a partnership with cellular provider MTN has enabled more than 9,000 village phone operators in the span of four years, the model has achieved perhaps the most traction.⁵

The village phone was innovative for a number of reasons. Shared-access allowed equipment and network access costs to be spread among several end-users, lowering marginal costs for new users and bringing phone access to underserved areas more quickly. An included antenna ensured the village phone entrepreneur of better reception than other phone owners nearby. Partnerships with both technology companies and microfinance organizations were also significant enablers of the business. Finally, by empowering a distributed network of franchised entrepreneurs, the scheme not only created a business opportunity for those willing to invest in the equipment, but also enabled a rapid scale-up of the rural networks.

With falling phone and service prices; increased competition among the mobile operators; and improvements in coverage, profits for these “village phone” operators are falling.⁶ In countries such as India and China, where rates and equipment prices are already among the lowest in the world, the Grameen model may be less attractive. But this is not to say that shared-access is a strictly short-term solution. While the village phone may lose some of its competitiveness as falling prices make services more accessible to community members at large, the

village phone entrepreneur can remain ahead of the mainstream by expanding the applications and services that she re-sells to her community. Already, many village phone operators are supplementing their incomes by selling SIM cards and prepaid air time. Efforts like the Grameen Technology Center's Application Lab in Uganda are also developing new revenue opportunities for the village phone operators.

2.2. Improving Market Efficiency

Increasing the efficiency of markets is a core goal of many poverty reduction initiatives. Mobile phones can help reduce or eliminate information asymmetries, thereby levelling the playing field between producers, middlemen, and consumers. Several initiatives that use mobile phones to deliver information have been launched to improve market transparency and empower small producers. Mobile phones, generally through the use of simple, SMS text messages enable consumers to get on-the-spot pricing information.

Market efficiency solutions exist across a wide range of niches. In Senegal, for example, hundreds of small-boat fishermen rely on a WAP and SMS-based service offered by Manobi.⁷ The fishermen select the port or beach to unload their catch by consulting their mobile phones for automated information on fish market inventories and prices. This same system also transmits safety information and alerts. Mobile For Good⁸ (M4G) has launched Kazi 560 in Kenya, a job matching service aimed at blue-collar workers and employers. For seven Kenyan shillings (\$US 0.10) per job notification received via SMS, job opportunities ranging from carpentry to typing can be sent to the service's 30,000 subscribers.

These services are innovative in the ways they empower their users through information. The same type of application that creates market efficiency could also be used to match buyers and sellers, or aggregate buying power. For example, bulk purchases of fertilizers or building materials could be made at a lower price per unit. Such

Reuters Market Light (RML) – Bringing Greater Efficiency to Markets

RML is a Reuters Service established to reduce poverty among poor farmers by providing affordable, accurate, and up-to-date agricultural crop pricing data while generating a new revenue stream for Reuters. Poor access to relevant and up-to-date market information among farmers enables well informed middlemen to offer below market prices for the farmer's produce. Coming to market with a crop for which there is no or little demand is especially costly when the market is several hours away and/or when production costs may exceed revenues. Low prices coupled with poor market transparency perpetuate a cycle of low farm incomes.

Using the phone as a delivery mechanism, Reuters launched RML in India in early 2007. Pricing data is collected at local markets and, along with weather info and agricultural news, is delivered via SMS to subscribers. Today several thousand subscribers pay 60 Rupees (\$US 1.50) per month for this information and RML has built local partnerships in India to improve the quality and lower the price of the data they provide. Depending on their success in India, Reuters is eyeing Africa as their next market for RML

Local market information can also be used to identify early trends. For example, if Reuters sees a rapid price rise in vanilla from markets in southern India (a major vanilla producing region), this may indicate the beginning of a vanilla shortage that will soon cause similar price rises in the Vera Cruz region in Mexico (where vanilla cultivation first began). Early indicators are particularly valuable to commodity traders and sale of that information can provide an additional commercial opportunity for Reuters. An increase in this revenue stream's value could eventually translate into lower service costs for RML users.

RML faces significant challenges to expansion that range from the sheer costs of data collection and customer acquisition, to the significant learning curve farmers must go through in order to understand how local prices are impacted by world prices. However, RML has shown that even those with limited incomes and high illiteracy levels can improve their situation utilizing mobile applications if the content and services truly meet their economic and social development needs.

applications could also address transportation needs, enabling several producers to share a truck to deliver products to market.

Timely access to accurate data encourages proper pricing and the appropriate distribution of resources. Improvements in market efficiency can be temporarily disruptive to existing markets and players as established roles and competitive positions are reshuffled. But this is necessary friction along the way to sustainable economic and social development.

