

**The potential of mobile devices in wireless
environments to provide e-services for
positive social and economic change in rural
communities**



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The only real voyage of discovery consists not in seeking new landscapes but in having new eyes".¹

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1 Introduction



As the chairman of a self help group in Kaku, in the rural area of Kadugala, Uganda, **Elizabeth Mpungu** looks after the computer donated by a development programme². She has a mobile phone which she uses to communicate with her family, and interact with a variety of connections external to the village in connection with her livelihood as a small-holder including the NGO BROSDI³, who manage the programme. Elizabeth has a complex set of family relationships to manage: none of her six living children stay in the compound but she looks after nine others, some are her own grandchildren and others are street children. The pressures on the family budget are immense. Through the project she has shared her own ideas and learned from others in the community, as well as from extension workers brought in to support

the programme. Working in this way she has increased her income through a range of improvements and diversification in her small-holding. The content generated by the interactions with her and the self help group, processed by BROSDI, form part of the database of ideas that drives the Agricultural Information text service established recently by Google and Grameen (described below). Elizabeth and the other members of the group receive texts from the service and can query the database using SMS. While the participative approach to Knowledge Sharing at the centre of the programme mirrors similar community level interventions across the world over 40 years of development the clear difference is that Elizabeth is part of a much wider exchange of knowledge and ideas than was possible when the maelstrom of HIV/Aids surfaced in her community some 20 years ago and carried away four of her children.

Anna Jn Baptiste is a partner in a direct loans scheme managed by the Haitian NGO, *Veterimed*. These screen-shots show how the French investor can track on the web the progress of the investment (the money is repaid through sale of calves) through information provided by Anna Jn. Anna doesn't enter data directly but communicates with *Veterimed* using her mobile. *Veterimed* itself has been using mobile phones as an integral part of their business processes since 2006. On the point of investing in costly, computerised supply chain management for their ground-breaking domestic dairy industry *Veterimed* instead exploited the spread of mobiles across the island. Individual milk suppliers such as Anna are telephoned regularly to check on milk supply and provide animal health support services. Local dairies are phoned daily to check milk receipt and delivery levels, information which is passed up the chain to HQ where it is entered into computerised systems. *Veterimed* have negotiated a bulk tariff with their network supplier to support this work.

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Mise à jour le 01/04/2008
 Veterimed Tous droits réservés | Mai 08

The interconnection between local and global communications is most dramatically displayed in modern emergency response. Communications capacity previously limited to the Security Services and the best funded relief agencies is now available to all through the use of mobile phones.⁴ At the same time, information and conversation about tragedies such as the recent Tsunami in Samoa are instantly available in all parts of the world through the use of social media, notably through the micro-blogging tool *Twitter*. As soon as the Tsunami struck in September, in what is now a standard pattern, eye-witness photographs taken on mobile phones and cameras flooded the news wires, many uploaded through Twitter's partner site, *Twitpic*.⁵ People post in *Twitter* or directly to social networking sites such as *Facebook* as a way to share what they saw with friends, telling how they'd been affected, and asking for information or advice on what to do next. Such multi-stream communications, enriched by instant updates from the disaster area, are a feature of online support campaigns engaging public support including with diaspora groups such as the US based American Samoan association. There two ways in which the development impact of these more personal media, and of User Generated Content (UGC) in general, can be seen. Firstly, people outside the event become more engaged through their contacts and deepen their understanding of the underlying issues. Secondly they play a key role in gathering public support for campaigns and fundraising. For example, during the recent UK Disasters Emergency Committee appeal following the Pacific Tsunami and earthquake *Twitter* had, unexpectedly, become the second largest source of connections to the donation site, exceeded only BBC news online.



1.1 Perspectives on a changing landscape

As a result of stories like these our starting point is that the communications and information context of rural communities in terms of their own capacity and their connections to the outside world has changed in significant ways over the past five to ten years. This paper explores that landscape as a way to mark out the domain for discussion at the November 09 CTA Observatory, which attempts “to explore the potential of mobile devices in wireless environments to provide e-services for positive social and economic change in rural communities”. The area to be studied during the Observatory is, therefore, challengingly wide-ranging:

- By *mobile devices* we include mobile phones, Personal Digital Assistants (PDAs), portable digital devices such as MP3 players, mini-laptops or Netbooks, cameras and many others, as well as the ‘Swiss Army Knife⁶’ nature of modern devices (i.e., my phone is also my music and, sometimes, video player, a way to connect to the Internet over wireless networks, a portable mapping tool and a spirit level)
- *In wireless environments* refers to the increasing number of ways that people can connect and share content between digital devices including wireless networking (Wifi, WiMax, Mesh⁷); channels available on mobile phones (such as standard GSM, GPRS, 3G, Bluetooth⁸); and older wireless technologies such as Radio and TV
- *e-services* refer to the supply to users of functionality, predictably and consistently, that enables them to supply, exchange or consume content that meets their self defined needs. The user may or not be able to interact with the service, the content or the supplier. The service may be free-at-the-point-of-use or directly chargeable.

- *Positive social and economic change in rural ACP communities* requires us to look at activities across the development spectrum in Africa, the Caribbean and the Pacific, focusing particularly on agriculture but also including examples from other sectors such as health, education and emergency relief as well as types of intervention, from Knowledge sharing and Learning to e-campaigning to emergency relief.

On one level this process is on familiar ground - examining the policy and strategic implications of a range of new technical developments in the traditional territory of the ICT4D⁹. However, it is also possible that the cumulative impact of new developments in technology and media over the past five to ten years means that the territory itself has changed dramatically. If that is the case then organisations which work at the intersection of technology, economics and changing human behaviour may need to make a step-change in the way that they operate.

In this paper we view the landscape through different lenses in order to identify what *is* different as a precursor to considering how organisations and individuals can and should adapt. We will consider:

- *Content in the new context*, looking at the wide array of channels through which content providers and infomediaries interact with communities
- *Sustainable e-services*, looking at examples of applications which are already, or have the potential to become, services which deliver benefit over the medium to long term
- *Technology trends* - in terms both of new devices or functionalities on the one hand and their penetration into ACP countries on the other. Note that we do not provide comprehensive data on technology adoption in different countries. We list a range of resources on the Observatory wiki.
- Policy and strategy implications, touching on the current, timely debate about the actual as opposed to rhetorical impact of mobile phones.

Having identified what is different, the focus during the observatory will be on identifying what capacity and competencies are necessary to work in this changed environment; the policy implications for CTA stakeholders; and how best (higher level) intermediary organisations such as CTA and their partners can add value.

1.2 Constraints, trends and capacity

Before continuing we need to review some more general assumptions and recent findings. Firstly, it is also important to recognise what hasn't changed in the last 20 years for rural communities such as those in Kaku, Uganda. Electricity supplies are limited and unreliable. Literacy levels are high in Uganda but, as elsewhere, those who have to leave education early, or couldn't afford it before the advent of free primary education, are disproportionately female and rural. The old are further disadvantaged by the late arrival of new technologies in their learning experience. While mobile penetration continues to approach saturation, content available on mobile phones is limited in contrast to the richness of content available on the Internet. However Internet penetration remains low beyond urban areas, as it does across many parts of the developing world.

Then there are the constraints that the mobile phone infrastructure imposes on poorer, more remote communities. If you are on the 'wrong' side of Johannesburg, for example, there are fewer mobile phone communication towers. This weakens the signal and impacts on voice calls as well as its' use for

Internet connections. Above all, the mobile operators in many countries, especially across Africa, are charging very high rates for both SMS and voice traffic. Steve Song has written eloquently about this issue, suggesting that the invisible and invidious impact of Blue Gum trees across parts of Africa is a useful metaphor for mobile operators. Song quotes estimates¹⁰ that in Uganda the monthly phone usage of the bottom 75% of the population accounts for 18%-20% of income and a far higher proportion – up to 50% - of their *disposable* income. Further, Song argues that, “the wealth that is being generated by mobile operators in Africa is not being distributed evenly” He gives a couple of examples:

- “In South Africa, Sameer Dave, Chief Technology Officer for (South African network provider) MTN, recently acknowledged that MTN were subsidising their 3G data traffic with revenue from their voice and SMS business. This means, when it comes to communication, that the poor in South Africa are effectively subsidising the wealthy.
- Or consider the microeconomics of the edge cases of mobile access. Let’s pick a remote village served by a single cell tower. We know a couple of things about mobile access in Africa. One, the majority of calls are local. Two, people are spending substantial amounts of their disposable income on access. So, in a remote village if 50% of the phone calls are local and people are spending 50% of their disposable income on mobile access, that means that 25% of their disposable income is being siphoned out of that village”.¹¹

‘INTERLACEABILITY’ AND ‘REACHABILITY’¹² ,

Interlaceability means the way that people are weaving together more and more separate lines of activity and communication into their days. Increased interlaceability is one of the strongest and profound changes brought about by mobile phones in those areas of the world where availability and low cost have made their users ever-present. It enables people to manage complexity more effectively and, theoretically at least, increase efficiency. For many, such as traders and small businesses, especially those – generally women – with multiple caring roles, interlaceability is a boon. However, there are many that would argue, backed up by some research¹³, that interlaceability and multi-tasking is damaging to work, education and human development. ‘Information overload’ is a genuinely difficult issue for many people, although the current cost structure in Africa means that for many others this remains simply an academic issue.

