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The Use Of Mobile Phones For Development In Africa: Top-Down-Meets-Bottom-Up Partnering

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Abstract

The African continent currently boasts the highest mobile telephony growth rates in the world, bringing new communications possibilities to millions of people. The potential for mobile phones to reach a large and growing base of users across the continent, and to be used for development-related purposes, is becoming widely recognized, evidenced by the growing number of development-oriented projects, applications, and programs that specifically make use of mobiles. Pent-up demand and limited resources have led to innovative usage and services being developed at the grassroots level. Yet much remains to be done by governments in order to support further growth of telecommunications markets and services, while the private sector, non-profits, and academics all have an important role to play in the development process as well. The phenomenon of top-down-meeting-bottom-up partnerships that are springing up across the continent offers the potential for cultivating the necessary feedback loops between various actors involved in the development process, in order to create relevant applications that meet real needs.

Keywords: Top-down-meets-bottom-up, development, mobile technology, Africa, innovation, ICT

Introduction

For at least the past decade, political leaders and policymakers have been stressing the paramount need for Africa to harness technology in order to join the information society and take part in the global knowledge economy (see, e.g. Akpan, 2000; Southwood, 2008; Farrell & Isaacs, 2008). The significance of achieving this development goal for the continent has been articulated as such: "To be left out of the information revolution will be a consignment to irrelevance and eternal oblivion" (Jimba, 1998, p. 68). Many have speculated that due both to the absence of land-line infrastructure in Africa and to the new wireless technologies available for ICT connectivity, the continent may be able to leapfrog the traditional development trajectory, adopting the newest, cutting-edge, high-speed technologies that would usher in the ICT revolution (see, e.g. Jensen, 1998; Nevin, 2000).

These predictions have been partially right: Africa is indeed experiencing an explosion of mobile phone sales, and currently is the world's fastest-growing wireless phone market—a boom that has exceeded all expectations. This explosion is certainly good news for the continent, in terms of economic development and quality of life improvement, as people are able to communicate as never before. There is an extremely important role to be played by mobiles in the context of African development, and a great deal of creativity has been exhibited in the creation of applications which take advantage of the mobile phone's capabilities. However, the predictions that foresaw millions of computers and laptops across Africa connected to satellite-provided Internet at low prices, contributing to a continent racing towards the information age (Fleming, 1996) have been far off the mark.

Unfortunately, the hyperbolic rhetoric referenced above sheds no light on effective policy formulation or on methods to effectively confront development challenges, and in fact can lead to unrealistic expectations and create an aspirations gap—not the desired result. This article will highlight some of the breakthroughs and the development possibilities promoted through the use of mobile phones, while arguing that an important area for future research, theory-building, and development activity is at the nexus of where bottom-up needs and innovation meet top-down capabilities and funding. Such partnerships can potentially address sustainability issues, and create a feedback loop between needs identification and technological expertise. Many of these initiatives involve partnerships, which can be between communities, companies, and universities, and can also involve individuals such as entrepreneurs, researchers, practitioners, and students. Numerous examples of such initiatives are presented, and the article also makes an initial step in the direction of building a theory of top-down-meets-bottom-up partnerships for development projects.

The structure of the article is as follows. The next section gives a brief overview of mobile telephony in Africa. This is followed by a discussion of the concept of mobile phones being used as tools for development. Next comes an overview of top-down development initiatives, followed by a section highlighting bottom-up innovation, specifically using mobile phones. The subsequent section brings these together and highlights partnerships involving “bottom up” meeting “top down,” while also discussing the potential of such partnerships. The following section describes socio-political development potential vis-à-vis mobile phone use. Finally, the article discusses the challenges that remain in promoting further development with the assistance of mobiles.

Mobile Telephony in Africa

Estimates of Africa’s average annual growth rate in mobile subscriptions stand at 65 percent or higher. This is the highest growth rate in the world. In 2001, the number of mobile phone connections surpassed the number of land-line connections on the continent, and the number of mobile users has only continued to grow: 89 percent of African telephone subscribers are mobile users (ITU, 2008). The International Telecommunications Union reports that as of 2007, the percentage of mobile phone subscribers in Africa had reached 28 percent, even though continent-wide coverage had only reached 60 percent (ITU, 2008).

Even so, macro-level statistics such as these are inherently misleading, both because the notion of a subscriber in the developing world is complicated and shared use of phones tends to underestimate the actual number of users (de Silva & Zainudeen, 2007), and because they do not reflect the disparity between connectivity in urban and rural settings. The vast majority of connectivity takes place in the major or capital cities across the continent. In rural locations, where the World Bank estimates that 65-70 percent of Sub-Saharan Africa’s population currently resides,^[1] connectivity is still nearly nonexistent. Different countries comprising the continent are not equally serviced, either: South Africa and Gabon have the highest mobile phone penetration rates, with around 87 phones per 100 persons, while Eritrea and Ethiopia have the lowest, with approximately 1.4 mobile phones per 100 inhabitants (ITU, 2008).

Curwen and Whalley (2008) estimate that in fact only a few African countries have what can be termed a large subscriber base: South Africa (30 million), Nigeria (18 million), Algeria (13.5 million), Morocco (13 million) and Egypt (12.5 million). A few other countries have between 1 and 5 million subscribers, and many of the rest fewer than half a million subscribers. This suggests much future growth, keeping in mind potential economic constraints.

The Potential and Limitations of Mobile Phones for Development

There is broad agreement among scholars that the adoption and use of mobile telephony in developing countries has positive economic effects, even though

estimates of these effects vary. Waverman, Meschi, and Fuss (2005) have found that mobile phones are having a positive and significant effect on economic growth in developing countries. In fact, they find that because mobile phones provide the primary method of communications in developing countries with no or few fixed lines, the growth impact for developing countries may be twice as great as for developed countries, in which attributable growth would be split between fixed-line and mobile-phone use.