2.3. Delivering Critical Information

Beyond simply improving market efficiency, mobile networks provide a mechanism for delivering information critical to the health, well-being and security of BOP consumers. Although many of the challenges facing BOP consumers are best mitigated by sustainable, long-term economic development and education, developing economies also tend to face a host of acute threats where critical information is often bottlenecked or stifled entirely by inadequate information sharing mechanisms. The mobile phone can help.

In Kenya, M4G's MyQuestion service allows customers to anonymously ask HIV/AIDS and breast cancer related questions. Seeking to address the growing tuberculosis epidemic in South Africa, the company On Cue sends text messages to patients to remind them to take their medication at pre-determined times. Efforts are underway by organizations such as Bloodbank in Kenya and the Jeevan Blood Bank in India to leverage SMS to identify donors, send alerts when blood supplies are low, and create an inventory management system of blood supply at local hospitals.

Automated text messages can be sent to a mobile phone via either push or pull. Push messages are those sent out to a customer's mobile phone without the customer initiating a specific request. Typically push messages provide general alerts for marketing, health or safety reasons (e.g. On Cue), and can be subscribed to for delivery on an ongoing basis. Pull messages are those directly initiated by the customer, and are a reply to a specific request (e.g. MyQuestion M4G, Manobi, and the new Google Mobile⁹ service).

These "information on demand" services are being further enabled by improvements in Interactive Voice Response (IVR) technology. IVR software detects voice commands and touch tones, allowing those that are illiterate to still request and receive personalized information.

While many of the existing offerings in emerging markets were initially developed by NGOs or other socially minded organizations looking to bridge the information divide, the willingness-to-pay by consumers is quickly becoming evident. The total BOP Information and Communications Technology market in Africa, Asia, Eastern Europe and Latin America and the Caribbean is estimated to be \$51.4 billion.¹⁰ As the tools for gathering and disseminating information become less expensive and easier to use, information provision may eventually serve as a loss leader supported by advertisements or texting charges. There are already many examples (especially in developed economies) of entertainment or news content being delivered free of charge—as long as the subscriber is willing to put up with, or tune out, the embedded advertising.

While not limited to critical information applications, an interesting provider of SMS solutions for NGOs is kiwanja.net. Their recently launched platform, FrontlineSMS, enables any organisation to access 'bulk' SMS messaging technology via their own computer, giving them an easy ability to carry out small- to medium-scale trials before embarking on larger projects.

2.4. Aggregating Enterprise Data

To improve operational efficiency, optimize supply chains, and manage real-time inventory, global businesses spend billions of dollars collecting data from multiple and often separate sources. This data is used to make decisions, automatically update inventory and production inputs, and generate management insights and reports. These processes are equally critical for social enterprises, NGOs and government organizations, and are increasingly found everywhere from organizations delivering a product or service to those tracking health indicators or potential disease outbreaks.

The Phones for Health project, announced in February 2007, will equip medical workers in remote areas of Africa with mobile phones and software to capture and exchange patient information. Instead of recording on paper, patient information

and disease incidences can be captured on the phone and sent to a central database for use by health officials and others. Aggregated data will also be available to field workers. The initiative is based on an already successful deployment in Rwanda and will initially focus on ten African countries.

As this example shows, information collection is often the input to make useful data available to those in the field. In fact, without a mechanism for collecting data, many of the market efficiency models noted above could not function. This distributed data collection improves the efficiency and reporting by enterprises serving remote or poorly-connected areas. By electronically collecting and validating customer and operational information at the source, errors are reduced and operating decisions can be made more quickly and effectively.

In sum, just as commercially-focused enterprises can improve data flow and quality, so too can social enterprises make use of technologies that are generally already in the hands of their often widely dispersed staff, agents and partners.

2.5. Public Reporting and Data Collection

In a parallel to the data aggregation case described, mobile devices can provide critical communication links to even more diffused and seemingly unrelated sources of information. Such applications can involve active data collection with individual users consciously pushing information towards one or more collection points, or passive data collection where individual users may be unconsciously collecting and submitting data via their connections to the network.

Examples of active data collection include the emerging phenomenon often referred to as citizen reporting, citizen journalism or citizen media. While certainly not limited to the BOP, mobile devices are effective tools for gathering journalist and citizen input. For journalists and citizens alike, especially those living in and reporting from conflict areas or places where they need to be highly mobile, or where other communications infrastructure is poor, the mobile phone allows them to truly report “on the go.” Citizen and journalist reporting can be transmitted to just one, or to any number of

Voxiva – Collecting Operational Data from Remote Locations

Social-sector organizations looking to leverage Internet-based technologies are often frustrated by the limited reach and high costs of using the Internet outside of major cities. Voxiva is solving this through its Pyramid Platform, which allows organizations to collect information from and communicate with distributed networks of people in a timely and systematic way. Applications built on their platform allow users in the field to submit data to the system via text messaging, the phone, web or PDA. Data can then be collated and analyzed in real-time to make decisions and send information back out to the field, supporting a two-way information flow.