However, all three of the stories above demonstrate an equally powerful phenomenon, *reachability*. With the spread of the mobile phone especially we can now be in contact with and reached by other people for more of the time and wherever we are. Importantly, this is a *personal* connection. Mobile phone numbers, linked to a SIM card and not a handset are fast, becoming a universal identifier. This is profoundly important in a range of situations, and in the context of development it has opened up a direct channel to and from people who were previously at either end of a chain of intermediaries. Many studies have followed Jensen’s ground breaking demonstration of the power of mobile phone-instigated disintermediation in the Keralan fish industry¹⁴. However, the impact of reachability extends into all areas of life, whether it is SMS queries about HIV/Aids and sexual health in Nigeria, communication between home and migrant workers, questioning local officials on community radio or communicating the devastation of physical disasters. Like interlaceability the notion is not one-sided: all mobile phones, once switched on, are traceable by the network operators and thus by both relief and national security agencies; demonstrators

in Iran and homosexuals in Kenya have been traced and arrested through their use of SMS and Twitter; individuals can be traced through their own or the Internet address of the location where they connect; the less powerful can become traceable by those who deny them rights.

THE CHANGING ROLE AND NATURE OF INTERMEDIARIES

All three stories also illustrate another crucial level for analysis – the impact of these changes on the role and activities of intermediaries such as *Veterimed* and *BROSDI*. Both organisations illustrate the way flexible and innovative intermediaries can adapt: both have responded quickly to the opportunities although neither started as specialists in the use of ICTs. However the use of the tools generates enormous pressures – managing increased information flows, managing and keeping abreast of technologies, building capacity in themselves and the communities they work with and delivering outputs to a world racing away with the latest and newest web and mobile 2.0 tools. At the same time new intermediaries are emerging through the use of mobile technologies. These represent both a threat and a challenge to established intermediaries of all kinds. For example, although fishers in Kerala and elsewhere evidently benefit from their direct contacts with market traders, traditional intermediaries often served more than simply a financial role: they can provide information and access to financial and other specialist services and intermediaries. They were often an integral part of local economies with a local understanding not shared by distant contacts.

A final related point is that while the crucial role of intermediaries in the appropriation of new ICTs has long been recognised¹⁵ the spread of mobile phones and their use has altered that relationship profoundly because it was a bottom-up, market-driven, personal choice-based process. Like many, many others, the CEO of *Veterimed* was taken by surprise by the appearance of mobile phones across Haiti: it wasn't expected or planned. Mobiles weren't introduced as part of a public or civil society programme. This, to some extent, re-balances the relationship between intermediary organisations and those with which they work. People own or pay for phones and airtime by choice and use them intensively according to their own interests and perceived needs. They don't use them because they have been given them as part of a development effort, nor do they see them as a development tool. At the same time, as the discussion above on cost demonstrates, commercial companies are arguably the dominant player in this new world. Development professionals have thus had to engage in different ways, adapting their approaches and relationships to their partners in communities and in the commercial sector. One of the central strategic issues for the Observatory is therefore the role of intermediaries at all levels, how they can and should adapt to the new context and what kind of support they need.

1.3 Using the wheel – what we already know

Before beginning our review of the landscape we should pause to reflect on previous cycles of innovation in ICT4D. Much has been written about the way in which, from the late 1990's, a wave of ICT4D programmes and projects using new technologies, especially those focusing on the Internet, swept forward with inadequate attention to what had been learnt from development in general and early Communications for Development efforts, such as those involving Radio. We need to approach the current crop of programmes with an eye to what was learnt before and during that period about what contributes to success. Useful guidelines abound in the literature and we shall choose one old and one new as filters to use in our review of projects:

- Research suggests eight critical success factors for ICT4D policy¹⁶:
 - a. Build on existing systems
 - b. Ensure services are demand-driven
 - c. Determine who should pay
 - d. Ensure equitable access
 - e. Promote local content
 - f. Build capacity
 - g. Use realistic technologies
 - h. Build knowledge partnerships
- Those knowledgeable about the *Mobile for Development* (M4D)¹⁷ describe “a set of choices which the ICTD literature has already identified as being correlated with project success....like other ICTD projects, successful M4D projects are likely to be evolutionary (vs. revolutionary), more aligned with existing practices, and more focused on intended outcomes¹⁸. “A more detailed list of choices which the existing ICTD literature suggests are more likely to lead to success, includes:
 - a. Embedding the mobile element into an otherwise ongoing development effort, versus casting the mobile service as itself the development effort or otherwise asking the technology to lead the effort;
 - b. Using the mobile technology to reduce transaction costs or increase productivity of existing practices, versus introducing entirely new behaviours via the mobile;
 - c. Requiring only basic literacy or skills from users, versus requiring additional technical knowledge or support.”¹⁹

2 Content

Rarely can there have been such a rapid, dramatic, global explosion of creativity and entrepreneurship as has occurred in the past 5 years in the mobile digital device space. Across the ACP countries new applications appear daily demonstrating the rich variety of ways in which people directly engaged in agricultural or fisheries value chains can receive or interact with content. We describe a range of such applications below in an attempt to portray the richness of the landscape. We shall group them according to how the primary actors such in the development processes receive and interact with content – and thus what channels are available to intermediaries²⁰. We aim to illustrate how people use different channels as well as some features of those channels of access.

2.1 Indirect Access

It's important to start at the bottom of the Bottom of the Pyramid (BoP). Much has been made of the surge in ownership of and access to mobile devices but for millions of poor people intermediaries remain their only effective connection to information and communication with the outside world. This, of course, is nothing new. Telecentres, radio stations, individuals with access to the Internet or a telephone have always played such roles. The difference in 2009 is that the intermediaries are much better equipped. For example, in Bangladesh, D-net transformed their programme of “Mobile Ladies”, supplied with a mobile phone, into “info-ladies” who “possess a laptop or classmate computer, internet modem, headphone, webcam, digital camera, photo printer and a mobile phone for giving the entire livelihood information services at a cheaper rate, and fast”.²¹ The Grameen Foundation has been piloting a similar concept in Uganda and recently



announced a massive expansion of their Community Knowledge Worker (CKW) programme. CKWs are equipped with a mobile phone.

“Upon request from a farmer, a CKW will use his or her cell phone to access actionable information to meet farmer needs. In addition, CKWs collect agricultural information from farmers, providing a vital link between farmers, government programs, non-governmental organizations and other entities focused on improving agriculture in Uganda and beyond. While farmers sometimes have access to a cell phone, this service will greatly expand its availability and also connect farmers to trained professionals tasked with sharing knowledge and information with them”²².

It's safe to assume that for some time to come such infomediaries will remain a key channel for development information and communications. However it is probably the case that, through capacity building and the emergence of younger, more technologically adept generations, the centre of infomediation will move down the value chain, closer to communities.

2.2 Basic mobile phones

Mobile phones have been the lead story in ICT4D over the past three to four years. While their impact on people's livelihoods and opportunities has undoubtedly been overhyped it remains true that, by enabling poor people to communicate more freely with their personal and livelihood related networks, the spread of mobile phones has transformed their environment and that of international development. We will consider some emerging patterns and then consider in turn the different access channels on a basic phone.

PATTERNS OF USE

There are some generally agreed features of mobile phone use in the developing world.

1. They have a positive impact on development, providing:
 - Better market information
 - Improved transport efficiency and more distributed economic development
 - Reduction of isolation and increase in security for villages, organisations and people
 - Increased connectivity to (and coordination with) international economic activity²³.
2. Mobile phones in poorer communities, especially outside the OECD, are as much a shared as an individual resource²⁴. This is in marked contrast to communities and individuals with more disposable income – or who prioritise handset ownership over other expenses – where handsets are the quintessential personal tool, often used as an expression of status or fashion. Handsets may be shared, rented (as in the Grameen supported phone ladies in Bangladesh, the Vodacom supported phone shops in South Africa or the 13,000 Grameen/MTN village phones in Uganda²⁵) or individual calls themselves may be for sale as in Nigeria.
3. The adaptation of handset and air time cost structures to the low wage, low liquidity nature of BoP market will continue to be one of the primary drivers to the expansion of access and services.
4. Mobiles amplify and extend existing networks of social relationships as much as create new ones and demonstrate interlaceability in those with access to affordable airtime. Research in Rwanda into small business owners showed that 66% of their calls were to friends and family²⁶.

