How Mobile Phones Work in the Developing World

A thorough understanding of mobile phone technology is vital to functioning in the developing world today, and skills and expectations from just a few years ago are rapidly being outdated. Villages which had no coverage just a few years ago now have majorities of their adult populations sporting mobile phones. Marketplaces which offered only “dumb” feature phones last year, now offer for sale Android touchscreen smart phones at realistic and affordable prices.

This section is from The Viability of Phones For Language Development, by Stephen Fierbaugh, International Literacy And Development (ILAD), 2012. Used under a Creative Commons Attribution-ShareAlike 3.0 United States license. Limited duplication permitted.

While this section speaks explicitly of Africa, most information is equally true of the rest of the developing world. As a general broad brush-stroke statement, Asia is slightly more advanced than Africa as described here, while the Pacific islands are slightly less advanced.

The Mobile Phone Mega-Trend

The rapid expansion of mobile phones is a mega-trend which has transformed the developing world. According to Tom Phillips, 90% of the world's population now has mobile phone signal coverage (2009, p4) and in Measuring the Information Society, the International Telecommunications Union (ITU) predicts “it will rise to almost 100 per cent by 2015” (2011, p15). Wireless Intelligence reports that five billion of the world's seven billion people own a mobile phone (BBC, 2010). IT News Africa reports, “Africa has become the second most connected region in the world in terms of mobile subscription count... There were over 616 million mobile subscriptions in Africa at the end of September, 2011.” (2011) GSMA's African Mobile Observatory 2011 shows that Africa now eclipses North America and Europe, and is second only to Asia in mobile subscriptions (2011, p8).

How Mobile Phones Work in the Developing World

Mobile phones in the developing world differ from contemporary American consumers’ experiences with mobile phones in some fundamental ways. This section is a primer on how phones work in Africa, from an end-user's point of view. It is considered “common knowledge” in Africa, but may not be familiar to western readers.

Mobile phones in Africa are nearly all prepaid. According to the GSMA’s African Mobile Observatory 2011, 96% of Africans use prepaid services (p9). A user purchases a handset for the full fair market value without signing any long-term contract or subsidy such as is common in the United States. All phones use GSM-based technology, similar to T-Mobile and AT&T.

A person may purchase a handset from a specific cellular carrier, but it is just as common for them to purchase an unlocked phone from a non-affiliated vendor. To use a specific handset with a particular cellular carrier, the user purchases a SIM card for a nominal fee (sometimes free, and always trivial). A SIM is a chip similar in size to a micro-SD card. It provides the unique ID and other information which allows a handset to operate on a specific network; the SIM may also provide other value-add functionality. The SIM is generally placed in a special slot inside the back of the phone underneath the battery. On some newer multiple-SIM phones, the second or third SIM may be inserted in slots similar to a micro-SD card.

Once a handset has a SIM for a specific vendor installed, it may access that mobile network. Prepaid credits, generally called vouchers, are used to place calls, text, or access the Internet. Vouchers take several physical forms, but by far the most common is the scratch-off card.

Adding credits to a handset is as simple as purchasing a voucher, scratching off the foil to reveal the unique voucher code, dialing a short number on the handset, and entering the code. Many preliterate and even pre-numerate (lacking basic math skills or the ability to tell prices in the marketplace) people have started using mobile phones. The voucher charging system has proven easy for even low-numerate people to learn. Notably, it is significantly easier than the similar voucher systems of prepaid plans in the United States.

Incoming calls are generally free. Calls between two phones on the same carrier are less expensive than calls between phones on rival networks. In the past, SMS texting has been cheaper than voice, although this is changing in some markets. All of these facts have important implications for African mobile use, elaborated on in later parts of this document.
Credits are transferable between handsets on the same provider network. This fungibility was quickly picked up on by informal businesses to transfer value over long distances (typically from a wage-earner in the city back to their family in a village).

Kenya’s wildly successful MPESA (“M”obile + PESA, the Swahili for “money”) network and its newer copycats are an exploitation of the same basic principle. MPESA ties a financial account to a handset and allows easy transfer of funds between handsets. Funds may also be “cashed out” at numerous business locations. This has provided lower economic classes with practical and easy access to “banking” services for the first time. MPESA is significantly easier to use than its western counterparts.