Similarly, Garbacz and Thompson (2007) have found that countries with less developed ICT use may experience stronger general economic growth due to the use of mobiles. In their analysis of the relationship between mobile use and growth in African WTO-member nations, Keck and Djiofack-Zebaze (2006) find that a 1 percent increase in access to mobile networks may result in a 0.5 percent increase in real GDP per capita.

Mobile telephony can lead to economic growth in a number of ways, both directly and indirectly. The telecom sector itself also generates employment, which ranges from construction workers needed to carry out infrastructure deployment, to service-related employees, to gray sector workers who sell top-up airtime cards along the side of the road. The use of mobile phones to conduct business reduces costs and increases the speed and efficiency of transactions. In African nations, the micro-entrepreneur stands to gain the greatest amount from use of the mobile phone (UNCTAD, 2007). Unfortunately, one reason that it is mainly the micro-entrepreneurs that stand to benefit economically is because across the continent there is an underdeveloped Small and Medium Enterprise Sector—a phenomenon known as the “missing middle” (Kauffmann, 2005), a term coined in the context of Africa to describe an economy consisting of both micro- and macro-sized participants (and often dominated by foreign-based multinationals).

This point leads us to a larger, and thornier, issue regarding mobile phones and development. Although there is great reason for optimism in the growth rate of mobile phone adoption and increased communications capabilities across the continent, there is simply no reason to be content to stop with mobile phones, for they—as well as technology itself—represent incomplete solutions to greater development challenges. The history of economic growth is a story of technological innovation and adoption (Easterlin, 1996; Sachs, 2005a). Yet the simple provision of and access to technology is necessary, though it is far from sufficient. ICT's impact on economic growth (and socio-political development) depends not only on its own level, but also on the level of other complementary factors (Edwards, 2002). Perhaps the most important of these factors is the level of human skills and capabilities required to make use of the new technologies. The most effective method for states to develop such capacities is through education (Lee, 2001; Jamali, Wandschneider & Wunnava, 2007).

Developing an economy populated with a workforce that is able to access, adopt, and create technology for its own advancement is a worthwhile goal, but it will take an honest, circumspect evaluation of whether and how technology can enable, empower, and enhance existing experiences, and a rejection of the too-simplistic notion that technology alone is the answer that will change everything (Adelman, 2001). If technology is to be adopted, this will require a long-term investment on the part of governments and all participants and shareholders, first in human capacity building, and second, in the technology projects themselves. There are numerous other areas in which governments must actively assist in realizing these development goals. Some of these will be addressed below.

In addition, it is also important to recognize that focusing on mobiles alone and relying on them to lead the African continent to economic growth is not a satisfactory endpoint. There is a difference between a populace that is able (enabled) to communicate and one that is able to access, process, use, synthesize, and produce information and technology—in other words, the difference between experiencing a communications revolution and entering the information society to participate in the knowledge economy. The requisites for achieving an information-

literate society differ in terms of skill sets, capabilities, investments, infrastructures, and timelines. While it will remain essential for all nations across the continent to continue promoting and enabling ICT adoption within their borders, the presence of mobile phones has already provided inspiration for the creative and thoughtful development of a multitude of relevant applications that allow people to enhance their political, social, and economic capabilities through the use of these technologies (Marsden, 2008).

While we recognize these limitations, mobile telephony is, in the short to medium term, expected to be the main form of ICT used across Africa (UNCTAD, 2007), thus this article will explore how mobile technology can be maximized for social and economic benefit across Africa.

Changing the Traditional Top-Down Strategy

Over the past few years, in large part due to the work of C.K. Prahalad (2004), there has been a growing recognition of a largely untapped potential market: the four billion people at the “bottom of the (economic) pyramid” (BOP). The acknowledgement of this segment of the population as a potential market represents an attitudinal shift on the part of large, Western multinational corporations (MNCs), which are now eager to expand their reach to include it.

However, Quadir challenges the top-down strategy that generally has been employed with BOP initiatives: simply treating the poor as consumers does nothing to increase their incomes or therefore their purchasing capacity, nor does it stimulate much-needed entrepreneurship (Quadir & Morse, 2003).^[2] Thus, given the large number of “early mover” (and mainly top-down) initiatives that have failed in recent years (London & Hart, 2004), there is also a growing comprehension that reaching this group and realizing successful ventures will require a new business strategy—one heretofore not addressed in the literature or theory of emerging market business models.

MNCs interested in doing business with BOP residents may be wise to consider projects that add societal as well as economic value. In practical terms, this also means that engaging a bottom-up approach will lead to greater chance of project success. By understanding what the technology recipients in the developing world truly want and need—what their pressure and pain points are, as well as what their unique societal concerns may be—projects are more likely to address existing needs and, as such, stand a much better chance of succeeding than those thought up by a research and development team in a far-off locale with the aim of selling a product that their company already makes.

One method for corporations to understand the needs of the poor is to engage directly with them. Nokia, for example, sends “user anthropologists” around the globe to engage directly with the poor in order to uncover what they would find of value in a mobile phone (Corbett, 2008). Nokia has used innovation from the bottom to become the handset leader in India by using its innovation to create 200 million customers. Through observing the unique needs of Indian customers, particularly in rural villages where most of the population resides, it segmented them in and put new features on handsets relevant to their unique needs.

Another method identified in the literature is to engage in partnerships (Hosman & Fife, 2008). While the case has been made for Public-Private Partnerships, and these are currently held in extremely high esteem by governments, NGOs, development organizations, and firms alike, a new form of partnership—that of partnering with universities and researchers, will be described below. Such partnerships may help corporations radically redefine their role in the developing world, in terms of not taking a technology-centric approach nor even a profit-oriented approach in their attempts to find the best solutions to a given challenge. There are signs that corporations are open to adopting such an approach: in a recent interview, Bill Gates indicated that Microsoft is open to such a “creative capitalism” approach (Kinsey, 2008).