Voxiva has found a broad market for their solutions, especially in developing countries where mobile phone usage is rapidly increasing. For example, in Peru the platform is being used to reduce crime by allowing citizens to more easily report incidents. CitizenNet has enabled authorities to perform thorough crime analysis, re-allocate resources to locations and times of greatest need, track and understand trends, and to more effectively allocate and justify additional staff. Voxiva systems have also been deployed around the world to track diseases, monitor patients, manage HIV/AIDS programs, and respond to disasters. Furthermore, Voxiva has leveraged the ‘shared user’ approach by providing their solutions as a hosted, managed service that includes maintenance of the communications infrastructure, hardware, software and data to ensure 24x7 reliability.

Analysis of the Voxiva model reveals a few interesting insights. First and foremost, the local environment should dictate the type of communication devices to be employed. The technology implemented must be both cost effective and intuitive and easy to use, another reason to leverage existing mobile phone infrastructure whenever possible. Also, based on analysis of existing Voxiva applications, real-time data collection has proven effective at improving situation assessment and response time. Finally, leveraging the shared-access idea and offering the technology as a hosted, managed service has increased adoption of the platform.

unaffiliated collection points simultaneously, aggregated and then sent back to the original data source.

In TheFieldOnline.net, while not limited to BOP settings, is representative of how such citizen journalism is being facilitated. Other examples are also quickly emerging. Launched in May 2007, the Africa Interactive Media Foundation's Voices of Africa project has taken advantage of expanded data capabilities on some mobile phones and is now gathering momentum and content from field reporters in a number of African nations. Ultimately they are making it possible for Africans to send articles and images (still and moving) about events taking place in their countries without using a computer and without having a traditional internet connection. The growing number of people expressing their opinions through this technology is strengthening democracy and contributing to good governance efforts.

Another active data collection example involves voting or, more typically, polling across any number of potential issues. In this case, community members who may share nothing in common beyond their demographic or broad community membership status can be questioned on the broadest possible range of topics. SMS "voting," offered by companies such as GlobiTec and

Mlogic, is being used among diverse groups of users. Relevant applications include commercially-oriented market research, government collection of census data, needs assessments by social enterprise and community organizations and many others. Actual electoral voting may also be on the horizon as security issues continue to be addressed. Interestingly, mobile phones are already being used by citizens to monitor elections. The Network of Mobile Election Monitors used SMS to feedback their observations on Nigeria's April 2007 presidential election. Volunteers texted their observations to a central database and the information was then shared with monitoring groups and authorities including the European Union.

Although official electoral voting by mobile phone is still in its infancy, governments are beginning to use mobile phones in other ways. In a close parallel to enterprise data aggregation by private organizations, government agencies have begun to discover the benefits of administering public affairs via the mobile phone. Known increasingly as m-government (mobile government), places such as Hong Kong and Malta are now using mobiles to allow license renewals, court deferrals, distribution of examination results, pollution notifications, and public facility status reporting.¹¹

Jamii Bora - Extending the Reach of Financial Services

Jamii Bora is one of the fastest growing microfinance organizations in Kenya. With a diverse client base and seventy offices spread throughout the country, the organization has a need for real-time information to help them administer their loan portfolio. Jamii Bora was already using a leased line solution to centrally manage its portfolio, but found it prohibitively expensive to link up its disparate branches to the existing system.

Jamii Bora enlisted Craft, a Kenyan banking software maker and innovator in mobile applications, to identify a better option. The company's new solution uses sophisticated point-of-sale (POS) devices installed in the field offices, each employing a GPRS (the world's most ubiquitous wireless data service) link to a central database. Produced by Sagem Montel, the devices cost \$1,000 each, and include a fingerprint scanner for secure client identification. They also rely on plastic membership cards that cost 50 cents each. The system, tailored to microfinance activities, provides Jamii Bora with complete automation, and its management and clients with real-time information about its accounts as well as immediate approvals for identification requests such as those needed to receive health care under their insurance plan.

The Craft solution has helped Jamii Bora manage its liquidity and cash, and enables them to more easily expand, either by deploying additional agents using the same POS devices or by joining Pesa Point or other ATM networks. The system has also helped to improve the organization's operations in other ways. For instance, the data transparency on mobiles exposed other data shortcoming and human control issues that are now being resolved.

Passive data collection can also take many forms. Although real world or BOP implementations are still rare, there certainly are opportunities for community benefit. A cutting edge example emerging from researchers at the University of California San Diego is a project dubbed Squirrel. Though not yet practically integrated within mobile handsets, the Squirrel project has explored how miniature air quality sensors can collect real-time air quality information via a network of mobile, palm-sized instruments that transmit data to a central database. This information collection can be completely passive from the phone owner's perspective. In the future, it is conceivable that sensors integrated with mobile phones could similarly be used to address water quality as well, which is a critical health, infrastructure and productivity issue in many BOP settings. Such passive systems hold out the possibility of far richer, more accurate and more timely environmental quality monitoring.