VOICE SERVICES

Intuitively, applications that use voice would seem to be the obvious channel of choice:

“voice transmission has a singular advantage over SMS and data transmissions—it channels human, spoken language directly. Users of many literacy levels can use voice technology with keypad and voice navigation, and applications can be run in local languages. Users can issue commands and requests in their natural language, and thus communicate more accurately. The problem, unfortunately, lies on the receiving end. Voice data is much harder to process automatically than text or other data. It requires considerable technical effort (or a lot of person-power) to parse and separate voice data (and even then accuracy isn’t perfect), and searching voice data still remains a nigh-impossible feat. And secondly, airtime costs tend to run higher than text message costs.”²⁷

In fact patterns of voice usage differ markedly. A 2005 study noted that in the UK nearly double the amount of SMS are sent compared to voice calls, a pattern repeated in the US. However, in South Africa the trend is the opposite, with three times the amount of voice to text in general and 13 times more voice for rural areas²⁸. The South African context of multilingual communities with high levels of illiteracy is repeated in many other parts of the world yet, “text is everywhere, voice is (surprisingly) nowhere”²⁹. Many cite cost as the most likely reason for low usage of voice services in the developing world. Nonetheless there are some promising pilots although one at least has been abandoned as too expensive. However, there is more interest and activity in India where airtime is 10 times cheaper than South Africa for example.

There are two main segments:

1. **People to people:** systems that connect people to people, essentially providing supplementary or enhanced extension services with the mobile phone as the channel. For example:

- **Question Box**³⁰ works in India and Uganda. It is a free telephone hotline service, in local languages, to bring information to those that don't have access to a phone or computer. The system, started in India in two locations in greater Pune, consists of a solar powered box that connects using the mobile network. People push a button and are connected to an operator who has a PC with an internet connection. The operator can look up the question using the internet and provide that information for free. In Uganda the system was adapted to include Question Box “agents” who have mobile phones and wear prominent shirts in order to identify them. These agents then phone into a call centre in a central location with decent broadband connectivity and ask the question on behalf of the individual. The agents get compensated with free air time. Now working with the Grameen Foundation in Uganda, they plan to expand the service to existing mobile phone users who can text or call the centre directly.



2. **Automated voice-based:** systems that are experimenting with direct voice input and/or output

- **freedomfone**³¹ (Mobile Information Service) addresses communities' requirements for a simple, affordable technology to communicate with one another. FreedomFone leverages the fastest growing tool for personal access to information 24/7 – the mobile phone – & marries it with citizen radio programming. Audio files are stored by FreedomFone in a Content Management System (CMS) which is updated through a simple to use browser interface. These audio clips populate an Interactive Voice Response (IVR) menu through which callers can navigate for information. Deployment in any language is possible as key global files for menu prompts can be uploaded through the browser interface to the CMS.



Individuals can contribute questions, content and feedback by leaving voice messages via the IVR interface. FreedomFone can be operated as a collective, with different groups managing different channels (IVR menu options) of information from the same installation.

- **Avaaj Otalo**³² ("voice-based community forum") is a system for farmers to access relevant and timely agricultural information over the phone. By dialling a phone number and navigating through simple audio prompts, farmers can record questions, review and respond to others, or access content published by agricultural experts and institutions. In addition to the Q&A forum, Avaaj Otalo includes an announcements board of headline-like snippets updated regularly by DSC staff, and a radio archive to listen to past episodes of DSC's popular weekly radio program. This project was the second implementation in IBM India's experimentation in the spoken Web³³.
- **BT Lifelines**³⁴. Started in 2006 by OneWorld, in collaboration with British Telecom and CISCO, LifeLines today reaches out to rural communities in over 4,600 villages across India with information services in the Agriculture and Education sector. The core information resource is groups of volunteers who answer questions submitted by phone. Technologically it is a sophisticated solution comprising a Cisco Unified Messaging platform incorporating Interactive Voice Response functionality, integrated with a Customer Relationship Management application and information database provided by BT. The farmer pays two calls: the question and to retrieve an answer, triggered by a query-id and available as a voice message in local language. The answer comes either from a database of already recorded answers to FAQs or a new recording provided by the NGO partners. The complexity of the solution and the transaction costs entailed in the processing means that the service is only partially self-sustaining.
- **National Farmer Information Service (NAFIS)**³⁵: a voice service that offers agricultural extension information which farmers can access through mobile phones. NAFIS is updated through the web, and the IVR is created automatically through a Text-to-Speech engine in both Kiswahili and Kenyan English

TEXT AND SMS

Started in 1985 as an experiment³⁶, using a secondary radio channel previously used for call control information (which means it is always available, and on all phones), and despite being limited to 160 characters, SMS has been the killer application that has powered the growth of access. The simplicity of the system, the fact that it is available on any handset over any network (AHAN) has resulted in a concentration of innovation around using SMS for development. Experimentation with mobiles has been going on, in Africa at least, since 1998³⁷ and in what is undoubtedly a maturing sector we can distinguish several segments, with illustrations drawn from a wide range of active SMS service providers:

1. **Broadcasting & Messaging:** a wide range of information and advice services provided to specific target audiences, sending an SMS to a list of users, using bespoke or adapted software systems.
 - **Cell-Life Cellphones4HIV**³⁸ programme in South Africa: Treatment Action Campaign broadcasting information to all their branches; Adherence clubs sending scheduled reminders to take ARVS twice a day.
 - **Souktel AidLink** has an SMS alert service relating to aid availability³⁹
2. **Interactive:** users can interact with the provider simply or using menus
 - **Cell-Life Cellphones4HIV** has a range of services: people can sign up by SMS to receive broadcast information on health; users also use SMS to request simple data, such as meeting times or translations; Polls to engage and research with users.
3. **Platforms:** moving up the value chain, some organisations offer general purpose tools such as configurable SMS Gateways (that can be adapted to provide broadcast and interactive services) or, like Cell-Life, are positioning themselves as mobile information and communication service providers using their own or other tools.
 - **FrontlineSMS**⁴⁰: Frontline have been successful in adapting and extending usage of their basic package. They are now expanding into different areas of work including data collection and, most recently, mobile finance.
4. **Large-scale application:** extending scaling ICT solutions in Development to a large mass of users has mostly been an 'un-scalable cliff'⁴¹. As we discuss below, *TradeNet* and *Manobi* illustrate the urgency and complexity of the issue.
 - Grameen Foundation recently gained a \$4.7m Gates grant to scale their AppLab family of services across the country, in collaboration with their Ugandan partners and Google. A programme of this scale and focus clearly represents a step change in the SMS development services sector

INTERACTIVE CONTENT

All mobiles have the capacity to interact at a basic level with external services. The original *Manobi* market prices system gave users access to menus which they used to select products and places⁴². Cell-Life use a similar system, based on different technology⁴³, to enable user interaction with their HIV/Aids treatment literacy product.

M-BANKING:

Financial services on mobile phones are possibly the most significant of the new functions available to the rural poor. We don't need to repeat here all that has been written about the huge potential benefits for millions of poor people who have not previously had direct access to banking and credit systems. For our purposes we need to note

- Mobile banking is spreading across Africa⁴⁴ - there are so many services that there is a new portal dedicated simply to m-money in Africa⁴⁵ - and other parts of the world. For planning purposes we can assume that it will be accessible in most parts of the world that have mobile phone access in three to five years.
- Its indirect use, as a facilitator of domestic transactions and commerce, especially credit will be at least as important as its direct use for money transfer. A striking illustration is a project using mPesa (the Kenyan mobile currency) to buy water⁴⁶. A new book, "Portfolios of the Poor", provides insights into how the market might evolve and potential intermediary roles:

For **Portfolios of the Poor** researchers studied in detail 250 households in Bangladesh, India and South Africa.

The ...most striking finding is the sheer complexity, scale and variety of poor people's financial activity. People living in poverty need financial skills more than the better off. Just to get by from day to day, they borrow, save, and exchange cash with a huge variety of friends, family, neighbours and institutions, both formal and informal. These last include savings clubs, savings-and-loan clubs, insurance clubs, microfinance institutions, and banks. Every one of the 250 households had both savings and debt of some sort, and no household used fewer than four types of financial instrument over the course of the year. Rural households have turnovers (i.e. total cash flows in or out) between 10 and 30 times greater than their asset value at the end of the year.

If formal institutions are to remedy these gaps, they need to pay attention to poor households' needs to save and borrow in very small amounts, on a regular basis, but with flexibility in payment schedules to match their unpredictable cash flow. They identify 3 top tips for the kinds of financial products that could take off in this kind of approach:

- 1) a cash-flow management facility that allows poor households access to small, irregular payments of both savings and loans to tide them over the day to day variability of their cash flows
- 2) long term savings products
- 3) large lump sum general purpose loans (i.e. not just for business start-ups as many microcredit institutions have traditionally demanded) – this is the biggest potential market among the poor

(Extracts from Duncan Green's blog)⁴⁷

DATA COLLECTION:

Using mobile devices to gather data is one of the most active segments in this area. They range from systems that work on all mobiles to others using all the functionality of high end phones. A comprehensive survey of approaches, tools and applications is on the Mobile Active website.⁴⁸

INTEGRATED USE

While not a direct example of ICT use in rural livelihoods the following example is about an issue which profoundly impacts rural livelihoods. It illustrates how these

technologies are becoming embedded into the Kenyan communications environment and the power of innovation combining these channels.