Wireless Internet service is provided through 3G, similar to what is available in the United States, and through Edge, its slower predecessor, which is still widely deployed. 3G service is being rolled out aggressively, as detailed below, but Edge is ubiquitous. In either case, a SIM and prepaid credits are still required, although the process for transforming voucher credit into “Internet credit” (which goes by various names) is not standardized. 3G dongles which plug into a USB port and visually appear similar to a thumb drive are also becoming a popular system for laptops and even desktop computers to get Internet service.

The main limiting factor in Internet performance is not 3G or even Edge, but rather the degree to which various networks have oversold their broadband capacity; this means that Internet speeds can vary significantly between various times of the day, being slow in the evenings but much faster in the early morning.

**Ubiquitous Features**

The differences between East African countries are mostly a matter of degree, rather than of kind. Each of the countries is ahead in some areas and behind in others. Some significant differences in Chad will be pointed out where relevant. However, several features were universal throughout all of these countries, whether in urban environments or the most rural settings.

**Advertising**

In Africa, advertising for mobile phone carriers is everywhere. From billboards in the capital cities, advertising the latest smartphones at the highest speeds, to local soccer team t-shirts in rural settings, the carriers are conducting massive marketing campaigns, competing for market share. Most of the carriers have a simple bold color branding, and in some areas of East Africa, more than 50% of the buildings are painted in a carrier’s color and feature a prominent logo. Buildings right next to each other often have competing carriers’ branding. This is equally true in both rural and urban settings.

Because the industry is still dynamic, some vendors have changed names and branding repeatedly in quick succession, as corporations are bought out or consolidate. This has led to many buildings which are advertising the color scheme of brands which no longer exist.

Chad has significantly less advertising in general, but most of it is for mobile phones and follows a similar pattern.

**Vouchers**

In Uganda, one vendor said that he makes 200 UGX ($.08 USD) of profit off of every 5000 UGX ($1.92 USD) of vouchers he sells.

The carriers make their money primarily off of sales of airtime, via vouchers. So they have well-developed networks of vendors selling vouchers. There is always a vendor available to sell additional airtime minutes anywhere in Africa, no matter how rural the setting. Virtually every store sells airtime for one or more carriers, but it is also commonplace to see informal street vendors doing a brisk business in vouchers.

Chad has logistical challenges in regular supply of ticket-vouchers, so it too has a well-developed network of vendors, but in rural settings they generally sell airtime by direct transfer of minutes from their account to the customer phone. Since it adds one more human into the process and increases the potential for miscommunication, this can be more accident-prone than using a scratch card.

“Beeping”

Incoming calls are free, so often someone who has little airtime credit, or is an employee of a business, or friends with someone wealthier, will “beep” them. This means they call and let the phone ring once, then hang up. The other person is supposed to immediately call them back, effectiveness reversing charges for the call. This is commonplace throughout the study area.

**Notable Hardware**

The following hardware is worthy of mention, and except where noted below, was common in nearly all geographic areas covered by this study:
**Nokia 1280**

The Nokia 1280 is the current (2011) version of what may be the most popular mobile phone on the planet. It is the archetype of the developing world feature phone. The 1280 is simple, cheap, and rugged. The feature which the press talks about is its built-in LED flashlight, but in Africa all mobile phone screens are used for flashlights; it takes very little light to have a large impact on a truly dark trail when there is no light pollution from electricity.

_Illustration 2: Nokia 1280_

The real reason that the 1280 is so wildly popular and omnipresent is that its battery lasts about a week and a half between recharges. Some people are fiercely loyal to it and Nokia because of this battery life, “Nokia really cares about village people. Their phones last a long time between charges.” The primary reason it is falling out of favor with consumers seems to be that it only supports a single SIM; Nokia has recently introduced dual-SIM models with the advertising slogan, “Dual SIMs. Loud!”

_Update 8/20/2012: Nokia (& nearly all other phone manufacturers) has moved away from feature phones. The 1280 had a good run, but is best regarded as typical of legacy handsets still widely used. It is increasingly rare to see it actually sold new. However, many millions of them will remain in use for years to come._

**Huawei IDEOS U8150**

Huawei is a large Chinese electronics firm with close ties to the PLA. They have recently made major waves with the IDEOS brand of Android devices targeted specifically at the developing world.

In the first half of 2011, the IDEOS was the least expensive Android phone available, by a considerable margin, typically costing around $80 USD. IDEOS has poor battery life if used for continual 3G web browsing like a typical western smartphone, but lasts several days for voice use with occasional web browsing, a much more typical developing world scenario. The IDEOS is small, rugged, and easily recharged by micro-USB. It is popular in every market where it is introduced.