2.6. Facilitating Financial Services

Mobile phones are increasingly being used as a banking and transaction platform in emerging markets, a phenomenon that has been widely covered by other writers.¹² In low-income markets, mobile devices can deliver major improvements in security, convenience and range of services. In South Africa, for example, it is estimated that half of all bank accounts will be administered through mobile phones by 2010.¹³ Through services such as Wizzit in South Africa and M-PESA in Kenya, customers use their phones for a variety of purposes, including accessing bank account information, making payments on loans or other bills, and transferring money between accounts. Mobile banking (m-banking) has created a new option for transferring remittances, both nationally and internationally. Mobile phones are also functioning as e-wallets, storing cash in the form of real money or airtime credit. Informally, airtime is also being used to buy everything from a can of Coke to prepaid electricity.

The mobile phone can also improve operations between self-help groups and established financial institutions. Branded SHG MIS by its creator, (for "self-help group management and information system"), this solution by Ekgaon Technologies includes a phone-based application for entering and processing data, a text-messaging tool for uploading data to online databases, and a package of Web-based software for managing and reporting data to self-help group lending institutions.¹⁴ Since self-help groups traditionally rely on paper documentation and may be reluctant

to abandon the paper medium, the software also includes a bar-code-based system. Loan applications, grants, receipts, and other documents are printed with identifying bar codes; the software enables the phone to scan the code, identify the document, photograph it, process the data it contains, and associate that data with the specific bar code. The result is a system that facilitates a quick and accurate flow of financial data from small villages to bigger cities, and vice versa.¹⁵

3. Lessons Learned for Mobile Application Development & Implementation

As the above innovations demonstrate, the mobile platform is a key enabler for critical service delivery to low-income markets. Indeed, mobile phones and assorted devices seem poised to constitute the information and networking platform that will be utilized by the next billion consumers and producers as they become more active and increasingly productive members of the global economy.

Applications supporting the conduct of business in this market space have already moved beyond traditional communication via voice and SMS to begin providing true automation and efficiency. The momentum is substantial; many social enterprises are developing, utilizing or exploring mobile applications, and a number of business models based on this platform targeting the low-income market have already been successfully implemented.

Customers demonstrate a clear demand for mobile telephony as well as an ability to utilize it. Service providers have been increasingly successful in matching pricing structures to market conditions. Distribution of mobile devices is simple and efficient, as the product is relatively small, requires little maintenance or service and moves in high volumes with good profit margins. The digital nature of mobile services makes them inherently scalable and replicable, and straightforward to provide uniformly to a large user base. Mobile devices can also provide cost effective aggregation of buyers and sellers, which is critical to delivering efficiencies to transactions and markets in the low-income space. And, they have the potential to provide SIM or number-based personal identification, opening up the possibilities of more customized services, to consumers in this market segment. Organizations seeking to deploy, or support the deployment of initiatives relying on mobile devices should be alert to the key factors that generally determine success or failure of such projects.

3.1. Listen to Users Early and Often

Delivering products, especially those with a technology aspect, requires a proper understanding of the target market, and this is where top-down initiatives often fail.

A key issue is the need for language, and perhaps cultural localization. To be useful, applications need to function in a language that users can both understand and feel comfortable using. The linguistic variety in many developing countries can represent a significant hurdle in the development of applications intended to have broad appeal and usability.

Many community members still prefer to rely on their trusted network of family, friends, and relatives — rather than a technology device — to get their information. In addition, projects focused on working with women may discover that husbands ban their wives from owning phones.¹⁶

Identifying and responding to consumer preferences is also critical. When Smart Communications began its telecom offerings in the Philippines it courted the mass market of low middle and lower income consumers. As a result, nearly 98% of their subscribers are pre-paid, a service which appeals to cash flow conscious consumers.¹⁷ A recent presenter at the GSM 3G Africa conference noted that the success of prepaid services has surpassed expectations and constitutes the majority of wireless accounts worldwide.¹⁸ In Africa, 87% of mobile subscribers have chosen pre-paid service, the highest ratio worldwide. Any business model not able to respond to unanticipated levels of interest in pre-paid services would have suffered.

In addition to smoothing cash needs by allowing users to pay as they go, prepaid cards also provide a way for those with no credit, bank account, or fixed address to purchase airtime. This same innovation, however, creates a new challenge for those serving the prepaid market — ensuring that each user has sufficient credit in her phone to participate in a two-way exchange.