IndyMedia Kenya publishes text, audio and video material contributed by its users. During the 2007 post election violence they invited their audience to contribute stories and opinions, including by SMS. The SMS items were published manually, though there are now many examples of sites that accept SMS automatically, but the innovation only possible in Kenya is that IndyMedia sent airtime credit to people who wanted to tell a story, recorded the conversation and published the audio on the website. There is a growing Internet audience in Kenya, through still very small, but this brought the voices of ordinary Kenyans to global airwaves and helped re-shape to some tiny degree the distorted, one dimensional image the world was receiving of the violence. All of this is available over the most basic phones, or Any Handset, Any Network (AHAN) as it is sometimes known. Below we explore additional functions available on more expensive handsets. However we turn next to how the phone has impacted more traditional communications and ICTs.

2.3 Radio

At first sight this appears one of the parts of the landscape that has changed little in the past 20 years. The oldest ICT still in constant use, Radio remains a central tool for communications in many parts of the world, particularly in Africa where it has by far the widest reach, with at least 85% of Africans able to access. However, in that time Radio has developed from an almost exclusively broadcast into an interactive medium and the global spread of mobile phones has extended this interactivity across ACP communities. A 2008 study⁴⁹ of 220 West African Radio Stations to the Internet, and their use of other information and communication technology found:

- 56% of radio stations report that journalists/reporters use their mobile phones for reporting at least regularly
- 52% of commercial, 42% community, and 31% public radio stations use mobile phones to interact with users.
- 83% use SMS for interaction between listeners and presenters during radio broadcasts. Cost of sending SMS are divided between sender, radio station, and telecommunications operators.

Some of the common ways they interact include:

- Using SMS to transmit important up to date information to be broadcast on radios during emergencies, for search and rescue, reunification, alerts and early warnings etc. This is valid both for natural and political emergencies. For example, SW Radio was able to collect mobile numbers of listeners' family members in Zimbabwe and send headlines direct to their mobiles.
- Providing a communication channel for listeners to contribute news, views, stories and feedback.

- Sending messages to listeners or subscribers' mobiles advising them of special programmes, competitions or events
- Mobile top-up time is an important currency: some radio stations are offering to charge a listeners' mobile phone if they stop by the station and either buy an announcement or bring a piece of news⁵⁰
- Keyword responses, where listeners are invited to text with words such as leisure, news, weather, travel etc and get automated replies with the latest information.

ILLUSTRATIONS

- In a short video interview Peter Balaba, manager of Nakaseke Telecenter, Uganda, describes how he has been working with local farmers for several years to gather and share good practice⁵¹. Farmer's leaders have been trained to gather ideas and stories which are woven into Radio programmes in the centre's studio and broadcast over their community channel. Listeners ring or text in with questions, comments and ideas enriching the exchange and deepening the connections of the telecenter to the community.



2.4 Mid-range mobile phones

All of the functions above are available on these phones but they also enable extra layers of functionality.

DATA TRANSFER

- Using these phones enables richer data collection, as for example in the mobile data collection application-- *DigitalICS* -- to monitor smallholder coffee farmers' compliance with organic, fair trade certifications and quality requirements at a rural coffee cooperative in Oaxaca, Mexico.⁵²

SOCIAL NETWORKING

- *Mxit*. The explosion in use of online social networking platforms such as *FaceBook* or *Orkut* is one of the most powerful new media trends of the past five years. As people get access to the Internet, across the world, they become avid users of these platforms. Although it is associated with young people trends in more mature markets such as the UK and US show increasing usage across all age-ranges. This has always been the case in some areas, as with *Orkut* use in Brazil (discussed below). *Mxit* is one of the first, and certainly the fastest growing, mobile Social Networking systems. It uses the channel GPRS to provide SMS at a fraction of the normal cost but also enables its users to identify and connect with friends when they are 'online' (when the system registers that they are using their phones for Mxit). We discuss the implications of Mxit and Social Networking below.

MOBILE WEB

Mid-range phones provide direct access to the Internet, a topic discussed in detail below.

DOWNLOADING & SHARING INFORMATION,

These phones provide more capacity to share data directly using Bluetooth or USB memory sticks

MULTIMEDIA FUNCTIONS

These phones enable people to take photos, record audio and sometimes video. This opens up an array of more sophisticated uses, from journalism, such as in the *Citizen Journalism Africa* programme of SangoNet⁵³ to grappling with crop disease in Kenya⁵⁴

2.5 Smart phones

Smart phones are designed to be permanently online and provide users with a packet of personal applications that provides a complete communications and entertainment product. They open up some new opportunities:

GPS APPLICATIONS

This is the most significant new functionality at this level. The position of the nearest transmitting tower to a mobile phone is sufficient information to build software applications which provide information or services based on location. The spread of high end phones with full Global Positioning System chips may take five to ten years but in the meantime many are experimenting with services using this information.

- *Manobi*⁵⁵ pioneered the use of phones in the agricultural and fisheries sector and one of the major benefits to deep sea fishing boats was the location information in time of danger. Since 2006, as more high-end phones with better location information became available, *Manobi* has been working with local insurance companies trialling new micro-insurance policies that were previously unavailable to artisanal fishers.
- The Grameen Foundation, the International Institute for Tropical Agriculture (IITA) and Uganda's National Agriculture Research Organization (NARO) designed a pilot project to test if data collection and transmission through the use of mobile phones (and GPS units) is a viable alternative to tradition agriculture extension. The project team used identifying, mapping, monitoring and controlling banana disease as a case study to model this new agriculture extension system⁵⁶.

MOBILE WEB

These phones are designed to make browsing the web a more satisfying and productive experience. Products such as the *Blackberry* have demonstrated that mobile users can remain in touch using email and newer phones from all manufacturers are pushing the boundary in terms of usability.

DOWNLOADABLE APPLICATIONS

This is an important new area which is discussed below.

2.6 Direct Sharing

There is an increasingly wide range of mobile devices that can be, and are being, used to share content.

IPOD AND OTHER AUDIO AND VIDEO CAPABLE DEVICES

- The Arid Lands Information Network is using iPods to share video and audio files of agricultural content⁵⁷. BridgelT is using mobile phones to download videos and display them in classrooms⁵⁸.

DIGITAL STORAGE MEDIA

CD-ROMs and Thumb/USB drives are now ubiquitous and enable people to carry rich content as they move around. This of course also includes the use of mobile phones as data stores. They can also be used to carry programmes that can be launched when they are connected to computers⁵⁹.

2.7 Other forms of rural access

BRIDGING THE GAP WITH MOBILE TRANSPORT

For some time to come there is going to be a continuing need for 'bridging' technologies that provide access rural areas. Buses, taxis, motorbikes and *Tuk-Tuks*⁶⁰ continue to be pressed into service in innovative ways to provide access. Generally speaking such innovations do not scale.

WIFI AND WIMAX

This technology is a key building block in the provision of full internet access to the rural and other underserved areas. It is relatively inexpensive and requires only basic technical skills for installation and maintenance. Its importance lies in the way that it makes the whole Internet accessible beyond individual mobile or PC based connections. There are limitations to the use of the current generation of mobile devices for web browsing and information access. Using wireless technologies is an affordable option for mass access. While the One Laptop per Child (OLPC) is regularly criticised (see below) it has nonetheless pushed the boundaries in a number of areas, including demonstrating the power of *mesh* networking in education and other sectors where groups of people use computers close together. There are enormous gains in economy and efficiency when each PC in a room, or locality, automatically connects to and shares content with any other.

INTEGRATED TECHNOLOGIES

- An example of convergence and the use of multiple devices, including high end phones, is the *Village for e-Science*⁶¹ project that is working with rural communities in Kenya to test a variety of mobile devices for delivering and recording agricultural information. They have been developing a wireless sensor network, combined with handheld units, which will measure air temperature, light levels, soil moisture and humidity, and make this information available locally to mobile phones, and globally via the Internet. Farmers can supplement this information using photos and other recordings. The use of sensors is a growing field, with detail research taking place in a number of areas.⁶²
- The *Kindle* and other e-readers deserve a mention since, with their wireless connectivity, they represent an enormous opportunity for Learning and Knowledge Management.

2.8 Concluding notes on Content in a mobile age

If, as the above catalogue demonstrates, we are in a period of seismic change that will deliver enormously increased global access to the Internet, along with all the other changes that come in the train of the mobile revolution, then we need perhaps to step back and consider some more strategic questions.

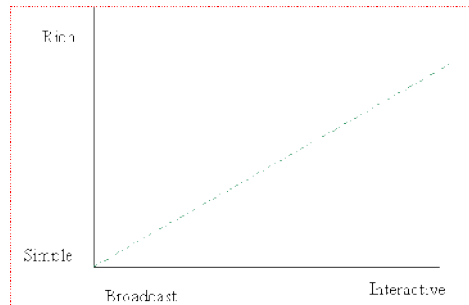
BROWSING PATTERNS AND LEARNING PATTERNS

A large scale survey in the UK⁶³ revealed significantly different information seeking patterns in online users. They describe 'a new form of information-seeking behaviour' characterised as being 'horizontal, bouncing, checking and viewing in nature. Users are promiscuous, diverse and volatile.' 'Horizontal' information-seeking means 'a form of skimming activity, where people view just one or two pages from an academic site then "bounce" out, perhaps never to return.' The average times users spend on e-book and e-journal sites are very short: typically four and eight minutes respectively.