Developing The Business Model For Bottom-Up And Top-Down Mobile Phone Usage In The African Context

Research communities are growing steadily around the study of mobile phone use in the developing world—several areas of study can be identified, including: a. the factors that drive adoption, b. the impact of use, and c. the relationships between mobile communications and users (Donner, 2008). Within these categories can be found a multitude of approaches, frameworks and definitions, often derived from disciplinary origins of the activity such as sociology, developmental economics, private enterprise efforts, or policy reports. We argue here that a common language for assessing and describing mobile solutions could be developed through the use of a business model framework which could be specifically relevant for collaboration between public and private entities and the world of practitioners and researchers.

The critical question of “who pays?” and the possibilities for revenue generation in the long term are often roadblocks to investment in rural and poorer areas of both developed and developing markets. Showing return on investment is needed to develop convincing models that will drive comprehensive solutions in healthcare, governmental services and other areas. Making the business case for sustainability, we argue, will help galvanize institutions and private industry to move forward. One example of this approach is the “Budget Telecom Model” described by Samarajiva and Zainudeen (2011), who show how mobile operators in Bangladesh, India, Pakistan and Sri Lanka have been able to make profits while serving customers at the bottom of the pyramid through technological and service innovations and depth of understanding of mobile phone behavior patterns. The success of mobile operators such as Bharti Airtel in India and recent expansion into many African markets will perhaps usher in similar business models (Samarajiva & Zainudeen, 2011; Fife & Dewan, 2011). Thus far, Bharti Airtel has faced difficulties, however, in bringing its affordable mobile service model to rural Africa, given its challenge vis-à-vis established regional carriers such as MTN and Vodacom.

A standardized framework for describing the business model for broadband that allows classification of current and future business models based on the categories identified below is proposed. This will support knowledge building and creation of an ongoing business model repository. The particular model suggested here is the VISOR model, which is composed of five elements that constitute its acronym: the Value proposition, user Interface, Service platform, Organizational model and Revenue model and includes analysis of relevant IS and IT factors which may be important differentiators in the delivery of digital applications, services and general access (El Sawy & Pereira, 2011). It also allows for modeling of likely evolution paths of a business model as the effects of change develop further.

Considering the development of mobile infrastructures in the African context from a business model standpoint with a unified framework, such as the VISOR model that brings together multiple elements and underlying drivers, can support thinking about development activities that are by necessity based on use cases that drive revenue to support a mobile infrastructure. Most importantly, it will allow a healthy interaction between research and practice in a way that advances both. Researchers will have a better common language and framework to communicate with, which will help them generate new types of business models specific to the developing world, and practitioners will have a way to examine the universe of models with the same language, allowing interaction between the two groups.

The term “business model” is often employed in many ways and frequently addresses only one element, such as revenue, growth opportunities or the firm’s internal processes, which include administrative processes and management, as well as the technology infrastructure that enables production or service delivery (Schafer, Smith & Linder, 2005). The VISOR model attempts to integrate several different approaches to business model development, and also includes unaddressed key elements, such as the user experience and interface factors (El

Sawy & Pereira, 2011). While these factors are not explicitly recognized in many approaches, they figure prominently in theories of diffusion of innovation and are equally relevant to technology offerings in the developing world where “appropriateness” and “fit” are often issues.

At its core, a good business model must address a few central questions, as Peter Drucker is quoted, “Who is the customer? And what does the customer value? ... How do we make money in this business? What is the underlying economic logic that explains how value can be delivered at an appropriate cost?” (Mageretta, 2002). These questions are even more critical for serving needs in resource-strapped environments where affordability, value and ease of use are requirements.

In these respects, the VISOR model, illustrated below in Figure 1, shows the core elements of a complete business model and includes how a firm responds to customer/user needs, latent or established, thus creating and delivering maximum value to the customer in a sustainable manner, and optimizing cost of value creation. A successful business model then, is one that is able to deliver the greatest value, maximizes willingness to pay on the part of target users, and also minimizes the real cost (tangible and intangible) for the provision of services. This is achieved through the optimal mix of the interface experience, service platforms and the organizing model.

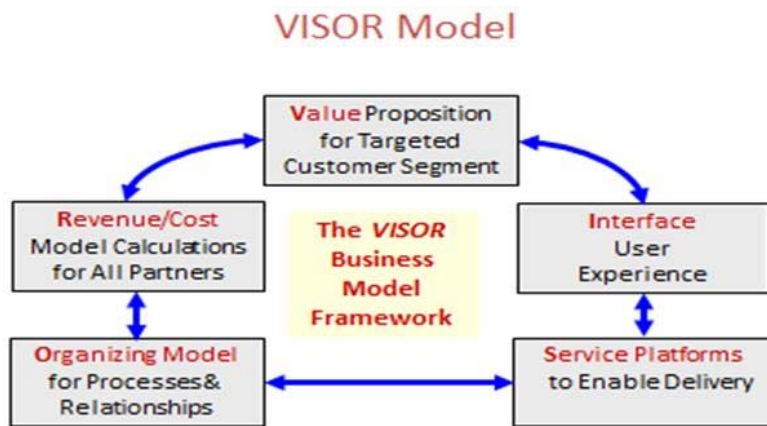


Figure 1. Elements of the VISOR model

Value Proposition

“Value proposition” addresses why particular customer segments value a product or service and are willing to pay for them. Willingness to pay, which also assumes the ability to pay, an added tension in resource-deprived environments, is a direct function of whether applications provide “value creation” in that they satisfy an unmet latent end-user demand, or “value substitution” in that they provide an alternative means to an existing application or service. Given ability-to-pay issues in the developing world, creative ways of addressing this critical element are key.