3.2. Contribute to Financial and Business Viability

In a business environment, the value proposition usually

comes from actionable information — such as sales reports, maps and location data, confirmations of orders, or changes in inventory levels. Metrics to ensure that the technology is having the desired effect need to be defined before a program is adopted. Since payment streams are not always easy to set up or to collect from a widely dispersed customer market, creative options such as tiered SMS pricing, and carrier toll charges for premium services should be considered.

In the case of cost-reduction and efficiency applications, it is critical to understand which costs will be lowered. While technology is considered to be cheap and labor expensive in developed countries, the opposite is true in most emerging markets. Depending on the relative local costs of technology and human resources, a technology solution that reduces the need for human involvement ultimately may not be as effective as keeping those human resources on the job.

3.3. Utilize Rapid Prototyping

Prototyping is the development of incomplete representations of a system or product for testing purposes. It is also a way to understand the difficulties of development and the scale of a problem. Prototyping is an essential element of an iterative design approach, where designs are created, evaluated, and refined until the desired performance or usability is achieved.

For mobile applications, initial prototypes should be “quick and dirty” to help identify problems with the model and to make improvements early in the design process when they can be modified quickly and inexpensively. For example, a developer can simulate an interaction with users (perhaps even drawing screen mockups on paper) before actually developing the code to provide it in real-time. This allows entrepreneurs to get a quick and early sense of how users will respond to such an application design. Key to any successful prototyping is to involve potential customers and their feedback throughout the design cycle.

3.4. Do Not Underestimate the Costs of Market Education

When introducing products to customers who may have little or no familiarity with the offering, it is a mistake to assume that they understand the content or that traditional market research can fully assess an opportunity. Unfamiliar offerings may require a very time-consuming and expensive education campaign. For

example, one of the challenges to the adoption of mobile banking is that many potential consumers don't understand the value of banking services in the first place. Even more basic can be the fact that in many BOP locations money has tremendous physical value. One can hardly blame users of currency for seeing cash as far more real than a fleeting icon that may appear on a mobile phone screen. Patience and a targeted marketing campaign aimed at customer education are often required to convince the end user of the value proposition of an unfamiliar service.

3.5. Recognize Incumbents and Regulatory Challenges

In most countries, there are few mobile operators. In addition, the mobile applications they choose to deliver (or allow) to customers are often network and/or phone-specific. Operators can act as virtual monopolies once a product or service is delivered on their platform. Highly interactive applications may need to be burned into the SIM card or phone memory at the time of manufacture, and others may need to be downloaded to the phone through the carrier's network. This gives network operators a huge "lock-in" capability and potentially limits the scalability and spread of network effects — the exponential benefit users get as more are connected to the network — since fewer users can leverage the application.

One way around this has been through the use of text messaging, supported by virtually every mobile phone without the need to install a specific application on the handset. Wizzit, a mobile banking provider in South Africa, is using USSD (unstructured supplementary services data) which can be cheaper and faster than SMS. The emerging generation of GPRS handsets that enables more direct connections to Internet applications and cheaper telephony through voice over IP (VOIP) — and therefore more independence and control on the side of the user — may ultimately limit the operators' control in this regard. For now this remains an obstacle that must be addressed.

Regulatory environments are also important to consider. Mobile banking services already established in South Africa may not transfer to other countries due to differing regulatory environments pertaining to financial transactions. One likely reason that mobile banking has spread so rapidly in sub-Saharan Africa and not in India or China is that the Chinese and Indian phone carriers are restricted in the financial services arena.

3.6. Heed Hardware Limitations and Existing Technology Usage

Technology typically incorporates a trade-off between cost and usability, but there is a point where limited functionality prevents usage of a particular application. Cheaper may not always be better, and in many cases determining the balance between available capacity (i.e. the existing phones owned by users) and a more expensive but more flexible platform (i.e. PDAs and smartphones) will be challenging.

The design of mobile phones — with minimal power and charging needs, a long life with little maintenance, a relatively low price and general resistance to viruses and abuse — makes them a generally easy and cost-effective platform to utilize. However, individual characteristics like network type, availability of data services in the target region, privacy and security features and a lack of standards around features such as screen resolution, and memory are still major issues for application developers. For instance, the GSMA Emerging Market Handset Program¹⁹ was created to design a sub-\$30 mobile phone intended for the developing world. The results, Motorola's C113 and C113a, are low-cost, but stripped of many features that could enable other applications beyond voice and basic SMS. Potential users of those handsets will have to recognize and understand their limitations.

3.7. Acknowledge the High Costs of Technology and Implementation

While mobile technology prices have seen rapid decreases in recent years, hardware and implementation costs still remain out of reach for many of the organizations, entrepreneurs, and end users who could benefit from their use. Mobile application development usually carries an upfront cost covering programming, setup, and hardware if needed, and an ongoing cost to cover short codes, data transfer and messaging. Finding the human talent to deploy new applications, or creating financing arrangements to help defray the upfront costs, have both proven challenging.