'It is clear', says the study, 'that users are not reading online in the traditional sense, indeed there are signs that new forms of "reading" are emerging as users "power browse" horizontally through titles, contents pages and abstracts, going for quick wins. It almost seems that they go online to avoid reading in the traditional sense.' These findings apply to online information seekers of all ages.

CONTENT AND COMMUNICATION CHANNELS

Some argue that the cost issues and the limitations of the devices means that roll out of the mobile internet is damaging to people's chances of gaining its full benefits⁶⁴. There is an optimal relationship between richness and purpose of content, on the one hand, and how interactive is its delivery on the other. This needs to be taken into account in developing content services.



3 Sustainable Services

The catalogue above is evidence of the flourishing and unremitting drive to innovation within the domain of 'mobile devices in a wireless world'. It offers superb potential for development actors at all levels. However, sadly and inevitably, the proliferation of small-scale experimental projects risks repeating one of the most damaging trends in ICT4D, perennial pilots. Many people argue that huge sums of money have been wasted in demonstrating that, with the concentrated application of untypically large resources - financial, human and research - applications of new technologies can be developed that could be of wider benefit, if scaled.

A number of projects fail to make it over the first hurdle – providing a robust, stable product that works in at least one context and is actively used by a group of people. However, many which do succeed at stage one fail either to demonstrate sufficient added value at an economic level so that they can be integrated into the operations – and budgets – of another public or civil society entity or develop a revenue model. It is also true, that while there is undoubted benefit in applied research, too many are technology driven, experimenting on the premise that X or Y interesting tool might be of benefit in situation Z. Firoze Manji's acid comment comes inevitably to mind, "what would people do without the poor in Africa to justify their latest ventures!"⁶⁵

The sustainable services lens focuses more precisely than technology led innovations on rural poverty. What are the problems, what do people need and are there technologies that can help us? Kerry McNamara provides a useful summary of the key issues⁶⁶:

Why is the mobile revolution so important for agriculture and rural development?

The vicious circle of rural poverty

- Physical isolation; poor infrastructure; few services; few assets; weak access to appropriate and affordable inputs

The significant *intangible* dimensions of rural poverty

- Weak access to information and communication; poorly-functioning markets and institutions; poor knowledge flows; weak opportunities for collective action; high information and transaction costs

The growing challenges, and opportunities, of “the new Agriculture”

- The growing importance of timely information and response
- The increasing integration of regional and global agricultural value chains
- The volatility of commodity markets and the challenge of food security

WHAT DO WE MEAN BY SUSTAINABLE SERVICE?

In this paper we consider a sustainable service as one which meets the needs of a client group in such a way that it ensures its own continuation. However, the fact that a group of people value a service is an essential but not a sufficient factor to ensure its survival. This can happen in three main ways:

- Through its operation a service can generate sufficient direct income to cover all production costs and provide a surplus for its development
- It is provided as a free public service by a body which consider it a priority and is itself a continuing institution with its own regular source of funds.
- It is delivered by a group of volunteers who consider it a priority and are themselves likely to be a continuing institution.

These are not mutually exclusive categories: a service can be sustained by a combination of the above, and move between them over time. We look at examples of all three.

3.1 Potentially, financially self-sustaining

There are, in essence, only two basic sources of income for a service:

THE USER PAYS DIRECTLY

• The group of SMS services provided by Grameen and Google in Uganda is a recent and high profile example⁶⁷. From the point of view of learning about sustainable services there is an unmistakable ‘business-like’ feel to the programme. The current service are based on market research and extensive trials and have been developed from the outset on the basis of a financial model based on providing the services as part of the content stream from only one of Uganda’s network providers, MTN. The services comprise:

- Google SMS Tips (targeting low-income, rural users primarily), providing Health and Agriculture information, in response to SMS queries
- Google SMS Search (targeting urban, mainstream users)

- Google Trader (targeting all users), aimed at helping buyers and sellers find each other

The business model is shared revenue: users pay for the service through SMS charges. Google Trader is charged at a premium rate, double the normal SMS charge

Such business models have always been contentious. The Google/Grameen project triggered fierce debate on the *White African*⁶⁸ blog run by Erik Hersman. He makes the case for the massive advantages of projects that, from the outset, are looking to sustain themselves through consumer choice, expressed through paying for a service or product:

The question posed is if people who are claiming to help the poor should charge, and if so, should they make a profit?


I think we've seen from the Grameen model in Bangladesh (ex: Grameen Bank and Grameen Phone's Village Phone program) that you can (and possibly should). By doing so you help both parties; first, by providing a service that consumers value and are willing to pay for, and second by making the business of running an operation self-sustaining. Many good business, or project, ideas die due to lack of sustainable cash flow.

For instance, if a 220 shilling SMS can save you the 1500 shilling visit to the doctor or veterinarian, or give you a 10% higher return for your crops, is it worth it?

The debate focused largely on the charging of a premium rate for Google Trader, which is not surprising given the huge profits network providers in Africa make already. However, as the long running *Kazi560*⁶⁹ jobs service in Kibera, Nairobi shows, poor people will pay a subscription and SMS charge costs for a service if it generates income or saves expenditure. *TradeNet*⁷⁰ is experimenting with a mix of a free basic service with paid-for premium or added-value services. The already quoted '*Info Ladies*' in Bangladesh shows these paid-for information services can generate income for infomediaries using mobile devices. The *Jasmine News Service* in Sri Lanka demonstrates that people will also pay for other content services delivered over mobile devices, in this case news.⁷¹ Although targeted at relatively affluent, generally Northern consumers, the market for downloadable iPhone software applications demonstrates both a different delivery channel and that people with disposable income to spare will pay small amounts of money for games and social networking tools as well as for precisely targeted information services.

A SPONSOR OR ADVERTISER PAYS

This business model, which has always sustained mainstream commercial media, has been extended successfully onto the Internet. It will undoubtedly be central to the development of the mobile web, whether for specific mobile applications such the mobile social network *Mxit*, which is sustained through advertising, or the migration of standard Internet services and applications which are already sustained in this way.

 **Please-Call-Me:** also from South Africa comes the interesting example of the free '*Call-Me*' service. It was developed by the network operators in response to the unanticipated widespread use of 'pinging' to initiate response calls. Looking to recoup some part of their below-target revenues they introduced a '*Please-call-me*' service that was free to the user but contained advertising. It is a useful demonstrator of the value in observing how technology is used as

a way to identify effective services and, since it is also being used as a channel for HIV/Aids messaging, also an illustration of how such channels can provide space for subsidised information services

SCALE AND SUSTAINABILITY

Scale is the major obstacle to long-term sustainability for services which seek to be financially self-sustaining. The income from micro-payments or a share of SMS or phone charges is tiny. *Manobi*, for example, has so far not been able to generate sufficient income from its Senegalese users to cover the costs of their information services without external support, although there are encouraging signs that the service might be taken on by the Senegalese Government.⁷² *BT Lifelines* in India, on the other hand, has reached a large number of users, who pay SMS charges, but the complexity of the system increase operational costs to a level that would require nationwide coverage to cover costs. *TradeNet* is seeking massive scale, already active in 12 countries. *Kazi560*, on the other hand, is self-sufficient. This is partly because, as an early example of such a service in Kenya and with some high-level commercial backing, the revenue share with Safaricom is more generous than in other cases. It is also because it has a narrow but large target audience: the number of people in the 1 million plus inhabitants of Kibera looking for work is high, it targets mainly the informal sector and the service is free to those seeking staff, so there is a constant supply of information. However, it was also fully supported financially for three years and had a partial subsidy for at least another two. Such long-term thinking is more typical of the private than the development sector but contains a lesson about timescales for those wishing to develop services that are sustainable in the long term.

3.2 Public services

Over the long term, if a service is not financially self-sufficient, the most promising route to sustainability is that it is taken on by a Governmental or other public body, such as the UN, as part of normal business. That means the service has to demonstrate one or all of the following:

EFFECTIVENESS:

Does the service reach more people and/or enable the delivery of better quality information directly or through infomediaries? There are many examples in Health and Agriculture that demonstrate the effectiveness of mobile device enabled services:

- *Cell-Life*, already referred to above, facilitates the delivery of both broadcast and interactive services for public and NGO clients. *Cell-Life* is an intermediary provider. The services are funded by its clients.
- *Learning about Living*⁷³, enabling young people to ask questions privately about HIV/Aids and other Health topics and in doing so reach specialists not available in their locality. It generated over 2,500 responses in the first five days. It also has an interactive competition called MyAnswer, also focused on Health education.
- *National Farmer Information Service* in Kenya (see above) which reaches non-literate rural farmers through voice services

EFFICIENCY

Does the service save money in business processes and service provision? There is compelling evidence that demonstrates the efficiency gains in using mobile devices, for example, in Research and data collection, as illustrated above.

ECONOMY

Is the service cost-effective in the context of development? For example, video conferencing has long been a technology that promised much for development but the cost of delivering good-enough quality has rendered it, until now, beyond most development actors. It is this hurdle which trips up a lot of pilot projects.