Interface

The successful delivery of a product or service is heavily predicated on the user interface experience in terms of ease of use, simplicity, convenience, and aesthetics. For instance, the use of cartoon figures and other representations as a replacement for text-based services have been developed to meet the needs of an illiterate user base.

Service Platforms

The IT platforms that enable, shape, and support business processes and relationships are needed to deliver products and services, as well as to improve the value proposition. Keeping in mind infrastructure limitations and device

accessibility, as well as training, service, and maintenance issues, technology requirements need to be scaled for the environment and existing capabilities. For instance, it is difficult to make the economic argument for broadband fiber to the home in “hard-to-serve” areas where incomes are low, population is sparse; alternative infrastructure such as wireless may be the best solution.

Organizing Model

This describes how an enterprise or a set of partners will organize business processes, value chains, and partner relationships to effectively and efficiently deliver products and services. The collaboration between a multitude of public and private entities is the current trend in many development projects; understanding the mechanics, interests and motivations in these partnerships is necessary, as well as management of stakeholders.

Revenue Model

In a good business model, the combination of the value proposition, the way that offerings are delivered, and the investments in IT platforms are such that revenues exceed costs and are attractive for all partners. The sustainability (i.e., capacity to create revenue) of a project or service needs to be identified and cultivated. In the case of the “Budget Telecom Model” this entailed mobile operators understanding income patterns of consumers, for example shifting from larger-denomination top-up cards to electronic micro-top-up cards of small denominations (Samarajiva & Zainudeen, 2011)

Innovative Bottom-Up and Top-Down Mobile Phone Usage in the African Context

Consideration of business models is a means to bring together bottom-up innovation and top-down solutions. Regardless of the use-case for mobile devices—personal communications between friends and family members, or as support to an inadequate public health care system—in the end, provisioning, servicing and other elements that make mobile technology available must have resources to support maintenance and growth. Bottom-up innovation is often driven by high necessity and very tight budgets of those occupying the “bottom of the pyramid,” while top-down innovations are created by those trying to discover how to make money while providing services to these same poor people. Interaction between the top and bottom can exist, however, when deliberately managed.

The level of innovation demonstrated from the bottom has been impressive, to the point where global companies have started to talk about applications “trickling up” from developing to developed world markets (Kahn, 2008; Marsden, 2008). Ironically, the developed world may be behind in adopting some of the newest technologies, because technologies obsolesce slower than they can be invented. Thus, when people have finally adapted to the latest “new” technology, they may be loath to re-adapt a short time later when the “newest new” technology comes out. This can mean that the latest technologies are deployed in the developing world because of the very cost savings enabled by the new inventions. As a result, VoIP and long-distance wireless technologies are currently being deployed in remote and rural locations around the world. These projects were unimaginable just a few years back, but the cost savings realized by technological breakthroughs have now made them feasible (Hosman & Fife, 2008). It also means that numerous multinational corporations are pioneering their new products and even locating facilities in the developing world, as they try to figure out how to do business there—and are discovering that they may need to radically rethink their business models, and how they produce, invent, design, and market their products and services (Kahn, 2008; London & Hart, 2004).

The following are examples of bottom-up inventiveness demonstrated by those with limited budgets:

- Beeping—the practice of sending an unanswered call, ring, or “beep” to

another phone, with a code that is understood by both sender and receiver. For example, one ring may signify "Call me," while two rings may mean "I made it home safely." Beeping has no cost, as an unanswered call accrues no charges (Heavens, 2007).

- Taking beeping one step further, Cell-life (www.cell-life.org.ze), a charity organization focusing on HIV/AIDS issues, sends short message service (SMS) messages out to all missed calls (beeps) that the health clinics receives, thus pushing information back to inquirers at no cost to them (Marsden, 2008).
- Fishermen in Tanzania and elsewhere use text messaging to receive weather reports, as well as to ascertain market prices before bringing their fish back for selling (Wray & Mayet, 2007).
- Farmers also use text messaging to check prices at local markets to ensure they get a fair price for their produce.
- Services have been set up that send text alerts to jobseekers about potential employment opportunities, which saves time and travel costs.
- Small business owners send text messages to keep in touch with their customers.
- Mobile phone airtime is being used directly as currency. This obviates the need for paying a middleman to transport money from one location to another.

In Uganda, local conservation groups halted the planned sale of a section of the country's Mabira rainforest after collecting over 11,000 names on a petition that was conducted purely through SMS. They collected the names through an online petition people could access through their mobile phones (Jay, 2007). Many of these innovations make use of SMS, or "texting," in original ways, to accomplish tasks that people in wealthy countries are able to do in other ways.

To give some examples of corporations pioneering their latest products in the developing world:

- Motorola has developed the "Motophone," which is thinner than its popular Razer phone, gets up to 400 hours of standby time on a single battery charge, and has a special screen designed for text messaging that works using reflected light, and thus has no need for an internal lamp. It is anticipated to retail for just \$30 (Kahn, 2008).
- Intel has been testing a specialized Wi-Fi platform that can send data over antennas located over 60 miles apart from one another. This breakthrough represents a great step forward for rural areas where it is too expensive to lay cables. Intel has already installed and tested the hardware in South Africa, India, Panama, and Vietnam (Greene, 2008).
- Metropolitan Life Insurance Company has created a business unit called Click2Go that makes it possible to buy life insurance instantly, simply by sending one's name and national ID number by SMS. This service costs R10 (US\$ 1.30), covers a person for six days, and pays out R60,000 (\$7,811) in the case of accidental death (Clickatell, 2007). This service essentially provides just-in-time life insurance to anyone with access to a mobile phone, with no need for medical tests, paperwork, or visits to brokers, and thus provides coverage to many who may not have considered it a possibility before.
- MTN Nigeria, Celtel and Safaricom offer pre-paid top-up cards both in Africa and in Britain, partly to enable Nigerians living in Britain to buy airtime for family members back home as a convenient alternative to sending smaller amounts of money (Mwanza, 2007). Though some larger African banks are opposed to this practice, where there is a profit to be made, other corporations will rise to address the demand for this service.