One potential remedy is to use a platform provider that offers the basic building blocks and tools to create such applications, and charges a monthly or per usage fee instead of upfront sums. This minimizes the expense for the enterprises and provides an annuity for the service provider itself. In any proposed solution, the differing costs for voice, data, and SMS services need to be

Mobile Project Implementation Checklist

Inspired by the visions, accomplishments and creativity of some of the projects described, and informed by the lessons and insights gleaned from those BOP ventures, social entrepreneurs, NGOs and technologists often ask “what’s my next step?”. While diverse applications, technology environments and cultural settings make it impossible to provide highly detailed guidance, there are several fundamental considerations for any entrepreneur as they consider implementation. The following checklist is intended to provide a general roadmap to success.

- + **Write It Up**—Prepare a 2–3 page Project Summary that identifies a need (quantify expected impact and measures of success wherever possible); describes past or existing attempts to meet that need (face the “competition”); proposes your remedy (keep the description simple); asserts the likely benefits of your approach (do your best to quantify potential outcomes); and identifies potential stakeholders (see steps 2 and 3).
- + **Focus on Outcomes**—Identify the explicit outcomes against which you will measure your success. Your performance metrics should be quantitative and concrete: be careful to measure outcomes rather than mere outputs.
- + **Assess the Stakeholder Landscape**—Identify any existing or potentially relevant programs, NGOs, partners, collaborators, or facilitators that share complementary goals or missions. Collect their contact information and prepare to selectively share parts of your Project Summary.
- + **Go Local**—Recruit and enlist individuals who can provide local perspective, insight and market intelligence. Don’t forget to include potential customers in this mix. Return to them and solicit their views often as the project evolves.
- + **Identify Cultural and Linguistic Considerations**—Beyond whatever considerations you’ve highlighted in your Project Summary, make detailed observations – and review them often – regarding possible cultural or linguistic roadblocks. Visiting the markets you intend to serve is an absolute must!
- + **Try On Your Marketing Hat**—Equipped with local insights and an awareness of cultural conditions, prepare a 1-page bulleted “sales sheet” that addresses the needs, preferences and prejudices of your end users. You need to close the gap between what they need and what they’ll buy. You’ve made some incorrect assumptions; fix them.
- + **Regulatory Assessment**—Identify, and factor in, the regulatory or enforcement drivers and barriers that may influence your project implementation.
- + **Borrow from Others**—Startup can be costly. As described in “Don’t Reinvent the Wheel” on the next page, spend time and resources to uncover previous attempts to address similar or complementary problems in other settings. Can you succeed where they haven’t? Contact those parties to hear their experience, lessons and recommendations.
- + **Seek Technical Validation**—Make sure a technical expert helps validate or inform your assumptions and expectations.
- + **Outline Tasks**—Establish a list of concrete and specific tasks and activities that will be necessary throughout implementation from startup to ongoing operations, maintenance and completion/dissolution (if relevant). Be sure to note the estimated timing and duration of all tasks. Take into account any emerging regulatory or technology factors.
- + **Identify Human Resource Needs**—Based on the task outline, identify the types of expertise you require and where you will go to get the talents you don’t already have.
- + **Track the Money**—Develop a realistic, detailed and dynamic financial prospectus that estimates financial resource needs in the immediate (0–6 month), medium (6–18 month) and long terms (18+ months).

considered, particularly if the application will be implemented in multiple countries. The open source movement and efforts such as Android (a suite of software for mobile phones based on open-source technology championed by Google), may also help to lower development costs.

3.8. Think Like a Network

The general paradigm of one-to-one sale of services ignores the latent value of the network provided by the vast number of consumers using it. Innovative applications will include features that catalyze network growth and capitalize on large numbers of users in the same way that the most addictive Internet applications (eBay, YouTube, Facebook, etc.) increase in value based on the numbers of visitors and subscribers. Clever BOP applications will also leverage the number of users and data usage to find creative ways to pay for service delivery. Additionally, requiring each user to buy a phone and then purchase credit as a first step may be misconceived in a world where soon the value of information and content (disseminated or collected) will be more than the value of providing the phone and network airtime itself.

Services that match “buyers and sellers”— blood banks, job boards, and used product listings— all suffer from a lack of critical mass in their initial phases. Without sufficient traffic or subscribers the service is not appealing enough to generate new users. Offering special incentives (including direct payments) to early adopters is one strategy for quickly creating a large subscriber base. Applications that provide a revenue stream for the target users themselves often grow most rapidly.

