
USAID
FROM THE AMERICAN PEOPLE

# FAMINE EARLY WARNING SYSTEMS NETWORK TECHNOLOGY SUPPORT CONTRACT (FEWS NET TSC)

## MARKET DATA COLLECTION VIA MOBILE PHONE: WHITE PAPER

**MARCH 15, 2012**

**This publication was produced for review by the U.S. Agency for International Development. It was prepared by Kimetrica LLC under Contract No. AID-OAA-C-11-00171**

# FAMINE EARLY WARNING SYSTEMS NETWORK TECHNOLOGY SUPPORT CONTRACT (FEWS NET TSC)

## MARKET DATA COLLECTION VIA MOBILE PHONE: WHITE PAPER

**MARCH 15, 2012**

# CONTENTS

# Introduction

The rise in interest in mobile data collection coincides with the marked increase in mobile phone use, in particular in developing countries. Mobile networks are now accessible by 90 percent of the world's population.[1] Moreover, the highest growth rate in mobile phone usage is in Africa where now 25 percent of the population owns (or has access to) a mobile phone.[2] This level of accessibility has spurred the development of new tools that use SMS and voice technologies to both disseminate and collect information.

The 'mobile solution' for data collection is well discussed in the literature.[3] Indeed, most organizations in the field of international development are currently using or investigating the use of mobile technologies due to the promise they hold. Mobile data collection eliminates the expense of printing and carrying around reams of paper surveys in the field. It can reduce the time and cost of data entry, as information is immediately digitized at the collection point. Furthermore, well-designed surveys with appropriate skips and option lists can greatly minimize measurement error related to data entry and translation. Mobile phones have the potential to collect more accurate data in a more timely fashion.

Despite these potential benefits, there are still multiple setbacks to using this technology in developing countries. Many remote areas still lack satellite coverage, requiring devices to capture information and then asynchronously load it to a website or stand-alone database. Mobile phones run on batteries which, with frequent use, need to be replaced or re-charged. This requirement means field operators must either carry an extra of batteries, a portable generator, or invest in a solar solution. Moreover, data collection via SMS still presents limitations in usability that is difficult to overcome while smart phone technology remains expensive, placing this type of solution out of reach for many organizations.

It is within this context that we examine the feasibility of mobile data collection solutions for FEWSNET. With limited resources and on-the-ground personnel, FEWSNET country offices rely heavily on in-country partners (e.g. government departments, WFP, FAO, etc.) to share food security data, including nutrition and price information. As such, FEWSNET has little control over the timeliness, periodicity, quality, and spatial distribution of this data. At the same time, FEWSNET understands the need for broader representation of price and nutrition information across space so as to improve the predictive value of their early warning models. The ability to gather more regular and spatially distributed social data will help triangulate remote sensing data, improving FEWSNET predictions on how the weather will actually impact vulnerable communities, leading to a better humanitarian response. Indeed, one of the recommendations from the 2011 UNEP report entitled *Livelihood Security Climate Change, Migration and Conflict in the Sahel* is to "prioritize systematic data collection and early warning systems."[4] The challenge for FEWSNET will be finding a way to leverage these new technologies within the confines of limited resources.

This report serves as a resource for understanding the mobile data collection space. The paper divides the discussion into three distinct, but related spheres: the phone technology, the data collection model, and the software.

---

[1] The World in 2010: ICT Facts and Figures, ITU, 2010, www.itu.int/ITU-D/ict/material/FactsFigures2010.pdf

[2] http://www.reuters.com/article/2009/03/02/us-technology-un-idUSTRE5211GJ20090302

[3] S. Patnaik, E. Brunskill and W. Thies. (2009) Evaluating the Accuracy of Data collection on Mobile Phones: A Study of Forms, SMS, and Voice, In Proc. ICTD 2009, IEEE/ACM Press, 2009; Tomlinson M. et al. (2009). The use of mobile phones as a data collection tool: a report from a household survey in South Africa. *BMC Med Inform Decis Mak.* 2009. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2811102/; Dillon, B (2011). Using mobile phones to collect panel data in developing countries. Journal of International Development.

[4] http://postconflict.unep.ch/publications/UNEP_Sahel_EN.pdf (P. 13)

## Mobile Data Collection Space

There are many ways to use mobile technologies in data collection and it is easy to confuse the issues when discussing the term generically. To gain a better understanding of the complexities, we divide up the space in three different ways: by the type of phone the project envisions using, by the data collection model, and by the backend software tool.

1. **The type of phone**. Many of the projects involved in mobile data collection use a GPRS-enabled or android "smart" phone. These more advanced-functioning (and more costly) phones allow survey formats to be downloaded directly to the phone, allowing for a more sophisticated collection process. The benefits of such devices are that they are intuitive in workflow, efficient in data transfer, and allow for automatic GPS tracking. The tradeoff is that the device is expensive and may not be accessible to enumerators. In contrast, if a project assumes that enumerators will only have a GSM or so called 'dumb' phone different challenges arise. While a much less expensive solution, GSM phones only allow for data transfer over SMS. As such, enumerators are limited to 160 character SMS texts. This restriction leads to a less intuitive data collection model as users must remember the order of questions and use a delimiter to separate responses so that a computer can parse the answers. The type of phone one anticipates data collectors using is in part determined by the type of data collection model the project applies). In turn, the type of phone used will help determine what type of data collection tool is feasible.