- Levi Strauss South Africa has launched a mobile phone service that will facilitate HIV/AIDS testing. People can send an SMS with the word “HIV” and their post code or town name, and the two nearest AIDS testing locations will be texted back. The project is a partnership between Levi Strauss, South African HIV Clinicians Society, karabo.org.za, and New Start. All of the testing centers in the program offer anonymous, confidential, free HIV testing, as well as counseling. The campaign is also aimed at removing the stigma associated with getting tested—an important first step in controlling the spread of the disease (iAfrica.com, 2007).
- Nokia has launched a mobile phone and accessory recycling initiative in East Africa (comprising Kenya, Uganda, Rwanda, Somalia, and Tanzania) in the effort to address fears that second-hand mobiles are posing an increasing toxic risk in Africa (Malakata, 2007). At this point in time, the phones are sent back to Europe for processing/recycling. Perhaps in the future, such recycling could be done directly in East Africa.
- Motorola, Ericsson, and Flexenclosure (a Swedish startup) have been testing wind and solar-powered base stations for mobile networks. Not only is this an environmentally-friendly initiative, it also saves on the costs of using diesel generators, because the fuel to power them is expensive and, because they can be used to power many other machines, they are prone to theft (Mayet, 2007; Sistek, 2008). Given the environmentally friendly aspect of these innovations (as well as the rising cost of fuels around the globe) these innovations are likely to find wide application in the developed world, as well.
- Vodacom offers a number of innovative services to make sure its low-balance users stay customers. They offer a service whereby one caller can send a “call me” SMS free-of-charge to another caller (of course, this is merely an extension of the “beeping” method described above). They also offer a “sponsor” service that allows a user to volunteer upfront to accept the charges for calls made by specific numbers made (a sort of sponsored “my faves” service). Taking this one step further, Vodacom also allows customers to transfer both airtime and funds directly through SMS, with no restrictions (Sanders, 2006). Vodacom’s competitor in South Africa, MTN, also offers this service—providing evidence of where competition among telecom companies tends to benefit the customer.
- Vodacom also allows merchants to accept credit card payments via SMS (Sanders, 2006).

“Bottom-Up” Meeting “Top-Down” Initiatives

The argument has been made that when ICT-related development projects are well thought out, technologically appropriate, and designed with long term sustainability and the empowerment of the localities in mind, they can bring about real socio-economic benefit (Hosman & Fife, 2008). Yet, the question remains of how to effectively address all of the above conditions. Discovering the true needs and demands of the poor requires their input and involvement. Determining whether these needs can best be met through technology, and then establishing how to do so, may best be done by those with pre-existing technological expertise. The challenge is to establish a feedback loop between the top and bottom, in order to understand local communities’ needs and, if called for, develop appropriate technology-based projects.

Scholarly study on the topic of bottom-up meeting top-down initiatives is nearly non-existent. While this will remain a crucial area for future research, we feel confident asserting that University-based researchers have an important role to play in establishing the feedback loop between the bottom-up and top-down. For example, calibrating solutions to needs and user perceptions requires extensive interaction and “in the field” market research (Donner, Gandhi, et al., 2008). Understanding individual circumstances is a vital element to understanding how

technology can best address needs and the design of the user interface. Communicating the “value proposition” was necessary to get women slum residents in Bangalore to use a mobile solution that provides information about housekeeping jobs. While the user interface was well thought out and the service met an identifiable need, the women users did not understand how a small box could have the information they wanted. Thus, they believed that talking to their friends would be a better way to learn about jobs. Identifying the realities on the ground, adjusting solutions and monitoring adoption through time are critical to successful “bottom-up” innovation and illustrate an important role for academic involvement (Donner et al., 2008) in business model development.

Academic researchers are auspiciously positioned to serve in this facilitating role for a number of reasons. Scholars often have access to resources, which includes the ability to apply for grants to fund initial and continuing research both at home and in the field, as well as a laboratory for doing research back at their home university, and contacts with other scholars to solicit additional input. Most scholars who study or are involved in development have good intentions and want to see technology assist development. Researchers focused on human development emphasize the importance of engaging and empowering the community, and of placing the focus on the people and the process, not on the technology—in other words, their motivations may differ from a government or corporate representative.

As such, collaborative partnerships between universities, governments, and communities have been identified as important success factors in the promotion of community-empowering projects (Marshall & Taylor, 2005). To this partnership list, we would add non-governmental organizations and businesses, for it has been shown that these actors also have an important role to play in the development process. In addition, a project embarked upon under the auspices of a university, as opposed to being government- or corporate-led, can bring about a sense of legitimization in the eyes of the local technology recipients, who are therefore likely to be more accepting of the project (Marshall & Taylor, 2005). A number of University researchers themselves appear to have begun already to embrace this bottom-up/top-down role, which is evident from the numerous collaborative examples below.

Still another aspect of top-down meeting bottom-up development is the growing recognition of the importance of training local people to become producers, and not merely consumers, of technology. This takes the concepts of sustainability and empowerment one step further, as it promotes locally-driven development solutions.