3.3 Voluntary Services

Services can be supported through formal voluntary services, where people commit to a certain amount of unpaid time to provide a service. However, in many situations and communities people wouldn't necessarily label themselves as 'volunteers' but are involved voluntarily in communal activity which generates no immediate, direct income. Finally, in some cases support for services is built into other programmes, such as the many examples of agricultural students collecting market price information as part of their educational programme. Most such programmes run on very tight budgets and are necessarily constrained in their ambitions. This plus the personal commitment involved can sustain services for long periods.

- 🌍 *Drugs Advice Support* is an example of the former, a Drugs counselling service provided by a mix of professional and amateur volunteers using *Mxit*. More than 6,000 people use the service - some 300 a day, on average.
- 🌍 *BT Lifelines* agricultural advice service is provided by a well organised voluntary group, the Indian Society of Agribusiness Professionals (ISAP)
- 🌍 *Give Work and Crowdfunder*⁷⁴ A new web-based company seeks to provide a global outsourcing service for short-term, discrete pieces of work. While it is too early to estimate its likely success an interesting side project is the attempt to connect this process to the *Dadaab* a refugee camp in Kenya. Users can download an iPhone application through which work can be outsourced to refugees in Dadaab.

4 Trends, possible futures or the Crystal Ball

The ever perceptive and often prescient John Naughton frames trend-spotting:

"Know the old joke about the drunk and the lost keys? A policeman finds a guy scrabbling under a lamp-post and asks him what he's doing. "Looking for my keys," he replies. "Is this where you dropped them?" asks the cop. "No," replies the drunk, "but at least I can see what I'm doing here."

When it comes to technology futures, we're all drunks, always looking in the wrong place".⁷⁵

Nonetheless there is never a shortage of people with opinions on future trends and development. We bring together here strands of thinking from a range of sources⁷⁶ that appear to us to identify landmarks in the changing landscape.

ICT4D 2.0, WEBSQUARED AND DEVELOPMENT SQUARED

Popularised by O'Reilly in 2004⁷⁷ the term *web2.0* is generally taken to mean a collection of technologies and associated behaviour, typified by examples like online Social Networks. A number of people have tried to imagine what a genuinely different Development 2.0 might look like if it took on board the insights, applications and approach of web 2.0 while others, less ambitiously, target only a renewed ICT4D2.0. Meanwhile, O'Reilly and many others are already trying to describe the features of something they see as recognisably different again, which they call *Web Squared*. Of interest to us are the trends

they identify and their expression in new combinations of applications and associated behaviour which may signal how we might envisage and operate in the digital space.

Heeks frames ICT4D 2.0:

“ICT4D has sought to surf each new wave of “technovely”. And ICT4D 1.0 initially took an invention-down approach – bringing new technologies into development contexts – much more than it took a use-up approach of understanding how existing technologies were being applied within poor communities.

If ICT4D 2.0 does shift the invention—use balance, that would mean:

- *Less emphasis on what might be used (the Internet and PCs), and more emphasis on what is actually used (mobiles, radio, television).*
- *Less emphasis on fundamental technical innovation; and more emphasis on application and business model innovation.*
- *Less emphasis on piloting and sustaining new applications, and more emphasis on assessing and scaling existing applications”*

TECHNOLOGY AND NETWORKS - A NETWORKED WORLD

The pace of change is accelerating in technological development relevant to rural livelihoods. The screenshot opposite is of the headlines on the website ‘AppAfrica Mobile’⁷⁸ on a random day, 13th October, 09. It illustrates the importance of several overlapping issues for a consideration of technological trends:

1. Continued technological innovation is a given. It is a self reinforcing, internally driven dynamic (demonstrated here with “Mesh network research, Internet everywhere”).
2. The leveraging of this innovation by commercial interests will continue to drive increased *convergence*. This will occur *within* technology families, as in the increasing overlap between high-end mobile phones, Netbooks and old-style PDAs: will there be an OLPC style rugged mobile phone, or will such developments be marginalised by the march of Google, perhaps towards a Google Android mini-netbook with a wireless headset for calls?. Convergence will also continue *between* those families (demonstrated here with “solar e-reader, extension of m-banking”). For Heeks, this means, “looking at the technologies that already penetrate – mobiles, radios, televisions – and seeking ways to add computing and Internet functionality”⁷⁹, as is already happening in the weaving together of radio, mobiles and the web in Nakeseke, for example, or the ability to query online databases using SMS.
3. The innovation that comes from the attention of commerce to the BoP (“Buying water with M-Pesa, Notebooks for Africa”); another important example is the growth in cheap Chinese manufactured phones and other devices, including specialist devices such as twin SIM and solar powered handsets⁸⁰
4. The power of the social driver in innovation and adoption (“Twitter in your languages”)

“The future is already here - it is just unevenly distributed”⁸¹

In many parts of the world it is also true that internal digital divides are growing wider – between rich and poor, rural and urban, old and young. “EDGE, 3G, WiFi



and WiMax, the future is almost guaranteed to go high-tech mobile⁸² is probably as accurate a prediction as “text will also remain prevalent for many more years because it has already proved its ability to deliver complex services such as full-banking or intricate supply chain management despite the constrained format”⁸³. This uneven development will continue to complicate choices for development agents.

“The overriding innovation issue remains the relatively low traffic demand and low population density of most areas of rural poverty; requiring solutions that can deliver broader reach at lower cost than current technology”⁸⁴. Clearly wireless solutions will become increasingly important. It should come as no surprise that recent research into Social Networking and Health Communications in Bangkok⁸⁵, where there are now over 16,000 wireless access points, found evidence of massive growth in the use of Social Networks and the rapid development of online cultures and behaviour patterns similar to those in the UK and US where people have benefited from cheap, universally available access for several years. It will be interesting to see the impact of the recent roll-out of WiMax across metropolitan cities in Pakistan.

All connected digital devices, including phones, are subject to the laws of the networked economy. A new phone user is a two-way communicator, in a network of connections, where any point can connect to any other. This may result in no more than easier communications among a family. But it also opens up the possibility of exponential increases in the density of interconnections within an interlinked family, social and commercial network as well as the potential for ideas and messages to spread *virally* (unpredictably rapidly and in all directions).

The Mobile Web will be a Social Web

One day in July this year Ednah Karamagi of BROSDI and the author used Skype to arrange a meeting in Uganda later that month. The author was working in an Oxford garden using a laptop, connecting over wifi: Karamagi was in a small Ugandan village using her mobile phone. This is one standard image represented by the term *mobile web* but we also need to look wider. Mobile phone networks are an infrastructure which a range of devices can use for access, including standard PCs or laptops, using cards or dongles to access the internet via a mobile tower, and Blackberry style devices designed mostly for email. People with wifi enabled Netbooks or high-end mobile phones can access the Internet on the move, as many do while travelling at roof height around central Bangkok on its Skytrain. So the fact that more people in South Africa access the Internet using mobile network connections than other forms of access does not automatically mean people squinting into tiny screens to read ICT Update. Indeed, those who are using mobile phones to access the web will be looking for material designed for use on such devices. For example, applications that provide quick reference material are the most accessible.

However, it almost certainly means that a large part of that traffic is social, in the sense of communications between individuals or groups using email, text chat, skype and, increasingly, social networking. This is a profoundly different online environment to the traditional ‘Internet as Publishing + Feedback’ model. It is important to reflect on what we know of the “social web”, especially for those for whom their first online experience is through, or entails, a social network⁸⁶. For example, Google’s social networking platform, *Orkut*, is very widely used in Brazil, not simply in cities, and across classes and ages. It is one of the main ways that people keep in touch when they move around, and plays a central role in social interaction – dating, looking for work, campaigning, simply chatting or

hanging out, making and strengthening friendship networks. People spend a lot of time online and use different forms of media – pictures, video, and music – as currency in social exchange. This is replicated in the way that young girls, women and men use *Mxit* in and around Orange Farm, Johannesburg. Online networks are expression of face-to-face networks. This means that the importance of personal recommendation and of trust networks more generally, in the transfer of news and information is replicated through the digital networks. This is an important opportunity for intermediaries in rural development who are engaged in Information and Knowledge Management

One final point about is that *Mxit* took off in South Africa (over 5 million users) for two reasons. The primary one is pricing: *Mxit* provides SMS at a fraction of the normal cost. This is because *Mxit* uses the web to transmit text. *Mxit* is essentially a mobile web service. It uses a channel called GPRS⁸⁷ which enables slow access to the Internet proper and when *Mxit* is launched on a mobile phone it is a web service which tells the user who else is reachable. However, sending text over this channel uses a minute amount of network traffic and so SMS is cheap. Pricing will remain the primary driver of the mobile web.