3.9. Don't Reinvent the Wheel

Are your stakeholders' needs completely unique, or do the same types of challenges exist in other industries or geographies? In addition to the examples already noted, there are several web sites focused on technology and BOP solutions. Many practitioners embrace an “open source” attitude, and are willing to share and receive input from others working on leading-edge applications. Some of the more prominent sites and online publications useful to social entrepreneurs are located at:

- + nextbillion.net/blogs/topic/telecommunications-and-it
- + nextbillion.net/blog/17
- + youcanhearmenow.com

- + vodafone.com/etc/medialib/attachments/cr_downloads.Par.3477.File.dat/VOD833PolicyPaperSeriesFINAL.pdf
- + gsmworld.com/digitaldivide/index.shtml
- + kenaninstitute.unc.edu/cseResources/
- + <http://blog.ted.com/>
- + <http://mobileactive.org/>
- + <http://kiwanja.net/>
- + <http://frontlinesms.kiwanja.net/>
- + <http://eprom.mit.edu/whyafrika.html>

4. The Future of Mobile Applications

As Apple's recently released iPhone demonstrates, mobile devices are already using processors more powerful than computers used several years ago, and will soon feature even richer computing capabilities. While premium handsets are much more powerful than those used in most developing-country scenarios, entry-level devices also evolve rapidly. More advanced phones will continue to open up possibilities for improving existing uses and deploying entirely new business models in emerging markets.

Peripheral devices common to desktop PCs are also being adapted for the mobile platform and are evolving rapidly. For example, HP Labs in India developed the Gesture-based Keyboard,²⁰ an electronic pen-based device that can be used to create text in languages that use phonetic scripts, rather than the Roman alphabet common in Western languages. Mobile phone printers are also being produced by companies such as Fuji²¹ and Brother²². Other technologies such as voice recognition software and thin folding screens have a similar potential for impact. Such devices could empower a mobile entrepreneur to provide many of the same e-government services that some village-based telecenters provide.

Over the past decade, these shared-access computer centers have become a popular (and sometimes profitable) way to provide access to computers, the Internet, and other digital technologies and information in emerging markets. With lower up-front costs, easier maintenance, and wider availability, the mobile phone can fulfill many of the information sharing activities that telecenters now perform, even providing connectivity to the Internet. Mobile networks also provide the added benefit of privacy, making it a much better platform to disseminate culturally taboo information about things like sexually transmitted infections and reproductive health. Of course, the user interface may not

be as friendly, and there will be limitations to how complex and interactive a mobile application can be. In the absence of competing alternatives, however, even today's most basic mobile devices can be a powerful platform for sharing information.

Perhaps more profound is the ability for the phone to act as an identifier in much the same way that a national ID card or identity number does today. Based on purchases and spending patterns made through the phone, credit agencies will be able to determine a mobile owner's credit ratings and advertisers will know product preferences. Government agencies will soon be able to conduct census data and issue land titles based on the "phone as address" and are already conducting voter and university registration, and providing entitlement benefits through mobile devices.

A number of untapped opportunities are on the horizon as organizations increasingly view mobile networks as a new way to conduct research, open new markets and develop new products. The imminent creation of WiFi mesh networks³³ and increased use of VOIP-enabled phones will cause plummeting voice and data transfer costs, furthering innovation in the sector. Simultaneously, mapping and GPS tools will steadily become more utilized, particularly for collaboration and rural supply chain management. Many solutions are in pilot or test today, but this is likely not a fad as the installed base, and behavior patterns supporting them, are becoming increasingly entrenched.

There is also a concurrent emergence of skilled solution providers with mobile expertise, and platforms making mobile application design faster and cheaper. These providers, however, have not yet focused on making low-cost, simple applications affordable and deployable by enterprises focused on the BOP, but that is certain to come. Two companies that have deployed this service are Frontline SMS, an open source platform offering a complete SMS solution that runs off a PC with a mobile phone or SIM card, and Voxiva, a platform provider for SMS solutions primarily in the healthcare space (profiled on page 7).

5. Conclusions

Social enterprises are increasingly realizing that mobile applications allow them to more effectively service low-income communities, aggregate information for the benefit of the users they serve and—for their own operations—realize true business

returns. The widespread use of mobile telephony ensures that new applications can be developed and widely disseminated quickly, and at a relatively low cost for each additional user. While today these applications are generally in early stages of development or deployment, they seem almost certain to multiply and increase in impact as they are inherently scalable and replicable.

Social enterprises must continuously examine how their operations can be optimized with the inclusion of mobile-driven solutions, viewing mobile applications as an opportunity to drive down costs and improve service delivery and data collection in low-income markets. Funders, investors, and technology providers also need to realize and act on the emerging potential for financial and social return on investment within the mobile applications space.

The most immediate targets for further exploration include platforms and tools to simplify the development of mobile applications, and better integration of these solutions into the programs and goals of social entrepreneurs and their partners in technology, finance, business, government and development.