Some examples of top-down/bottom-up initiatives include the following:

EPROM (entrepreneurial programming and research on mobiles) forms part of the MIT Design Laboratory. Over the past two years, they have been teaching mobile phone programming within the computer science departments of six universities across East Africa. This training is designed to give students proficiency in mobile-based codes, software, and general programming, in order to be able to design their own applications, with the needs of African users in mind (EPROM website). There is also a pilot program underway which teaches entrepreneurs how to develop, market, and launch their own mobile phone application, in order to promote their commercial ventures (EPROM website). Participants in these courses have already contributed innovative applications, such as one computer science graduate who created an SMS-based bulletin board system to help connect buyers and sellers in Nairobi ([EPROM website](#)).

[kiwanja.net](#) is a well-known website/database/information clearinghouse/NGO supporter. All of kiwanja’s activities are related to mobiles and development. They have proposed to continue and expand the efforts begun by EPROM, first by developing software and tools such that mobile phone programming can be done on phones rather than computers. Second, they have proposed to expand the

training and education for such programming by placing it online, so that it may be taught on a much wider scale than just in universities (mobility.kiwanja.net).

Stanford University has partnered with Makerere University, Mweka College of African Wildlife Management, and University of the Western Cape to conduct classes via cell phones. Ericsson and Sony Ericsson collaborated to provide mobile smart phones equipped with video cameras, audio recorders, and Internet capability, as well as technical and other support for the pilot version of this course (Silicon Valley, 2007).

Through a joint project between the TIER research group at the University of California, Berkeley, and Intel Research Berkeley, the AMITA telemedicine organization was formed. Rural healthcare workers in many African nations can contact city hospitals in emergencies, or for diagnosis assistance. In certain locations around the continent, smartphones are being used to assist with survey-taking and record-keeping, as well as being used for sending photographs, emails, and written or verbal descriptions of maladies and for assistance with diagnoses. This assistance is obtained from experts across the continent and around the world, through a diasporic expatriate network (many expatriates who have left their home countries for Western locales consider contributing to this community one way of “giving back” to their home country) (Luk, Ho & Aoki, 2008). This project is one of numerous collaborative endeavors that the TIER research group is involved in, in order to design and deploy new technologies in emerging regions.

In Uganda, a Dutch NGO initiated a project that takes getting information about crop prices to the next level, encouraging networking among farmers. In this network, farmers share information and tips with one another over SMS. These tips range from helpful hints on how to raise ducks for extra income, to information that helps to coordinate the planning of what to grow, and when, to maximize income for the farmers, so that the farmers have knowledge at the macro level instead of just the individual level—when one district chose to grow cassava, another district knew to choose another crop; when bird flu broke out, all farmers were warned. Additionally, this program is enlisting literate farmers to teach their not-yet-literate neighbors how to read, so that they can send, receive, and understand the texts (Ssendi, 2007).

Though their efforts are not strictly mobile-oriented, Inveneo, a non-profit company based in San Francisco, provides innovative ICT solutions to those in rural and remote locations, mainly in Africa. Inveneo creates ICT devices that spring from a consideration of external environmental conditions, energy supply (or lack thereof), and long-term energy costs facing a client. Their solutions tend to be ultra low-power or solar-powered computers and servers, and they make use of Wi-Fi and VoIP to take advantage of available and affordable technologies. One unique aspect of Inveneo’s focus on project sustainability is that they recruit, train, and certify local ICT professionals, so that these small- and medium-sized business entrepreneurs perform the installation, maintenance, and support for the projects. This not only keeps costs down for the projects, it also promotes sustainability by building local expertise and abilities, which benefits the local economy. This focus on the “local” is even more important once one factors in maintenance and support.

It is, of course, difficult to identify where innovative initiatives originate, where the bottom-up and top-down meet. The above examples are meant to illustrate that innovation of all kinds is on display, and when feedback loops can be established between top-down and bottom-up insight and expertise, all involved will benefit.

Socio-Political Development Potential vis-à-vis Mobile Phones

Not all development is of an economic nature, of course. Social and political issues are equally important, and must be factored in to development considerations. Some research—though not a great deal—has considered the social impact of mobile telephony in the developing world. De Silva and Zainudeen (2007, p. 2) rightly point out that the “social” use of ICT is not to be considered frivolous—the

ability of family members to stay in touch with one another contributes to a better quality of life, to give but one example. There are also important advances being made in the realms of health and education across the African continent.

In the field of tele-health, applying new technologies has the potential to benefit countless Africans. A limited number of exemplary programs exist as examples for what could eventually serve the entire continent:

1. Dr. Teresa Peters in Cape Town, South Africa, came up with the idea of sending SMS messages to patients, reminding them to take their medications. This is extremely important for patients diagnosed with tuberculosis or HIV/AIDS, as the treatment programs for these diseases require patients to take medications at certain intervals throughout the day, and missing a dose can necessitate recommencing the entire expensive treatment program (Wright, 2004).

2. Doctors and medical students in Uganda and Kenya participated in a pilot program wherein they were equipped with hand-held Personal Digital Assistants (PDAs) that helped with diagnoses, medication dosage recommendations, contraindications, drug interaction information, and even drug availability in the region, all in real-time. The doctors who participated in the program were very enthusiastic about the PDAs, with more than 90 percent claiming they would spend their own money to buy their own; after the program they felt they could no longer function efficiently without one (Wright, 2004).

3. The adoption of mobile computers and wireless technology has been slow in hospitals, clinics, and health-care centers across Africa, but the potential for increased productivity and quality of service is great. In addition to the above-mentioned access to information, and doctors being able to collaborate with other specialists around the globe with the aid of images available in real-time, patients will also benefit from having their health history information readily available at any hospital or clinic they come to for care.

4. In South Africa, teachers lacking access to projectors in lecture halls are now able to share their PowerPoint slide decks with all smart-phone owning students (which is the majority) through Wi-Fi, and the Wi-Fi enabled phones act as bridges to students with Bluetooth devices—which are more common than those with Wi-Fi (Marsden, 2008).