The second main reason is of course because *Mxit* provides the essential core of social network software: the ability to store a list of 'friends', message all of those friends at once or singly; and, crucially, know who else is online at the same time. A telling illustration of the power of such media comes from research in South Africa reporting on the first-time contact of a group of women to the mobile Internet. "In the midst of training about instrumental uses of the mobile internet, particularly job search, the women also gravitated toward the self-expression offered by Facebook, and the connection offered by *Mxit*."⁸⁸

As more and more people are connected, which means in turn they are *individually addressable* the concepts of *interlaceability* and *reachability* come back into play. If women who have never met the mobile Internet immediately see the benefit of engaging with online social media then it is likely that, as the social networking literature suggests, whenever people become connected they will rapidly engage these social spaces, interlacing, or weaving them into their daily activities. There is thus developing an *expectation of connectedness*. This changes the way that we plan and coordinate our interactions, introducing a *mobile logic*⁸⁹.

CONTENT

There are four points to note in relation to content:

1. **"Mobiles aren't just a delivery channel but fast becoming a media in their own right"** National consumer surveys in Balancing Act's report African Broadcast and Film Markets showed that between 3-9% of respondents in a variety of countries named the mobile as one of the most used daily sources of information.⁹⁰
2. **Local Content:** the crucial importance engaging with people's own knowledge has long been recognised as both as an end in itself – leading sometimes to the discovery of effective local agricultural techniques, for example – and as a means of facilitating the introduction of ideas from outside. The central importance of User Generated Content to the development of web 2.0 and therefore the mobile web, strongly reinforces these ideas. Participatory radio and TV or video, localised broadcasting – as in Nakeseke, as well as the use of mobile devices for the collection of information and stories, will play an increasingly important role in extension and advice services.

3. **Crowdsourcing:** this refers to the formal or informal collection of data through engagement with, or the voluntary effort of, people otherwise unconnected to the programme. The classic example is *Wikipedia*; *Ushahidi* is a contemporary development-focused instance and there are growing numbers of voluntary mapping projects⁹¹ such as *OpenStreetMap*⁹². The crowdsourcing and mapping of Local Content as a means to share innovations and indigenous knowledge using location-sensitive mobile devices would take this kind of work to a new level. The *GiveWork* application and the whole *Crowdfunder* experiment referred to above also show interesting new dimensions.
4. **Web Squared Skills:** “The ability to process high quantities of data and identify and visualize patterns in unstructured data is going to be a key skill of the Development Squared sector”⁹³. This needs to be built within the sector but the idea of crowdsourcing suggests ways this might be strengthened.

SOFTWARE APPLICATIONS ON MOBILE DEVICES IN A WIRELESS WORLD

Calling a Nokia N32 a mobile phone is rather like referring to Microsoft as a company that makes computer operating systems such as Windows. Both statements are true but inadequate descriptions. In fact, the N32 is a computer that has radio communication capabilities. Since the earliest handsets software applications have been developed that can be loaded into the devices to extend their base functionality. Modern examples include Frontline SMS and iTunes, both of which are open systems, meaning they can be loaded onto many different makes and models.

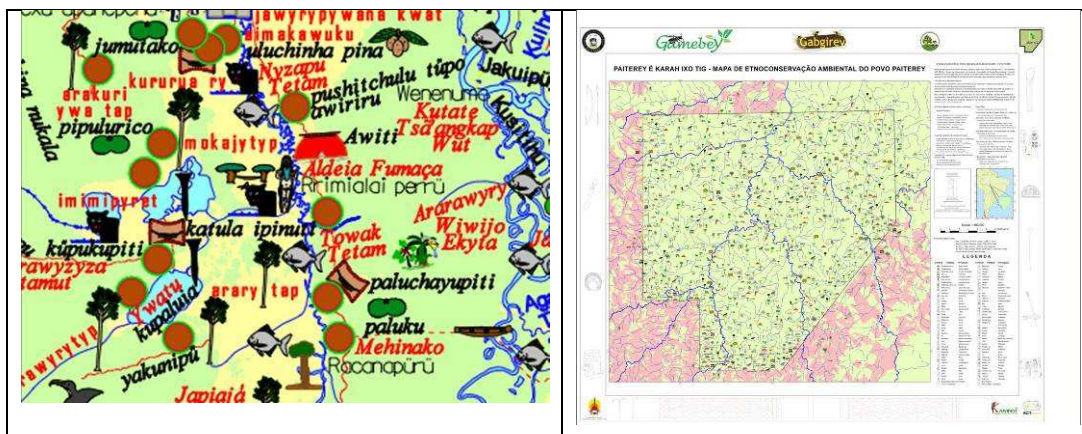
This is not true of many iPhone applications. While many criticise, with good reason, the closed nature of Apple products in general and the iPhone in particular it's undoubtedly true that the iPhone has changed the handset application market. Having transformed the online music business through the provision of a site supporting micro-purchases (one track at a time) Apple applied the same principles by providing a business and promotional platform for creative developers to develop and sell software applications for iPhone users. The business opportunity generated a flood of innovations tailored to exploit the features of the device, which is a lesson in itself in the context of the growing army of under-capitalised developers in the developing world. Such applications could be a step towards what Heeks calls, *per-poor* development, harvesting grassroots innovations⁹⁴.

A second key point is that most of those are *micro-applications*. They provide only simple services, some informational – downloading a map, finding train-times; some augment the base iPhone functionality - adding zoom-like functions to the inbuilt camera; some are for entertainment - adding a radio station receiver or new games and some are social – connecting to Facebook or linking the GPS functionality to a social network to enable people to find similarly registered friends. Finally, the success of the store and its network of users means that it has become a rich library of educational and other content (in the iTunes U), including material for development. ALIN, for example, is experimenting with using the iTunes podcast download service for its video iPod application.

These applications can be downloaded using wireless connectivity, which offers direct potential applications of mapping and information services. However, it is probably more significant that all other handset and network providers are racing to catch up with Apple which means growth in potentially useful applications – many of which will be on more open environments so they can be transferred

between devices⁹⁵ - but also increasing opportunities for small or niche players to develop applications targeting the rural poor.

We have seen above how GPS functionality in phones and specialist devices can be used for mapping in a variety of development contexts and, as can be seen in several global markets, it is already driving a new wave of mobile applications – from “find me my nearest Starbucks” to “where are my children” to the *JungFrau* application which provides information about climate change in that region of the Swiss Alps (through a series of guides to walks for which there are detailed maps and commentaries linked to GPS location points⁹⁶). We have seen above how the expression of Local Content in all its forms is both called for and enabled by the spread of interconnectedness. A boundary-expanding expression of this convergence emerged from collaboration between the Surui tribe of the Amazon basin in Brazil and the Google Foundation. They worked together to develop a cultural map, first developing a pictorial code to signify the cultural meaning of particular places – such as where significant battles had taken place or particular kinds of fishing was appropriate (below left). Using Google Earth and GPS they then tagged culturally significant locations, as shown below right.



Applications in community mapping and other forms of participatory planning and appraisal are immediately obvious as are, for example, extensions of the kind of small commercial mapping functions now common in many parts of the world – showing the nearest pharmacy or clinic - which are available on mobile phones and other wirelessly connected devices. CGIAR, for example, is engaged in two mapping programmes: a digital soil map of sub-Saharan Africa⁹⁷, run by CIAT, and “a comprehensive program to provide smallholder farmers in sub-Saharan Africa and other agricultural stakeholders with access to geospatial data, services, tools, and methodologies to help them make more informed decisions”⁹⁸.

AN INTERCONNECTED WORLD

One of the key ideas within the discussions around *Web Squared* is the “information shadow” of organisations, people and, in this context, development projects. A number of people have become excited about the impact of mobile devices and their multi-media capabilities on the amount and sophistication of the information that can be collected about projects in real-time. This will combine with the enormous amount of information that will be posted for other reasons in social media such as workshop photos on Flickr; group photos of project visits taken by both visitors and visited tagged on Facebook or MxIT; tweets and blogs with choice quotes from local or visiting dignitaries. The information shadow of

projects and places will deepen inexorably. For example, already on Google maps there are lots of geo-located photos associated with specific tourist sites.

However, even newer technologies open up more remarkable opportunities. New software is available – called *Layar* - that enables such data to be placed – layered - onto the display of a connected camera (in a phone, for example). This is in some ways similar to ‘heads-up’ display of flight and other information on the windscreens of planes. The result is known as *augmented reality*. The image below shows a captivating imagining of how Google's augmented reality system could play out in development.



“Already people are recording audio, video, and blogging to keep donors abreast of their work in the field. Imagine making appointments for them to check in for real-time conversations to make sure everything is progressing as planned. Your phone would be a video/chatting device that would allow them to even participate in discussions on the ground in real time. In the image below you can see the AR view more clearly. The top left window has the coordinates of where you are along with the history of that location, and when your organization last visited the spot — all data that could be recorded without the field team ever even knowing it. In the top right you also have photo and video that was recorded by your team at that location at some point in the past, along with notes and files uploaded from that spot.

Other elements in the picture show how there might be constant contact with donors, contacts at relevant organizations or other team members; how numerical data could be instantly available, updated in real time”⁹⁹. “Real time response will move beyond the traditional confines of disaster management or disease outbreaks control to become a mainstream feature across development operations: from donors having real-time access to aid recipients, to on-demand micro-volunteering”¹⁰⁰.