It is tempting to look at the projects, experiments and opportunities that are growing up around the mobile phone and conclude that the next bright idea will have to be sufficiently complex and innovative to win success. But while many of the challenges faced by BOP residents may be long-standing and complicated, some remedies can be surprisingly simple. The mobile phone has been demonstrated as a platform for modest and incremental creativity that can have far reaching benefits in low-income settings.

Lastly, the utilization of mobile phones to develop and deliver many of the products, services and benefits described above can and will serve as a model and a catalyst for entrepreneurs across a range of markets and applications that may have little to do with mobile telephony. Just as Internet pioneers inspired new thinking and new approaches to developing and delivering products and services in virtually every corner of the economy, so too will the mobile phone open new doors and inspire creative action for the widest possible variety of entrepreneurs at the base of the global economic pyramid.

Mobile Application Assessment Framework

This framework provides a practical methodology for assessing the feasibility, benefits and likely disruptive impact of various existing or emerging mobile phone applications. The representation below is by no means an exhaustive list of BOP applications but is intended to allow and encourage entrepreneurs and stakeholders to begin evaluating their own ideas and innovations.

The figure captures three critical dimensions of project potential — Feasibility (horizontal axis), Social/Economic Benefit (vertical axis) and Disruptive Impact (volume of bubble).

Disruptive Impact is a measure of how great a departure from existing practices a particular application may be. For example, electoral voting by phone may represent an incremental (but not insignificant) change in a setting where voting was already taking place, albeit by paper. Mobile banking, on the other hand, might be a hugely disruptive innovation in a setting where non-barter transactions, savings or other financial practices may have been previously nonexistent. Obviously, the level of disruption associated with a single application can vary greatly among countries, regions or even villages, so we have attempted here to aggregate the impacts across all BOP settings.



* Feasibility represents an aggregate summary that accounts for the financial, technical, cultural, political and regulatory constraints that are likely to bear on a specific project.

The size or volume of each bubble is an indication of the level of disruption that the proposed application or solution represents compared to previous or existing tools or practices (if they exist at all). The larger the bubble the greater the level of disruption.

Notes

- ¹ reuters.com/article/technology-media-telco-SP/idUSBOM2809820071003, internetworldstats.com/stats.htm
- ² reuters.com/article/companyNewsAndPR/idUSL2712199720070627
- ³ wri.org/business/pubs_description.cfm?pid=4142
- ⁴ The ‘poverty penalty’ describes the phenomenon that poor people tend to pay more to eat, buy, and borrow than the rich. The term became widely known through a 2005 book by C. K. Prahalad, “The Fortune at the Bottom of the Pyramid”.
- ⁵ oecd.org/dataoecd/27/0/38563109.pdf
- ⁶ Author’s interviews with MTN Village Phone Operators in Uganda, July 2007. For a broader discussion on this issue see fastcompany.com/magazine/118/unplanned-obsolence.html and kiwanja.net/blog.htm (“Let’s not write it off quite yet”)
- ⁷ manobi.net/worldwide/
- ⁸ mobile4good.com/
- ⁹ google.com/intl/en_us/mobile/sms/
- ¹⁰ Allen L. Hammond et al., *The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid*, published by the World Resources Institute 2007, Pages 44
- ¹¹ Hong Kong (info.gov.hk/digital21/e-gov/eng/init/mgov.htm), Malta (gov.mt/egovernment.asp?p=106&1=1)
- ¹² An excellent report on “Micro-Payment Systems and their application to mobile networks” was published by infoDev in January 2006 (infodev.org/files/3014_file_infoDev.Report_m_Commerce_January.2006.pdf). Nick Sullivan’s book “You Can Hear Me Now” also offers an excellent discussion on mobile banking and how it is connecting the world’s poor to the global economy (youcanhearthenow.com/?page_id=37).
- ¹³ vodafone.com/start/responsibility/cr_dialogues/dialogue_3_-_economic.html
- ¹⁴ technologyreview.com/TR35/Profile.aspx?TRID=619
- ¹⁵ <http://business.iafrica.com/features/649690.htm>
- ¹⁶ Email comments from Ken Banks, founder of Kwanja.net, on his work in Uganda in August 2007.
- ¹⁷ digitaldividend.org/pdf/smart_communications_case.pdf
- ¹⁸ itu.int/ITU-D/ict/statistics/at_glance/Africa_EE2006_e.pdf
- ¹⁹ gsmworld.com/emh/
- ²⁰ http://exch.hpl.hp.com/india/press/news_20060318.html
- ²¹ amazon.co.uk/Fuji-MP100-Mobile-Phone-Printer/dp/B00083HA5C
- ²² iqu.com/article1169.html
- ²³ usaid.gov/our_work/economic_growth_and_trade/info_technology/tech_series/Rural_Connectivity_508.pdf

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