Samsung, the dominant developing world smartphone vendor, has not taken the threat of IDEOS lightly. The Samsung Champ is not available in most Samsung stores, but is often available from street vendors for the same price as the IDEOS. However, the Champ runs a proprietary operating system, has a resistive touchscreen, and compares poorly to the IDEOS in applications, usability, and general user experience. The Champ feels like an intentionally crippled Microsoft Works, compared to IDEOS’s powerful LibreOffice.

Huawei also has an IDEOS-branded Android tablet, but it is much less compelling, with cheaper hardware which isn’t in the same league with competitors. It remains to be seen if its lower price will overcome the burden of its outclassed hardware.

_Update 8/20/2012: Huawei continues to sell Android phones as fast as they can manufacture them. MediaTek/TECNO also is selling low-cost Android phones across the developing world. In Kenya, for example, there are a dozen different brands available for less than $100 USD._

**USB/SD SW Radio**

_Subsequent study in the markets and followup emails confirm that in just the past year USB and SD audio has become a common feature of SW radios not only in all the countries of this study, but throughout the world._

_Illustration 4: A typical USB/SD Shortwave Radio._
developing world. Similar models are available for $10 - $30 USD in India, Papua New Guinea, and even areas of war-torn North Africa.

While there are a plethora of brands and makes, they are generally identical in price, with a pricepoint at $15 - $25 USD for a cigar-box sized unit and at $30 - $50 USD for a “boom box” sized unit. The feature-set of the two sizes is identical; the perceived difference is that size equals loudness and hence a higher price.

Different brands offer identical hardware, suggesting that most of these ultimately are made by only a handful of manufacturers.

The decision to use USB vs SD media varies by which is less expensive in a given geography. SD seems to have a slight edge because they are already being used to store music for phones, while often there are no pre-existing USB devices in common use. One national reported that SD was better because the USB connectors break more often.

**Universal Battery Recharger**

How are mobile phones kept charged where there is no mains electrical service? In each village there will be a kiosk with a generator or solar power, which sells battery recharging to townspeople. It is not unusual to observe a young child run up to the kiosk with a small coin and a handset. This is just regarded as another chore for the child to do for their parents. The cost of charging varies, but is generally inexpensive: it’s uncommon for someone to not be able to afford to charge their phone, although if they are very poor they may leave it off much of the time to stretch out the time between charges.

However, that leaves the kiosks with the problem of charging the batteries of dozens of different phone models. The kiosks will commonly have a row of small plastic mouse-sized devices, plugged into power strips. These are ingenious universal battery chargers, and they are also common in middle-class homes and businesses if there is mains power, so that one battery may be charging while another is in use. The chargers are clear plastic with lots of flashing lights and are Christmas-tree obnoxious to western eyes. But in Africa, if the lights are flashing, it means that you’re getting your money’s worth from the charging kiosk.

**Digital Quran**

In malls catering to the wealthy, several digital study tools for the Quran were available. These devices were found in only two locations, both targeting an upper-class clientele. They are not commonplace... yet.

A netbook and a tablet were observed in one location and a netbook in the other. Neither was sold as a general-purpose device. The tablet was available for inspection; a full marketing description may be found at [http://www.islamicebook.com/](http://www.islamicebook.com/). The hardware appeared to be fairly standard but the software was customized, along with packaging and marketing materials. The tablet cost 350,000 TZS ($227.86 USD; approximately the same as a similar general-purpose low-cost tablet would have in that geographic location).

The software provided the Arabic text, along with the meaning in several translations, concordances, dictionaries, and commentaries. Overall, the feature-set was similar to what would be found for other electronic religious books in a western setting.

The cover of the tablet was made of high-quality leather with beautiful embossing. It appears to be intended to convey the same cultural impression as sacred borders on hardcopy texts.

Many carriers offer holy texts of several major world religions automatically delivered daily by text message to feature phones for a nominal fee. While of low value for in-depth study, these brief blurbs appear to be particularly popular for the Quran, suggesting that this device may be poised to tap into an under-reached demographic.
eAlimme
World's First Islamic eBook
EL1000 (7" Touch Screen)
Al-Quran
Hadith, duas, tacts, hadith, tasbih,
Islamic Encyclopedia
Prayer Times, Islamic Calendar,
Full Multimedia
Games, Audio, Video, Photos, Math,
Much More
And all other apps, games, and resources.