The above are but a few anecdotal examples of mobile-enabled social development initiatives across Africa, and the authors recognize that for meaningful adoption of ICT--mobile or otherwise, within the educational context, requires long-term teacher training and support, integration into the pedagogical process, and access to the requisite technologies (Chigona et al., 2010; Hosman & Cvetanoska, 2010).

There is also an important role for mobiles in the political process. In theory, mobiles can facilitate democratic processes by enhancing communications abilities toward political and community ends, increasing the possibility for people to make their voices heard by government and to reduce their reliance on government-controlled media as the source of their information (Kyem & LeMaire, 2006).

The 2000 presidential elections in Senegal provide a good example of mobile telecommunications being employed to ensure fair voting conditions. Senegalese citizens armed with radios and mobile phones manned the individual ballot stations, reporting fraud as well as phoning in results to local radio stations. In the event, it proved difficult for the 19-year incumbent to alter the results, and he peacefully abdicated power to the electoral winner. On the other hand, use of texting in the 2011 Nigerian elections did not prevent violence from occurring at polling stations, but it may have lessened the amount that ultimately did occur. Similarly, though widespread use was made of SMS during the election campaigns in Zimbabwe, it was not employed specifically to prevent the pervasive violence that occurred surrounding these elections.

In a mixed-outcome example, video-phone images of police torturing detainees in

Egypt have brought worldwide attention to the alleged widespread use of torture by Egyptian authorities. As a likely-unanticipated result, however, the Egyptian government closed down the Association for Human Rights and Legal Aid, a group that has raised torture cases in Egyptian courts (Stanek, 2008). These examples both underscore that even though information is thought of as a great equalizing, democratizing force, repressive regimes can still limit its use, and use it to their own intimidating advantage.

The theory that mobile phones and increased information lead to greater levels of government accountability and democracy is widely held. However, to our knowledge, it has not been subjected to any rigorous empirical testing, and the examples above demonstrate that positivist assumptions require critical examination.

Supporting Further Adoption and Innovative Usage: The Challenges Ahead

The argument was made above that relying on technology alone to provide development solutions is an incomplete answer, and that governments have an essential role to play in the development process. At the same time, we acknowledge that “most states in Africa can be described as states that generally fail to meet the basic needs of their people” (Agbese, 2007, p. 42). Not only does this mean that much work remains to be done by many African governments in terms of governmental development itself, in building institutional capacity, and in reducing corruption and repression, but it also means that many may question a state’s prioritization of technology issues in the absence of basic needs being met.

Our argument to this question is that the meeting of basic needs and the utilization of technology should not be thought of as an either/or, which-comes-first proposition. They are not mutually exclusive, and may be pursued in complementarity. ICT can provide dramatic changes in quality of life and opportunity. Given this article’s focus, the current section highlights areas where there is room for improvement in how African governments deal with information and communications technology.

According to Infodev, most African countries had, by 2007, created national ICT policies (Farrell & Isaacs, 2008, p. 6). While this is undoubtedly a step forward, they also find a large disconnect between the formulation of these policies and their translation into reality (p. 1, 7), underscoring the fact that there are numerous challenges ahead as African nations attempt to move from policy proclamations to action.

As of late 2006, more than one-third of Africa’s state-run telecommunications companies had been privatized, with several more set to undergo privatization in the near future. While it is generally agreed that liberalization of this sector is a positive development, there are those who express concerns, rightly pointing out that divestiture itself does not cultivate competition, and that liberalization can be detrimental to the interests of the citizens of a state if it precedes the establishment of an independent regulator (McCormick, 2002). State regulation of the telecom sector must be independent, effective, and transparently managed, in order to inspire investor confidence and fair competition that will benefit consumers.

In addition, governments must not be too hasty to make concessions to foreign investors, but must also contractually ensure that profits will remain or be reinvested in the country, or must search for local investors. If they do not do this, they risk allowing telecom investment to be yet another form of neocolonialism, as Western multinationals rush in to take advantage of the high profits available due to the extraordinary growth rates, and then ultimately repatriate these profits abroad. They also risk leaving behind rural areas, for in cases where it is not profitable to provide services to such locations, corporations will not do so of their own volition. Instead, governments can require the provision of services to rural areas in order to be awarded the license.

Appropriate regulation will promote market growth and a visibly open, transparent, and even-handedly run telecom industry will have a spillover effect—some even claim it will have a multiplier effect—on other sectors across the economy in two ways: it will encourage technology transfer as other industries take advantage of telecommunications for business operations (which they currently are not) and the government's efforts at effectiveness and transparency in the telecom sector will be rewarded with investor interest and confidence in other sectors (Bodammer, et al., 2006).

Deregulation in the telecom sector must also address compatibility and interoperability issues. In many sub-Saharan countries, rival telecom companies do not allow customers to place calls to competitors' networks, with the result that many people find it necessary to carry multiple phones on separate networks, which is highly inefficient and unnecessarily expensive for consumers. This could easily be changed with regulation. In addition, governments can regulate lower roaming fees and tax rates—both of which in Africa are among the highest in the world. Doing so would promote economic activity. African governments can look to Kenya, Tanzania, and Uganda, where Celtel has provided the world's first borderless mobile phone network, one that serves a region experiencing a high degree of border-crossing for work-related activities. Also, the Deloitte consulting group recently released a study (2007) claiming that the high tax rates on mobile phone services in sub-Saharan Africa are short-sighted, economically-speaking. Deloitte calculated that by cutting taxes on mobile phone services, the governments would see their overall economies grow at a higher rate in the long term, and that as a result, their overall tax receipts would actually rise in the medium to longer term. In other words, consumers, private enterprise, and governments would all benefit from a cut in mobile-specific taxes, as the indirect benefits to the economy of affordable access to telecom services far outweigh any short-term benefits to the budget (Deloitte, 2007).