The ICT4D 2.0 Manifesto ends with some powerful questions:

In conclusion and above all, we can see that ICT4D 2.0 is about reframing the poor. Where ICT4D 1.0 marginalised them, allowing a supply-driven focus, ICT4D 2.0 centralises them, creating a demand-driven focus. Where ICT4D 1.0 – fortified by the "bottom of the pyramid" concept – characterised them largely as passive consumers, ICT4D 2.0 sees the poor as active producers and active innovators. Three overarching questions for this next phase therefore emerge. How can the poor be producers of digital content and services? How can they create new incomes and job through ICTs? And how can we recognise and scale the ICT-based innovations they produce?

5 Capacity, Policy and Strategy

In this final section we raise some questions for consideration in the Observatory and beyond.

5.1 Hope or Hype

The previous section was designed to explore the boundaries of the current technologies, to inform a discussion about trends. However, we need to focus again on current realities and consider the arguments questioning the real impact of these developments.

Some argue that the rapid spread of these technologies is widening existing divides, that it is being propagated along existing class and gender divisions and further disenfranchising the poorest.¹⁰¹ Many therefore argue that to counter this we need to focus on the social relations of production and activity, ensuring that development of applications and engagement with technology occurs *with* people and communities not *to* them.

There is certainly strong evidence that the spread of mobile technology is influenced by traditional gender divisions and not enough is done to develop a 'gendered' approach to this work. "

Mobile technology has the ability to change the way we communicate, but its effects are not evenly distributed. In societies that are divided by social and gender roles, women, especially rural women, are often left out. Gender disparity in society is often echoed in mobile usage; while technology allows some women greater social and economic freedom, in other cases, it simply upholds previously held social constructs. In the areas of social interactions, education, and economics, mobile phones have a distinctly gendered impact on its users. An examination of research and case studies that focus on women and mobile technology reveals that although access to mobile telephones has many benefits for female users, it is not a solution to female poverty or gender inequality..... The mere existence of a phone in a rural home or community does not mean that the women there will have access to the opportunities promised."¹⁰²

Others argue for caution in assuming that the open models and processes - seen as one of the key benefits of gaining access to the Internet - are replicable in the mobile space¹⁰³. The dominance of the space by commercial network providers can constrain independent development; commercial imperatives can often result in a focus on applications that are not the most appropriate to the needs of the

poor; and the ease with which Governments can gain information about and control mobile communications limits its use in community mobilisation and activism.

BREAD NOT COMPUTERS, OR MOBILE DEVICES

The issue that investing in technology can substitute for more basic services has been a constant theme throughout the history of ICT4D. A powerful new article demonstrates the continuing importance of this discussion. It contains a review of the evidence of OLPC performance in schools.

*“Which gives more bang for the buck, deworming or OLPC?”¹⁰⁴
“The One Laptop per Child (OLPC) program provides computers at around \$200 a pop, while deworming pills cost between 50 cents and 4 dollars per student per year. All the control trials of computers in classrooms have given—at best—ambiguous results. But the available studies of deworming pills suggest improvements in student attendance in the range of 20-25 percent.”*

The interesting variation in the field of mobile devices, especially the phone, is that the poor choose to invest in the technology. However the, at best, patchy success of the OLPC in terms of its ambitions reinforces the arguments against technology-driven, externally designed, very large scale interventions. It will be interesting to track the impact of the Grameen CKW programme in Uganda, since it has been based, by contrast, on a slow, locally driven, emergent process. The programme is going to scale but the model is an amalgam of local and external innovation welded together in field trials where demand was tested and service models trialled. The latter perhaps again illustrates the point that the development of a commercially viable model has kept the project team focused on need, appropriate technology and realistic scope.

However, in considering the impact and potential of these examples we should recognise that it has become even clearer over the past five years that understanding human behaviour is as important as business analysis. Major trends such as mobile phone uptake and the eruption of social media in that period shows us that, except in cases of dire emergency and deprivation, ‘need’ as defined by objective analysis is less useful in reading trends than an understanding of how people live their lives and their own sense of priorities. Education, status, fun, sex and relationships, closer connections with loved ones – these are the drivers for people buying expensive airtime or spending hours in online social networks. As Mark Davies says, “It’s all about understanding the agents of change and that’s anthropology not technology.”¹⁰⁵ It is at the intersection of technology, economics and human behaviour that choices are made.

5.2 ICT in agriculture and rural development

McNamara’s analysis¹⁰⁶ is a useful starting point for further discussion. He lists some key dimensions of ICTs potential contribution to agriculture and rural development (*and a few examples*)

Increasing smallholder productivity and incomes (Reuters Market Light, India; Life Lines, India; Mali Shambani interactive radio program, Kenya; National Farmers Information Service, Kenya)

Making agricultural markets more efficient and transparent (Esoko/TradeNet; Jenny Aker research on mobile impact on grain markets in Niger; Kenya Agricultural Commodities Exchange; Xam Marse, Senegal)

- Linking poor farmers to urban, regional and global markets
- Improving services and governance for the rural poor
- Promoting – and including smallholders in – agricultural innovation
- Helping farmers manage a range of risks
- Improving land and natural resource management and addressing environmental pressures
- Helping poor farmers participate in higher-value agriculture
- Supporting the emergence of a more diverse rural economy, and supporting rural family decisions about their mix of productive activities

5.3 Choices for policy makers and intermediaries

We need to explore how to encourage and interact with a *continuum of innovation types* revealed in the examples seen above:

EXPERIMENTS

At one end are experimental pilots, aiming to develop a model showing innovation in use of technology and, ideally, the social relations of implementing the model (e.g. Knowledge Lab Village Resource Kit, Question Box). They have the advantage they often feature genuine innovation. However, the field is crowded with such pilots, since it is often easier to gain support for a short-term, creative demonstration. Many also require untypical, uneconomic resource levels and are technology led. Finally, such pilots rarely begin with a commercial connection or a clear business model

TOOLKITS

Along the continuum there are many projects aiming –sometimes successfully – to develop a tool that can be exploited in a range of situations (e.g. Ushahidi, FrontLineSMS). Again, these often show genuine innovation but usually have a wider audience in mind from the outset and are also often more focused on a more generalisable applicability. However, they are often technology led, rarely start with commercial connection and sometimes face problems in transferring to new, very different situations.

SERVICE MODELS

These start from the outset with the aim of developing a scalable service, often, but not always, aiming for commercial viability. (e.g. TradeNet, Grameen AppLab in Uganda). The advantages of this approach is that it tends more often to be user/audience led, is designed to be scalable, and contains a revenue model. However, there is some risk that such programmes become substitutes for Government action, in effect taxing the most needy to pay for their services.

CRITICAL SUCCESS FACTORS FOR PRODUCTS AND SERVICES

There are a range of sources which provide pointers to factors that influence project success which should be taken into account when making funding and programme choices¹⁰⁷. The core principle is that services and applications need to be developed or adapted according to the context in which it is being applied including, crucially, the various dimensions of capacity. We need to identify the most significant changes and trends in the landscape that support or constrain development and consider how their impact will play out. We also need to think through what capacity is required to navigate the changed landscape. These issues will be the starting point of the Observatory.

Endnotes

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- ⁴ Photo from a presentation by Romilly Gregory of Oxfam GB
- ⁵ Daily Telegraph, UK, 30th September, 09
<http://www.telegraph.co.uk/technology/twitter/6247010/Samoa-tsunami-devastation-captured-on-Twitter.html>
- ⁶ First encountered by the author in Ling and Donner, 2009
- ⁷ Wifi enables computers to connect to each other using radio signals, without using network cables, typically covering up to 15 to 20m ; WiMax enables these wireless signals to be spread over much larger areas – up to 50Lm. Mesh networking enables computers to connect with all other computers within range and share information and services between them, without any central server. The OneLaptopPerChild (OLPC) system has a very effective built-in mesh networking system
- ⁸ GSM – General Standard for Mobile Communications (originally *Groupe Spécial Mobile*) is the most popular standard used for mobile phone communications. It enables digital data to be carried on the same signal, and is therefore sometimes referred to as 2nd Generation -2G. GPRS – General Packet Radio Service - is a faster radio communication standard for mobile phone data transmission. 3G – Third Generation – is a mobile phone radio communication standard that allows simultaneous use of speech and data services and higher data rates. It requires updated equipment and mid to high range mobile phones. *Bluetooth* “is an open wireless protocol for exchanging data over short distances (using short radio waves) from fixed and mobile devices”. All information extracted from Wikipedia
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- ¹⁷ “Reflections on MobileActive 2008 and the M4D Landscape”, Jonathan DONNER, Katrin VERCLAS2, Kentaro TOYAMA
- ¹⁸ Heeks, 2002; Kuriyan & Toyama, 2007; Rogers, 2003
- ¹⁹ Donner et al, op cit
- ²⁰ The grouping was worked out with Christian Kreutz and many of the examples used in this paper come from his research. <http://www.crisscrossed.net/>
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²³ Ling and Donner, op cit, p66: they quote a 1994 report from the World Bank Op

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<http://mobileactive.org/survey-voice-based-mobile-tech>

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