One unique aspect of the telecom industry is that it enables other industries to perform their own functions more efficiently, promoting growth and productivity in nearly all sectors—yet across Africa, businesses are not yet taking advantage of this aspect of telecom services. Fewer than 10 percent of the region's businesses provide mobile phones for their employees, and over 80 percent of mobile phones purchased in sub-Saharan countries are for personal—not business—use (Mbarika & Mbarika, 2006).

Governments are understandably eager to tout the rising employment rates and incomes experienced by those working within the telecom sector and in complementary service jobs (such as vendors who sell prepaid cards or minutes on their own mobile phones). Yet, much more could be done to promote telecommunications-related development in other sectors, as well as the savings of disposable income that results from the increased wages that have accompanied the telecom boom. As it stands, most street vendors, "minute-sellers," and others operating in the gray economy are still living at subsistence levels. There is very little opportunity for saving money across Africa, either on the individual level, or for funds that could contribute to the building out of a business. There are initiatives that are targeting the unbanked through the use of mobile phones, and these should be encouraged, as should policies that promote the development of a small and medium enterprise sector in the economy.

Policy Insights & Recommendations

The numerous examples noted above give evidence of mobile solutions that are addressing identifiable needs on a limited scale and scope; success seems more likely when local users are meaningfully involved in the development process. We consider this an extremely salient policy point, as well as the overarching theme of this article. Future initiatives will have greater chances of success when feedback loops and long-term partnerships are established so that top-down initiatives and skill-sets meet bottom-up user-needs, creativity, and knowledge. Then capacities are developed at local levels, and technology-related initiatives are more likely to

become relevant and be adopted, ultimately able to contribute to quality of life improvement. Other players are also critical to the process of integrating solutions on a nation-wide or regional basis.

The coordination of various stakeholders in the private and public sector and establishment of structures that provide collaborative input from academic researchers and practitioners can support better and more meaningful investment decisions and enhance the link between policy objectives and successful outcomes.

Since historically there has been a gap between governmental rhetoric and implementation across sub-Saharan Africa concerning widespread ICT promotion, provision, and adoption, we believe that governments can learn from some of the best-practices and successful cases enumerated above. Acknowledging the specificity of individual contexts, broad recommendations for policy makers include the following:

1. Where the private sector can be involved, the application of a “business model” approach to ICT solutions for development is needed to ensure that solutions meet real needs, will be utilized, will be sustainable and will involve the partnerships needed to ensure delivery and sustainability. The elements of the VISOR model detailed in this paper highlight key components to successful product adoption. The applicability of this model can be explored more fully in future work, but here the main attributes are listed:

- organizing model: public-private partnerships;
- user experience: careful study of the population that will use the service;
- value proposition;
- service platform (IT); and
- revenue/cost - for all partners.

2. Additional enabling policy practices can include allowing interested local groups to form and address challenges that affect them, which allows local competencies to develop—relevant for local and regional governmental and civil society formation (Hosman, 2010). Also, governments can encourage the realization of creative projects, and in particular public-private partnerships at local levels, which can prove concepts that may lead to scaling.

3. Likewise, scaling solutions for health, economic growth, and education require at a base level that governments prioritize the creation of structures, such as a public health system, so that necessary services can be delivered comprehensively and mobile technology can support the speed, efficacy and cost-efficiency of delivery. Similarly, long-term public commitment to the use of ICT in education is necessary to ensure meaningful adoption of technology into the curriculum, as is policy that recognizes the concerns and needs of teachers in the technology adoption process.

Other policy recommendations include promoting sufficient telecommunications-sector competition, transparency, and services pricing, eliminating roaming charges, and lowering taxation rates (see, e.g. Gillwald & Mureithi, 2011; Gillwald & Stork, 2008). These policy actions can actively promote not only additional ICT uptake, but affordability for even the poor to have access to mobile technology.

Conclusion

There is great cause for optimism regarding the staggering level of mobile phone diffusion across Africa. The creativity that is being exhibited in the use of mobile phones across the developing world, and particularly in Africa, underscores the fact that needs are not being met. Mobile phones remain an incomplete answer to the greater issue of underdevelopment, and the push for complementary development areas, such as human capacity and institution building are needed to fundamentally address issues of poverty.

Much work remains for African governments to do in terms of policies, structures and regulation that supports ICT adoption. We have argued that meeting basic needs and pursuing technological advancement need not be mutually exclusive endeavors: where appropriate, technology can be employed in the pursuit of meeting development challenges. Technology alone will not create demand; realistic assessment of the ways in which technology can complement and amplify current capabilities is in order before further resources are invested in the ever-increasing number of ICT-related development projects.

In the short term, however, development efforts that target the mobile phone have demonstrated both creativity and the possibility for quality of life improvement. There is great potential for increased partnerships that focus on the nexus of bottom-up and top-down development, in order to cultivate a productive feedback loop between the various actors involved, to conjoin needs identification with appropriate technology and sustainable models for delivering services.

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Endnotes

[1] The World Bank's estimates vary on its website. The World Development Indicators from 2005 indicate 65 percent of Sub-Saharan Africa is rural, while a report summarizing urban/rural populations around the world estimates that Sub-Saharan Africa's rural population is 70 percent (<http://web.worldbank.org>).

[2] Mobile phones may have been an anomaly in the developing world, for they meet an immediate and basic need—person-to-person communication over distance—for which there is great demand universally, and even the poorest of the poor around the world have demonstrated a willingness to spend a large proportion of their incomes on being able to communicate. This is not the case for all goods and services.