2. **The type of data collection model**. FEWSNET must think about how any data collection methodology might be structured. Broadly, there are three primary ways to think about data collection. First there is the 'outsider model' where an outside organization hires outside personnel to come into a community and collect data. The second is a 'trusted representative model' where an outside organization works with trusted community members such as educators, traders, or health care providers, training them to collect data.[5] Finally there is a crowd-sourcing model where the outside organization relies on anonymous or non-affiliated enumerators to provide data. Some of the questions FEWSNET must ask to determine which model will be most appropriate include:

    - Do you plan to only collect data (one way communication) or do you also plan to disseminate data (two-way communication)?
    - Who will be collecting the data?
    - What is the budget for the purchase of the mobile technology, if any?
    - Who manages the data collection and training, if anyone?
    - What is the incentive structure that encourages enumerators to submit data?

3. **The data collection tool**. Here we are simply referring to the platform FEWSNET might choose to use. There are a plethora of out-of-the-box data collection tools that largely work the same way, with more or less features. Later on, we review a sampling of these tools. However we concluded that in general the technology behind these tools is strong and not the issue. Depending on the features deemed most important to FEWSNET (e.g. visualization/presentation tools, supported

[5] Cite the Hystra report

devices, etc.) most will serve the purpose or can be programmed to do so. The larger challenge is sorting out the type of data collection model most practical for FEWSNET.

## Type of Phone

The primary difference between different types of mobile phones is not the physical phone itself, but rather the type of data connection that the phone uses (although the physical phone must support the connection type). There are three main types: [6]

1. **GSM**: Global System for Mobile Communications, originally Groupe Spécial Mobile**.** GSM uses a 2G network, the most basic form of digital technology (an upgrade to the old analog phones). GSM is limited in its capacity to transfer data and is typically only used for voice calls or simple texts. GSM is the first type of phone to have a SIM card. This type of phone is what the majority of people in FEWSNET countries have ready access to in terms of cost and availability.

2. **GPRS**: General Packet Radio Service**.** GPRS is viewed as a "2.5G" network – it is a method of enhancing 2G networks to transfer data more quickly (roughly 10 times faster), to achieve closer-to-3G speeds. GPRS phones have different classes that determine the speed at which they transfer data, but they are generally characterized by having a web browser and the capability to access email.

3. **Smart Phone:** Smart phones emerged with advent of the 3G network. These networks are typically defined by their high data speeds which allow phones to stream live video, etc. Most androids and iPhones use this type of technology.

The type of phone used is a key component in determining the type of data collection project that is feasible. The next few sections describe how a GSM phone, limited to SMS, might be used versus a GPRS or smart phone, with browser capabilities.

### SMS vs. Browser-Based Mobile Solution

The best way to understand the advantages and disadvantages of an SMS-only solution versus a browser-based phone platform is to use an example. In this example, the hypothetical organization wants to collect price information on four commodities in four different markets in Kenya. The data to be collected is:

- Identity of the enumerator
- The name of the market
- The name of the commodity
- The unit of measure of the commodity (e.g. kilos, bushel, basket, etc.)
- Currency (Kenyan shillings – KSH)
- Price

Table 1 shows the data the hypothetical program is tracking.

[6] Put in a reference here…

**Table 1: Hypothetical Price Collection Project Data**

| Markets | Commodities | Possible Local Units of Measure[7] |
|---|---|---|
| Meru | Maize | Bushel |
| Kitale | Bean | Bucket |
| Malaba | Millet | Basket |
| Kisumu | Wheat | Kilo |

## SMS-Solution

The SMS solution can be used with any type for phone, from GSM to smart phones. Using an SMS solution, the enumerator must type all the necessary information into a text. The trick, however, is that the system or tool collecting the SMS information on the other end needs to know how to (or be programmed to) 'read' that text, parsing the information into the appropriate bucket. Unless the data is entered using a pre-defined format, the system will not know what to do with the information.

In a 'trusted representative' or 'outsider' data collection model where the organization has control over the process, the enumerator can be trained on how to submit the appropriately formatted text. In a crowd-sourcing model, the message pushed out to potential enumerators requesting they provide information via a text would need to clearly state how the enumerator should respond.[8]

Using our hypothetical example above, an enumerator might text in the following:

Meru#Maize#bushel#KSH#335

When the user hits submit or send, the tool receiving this information this information would be programmed to use the pound symbol (#) as a separator between the data. For example, the output from two users for the Meru market for all commodities might look something like Table 2.

[7] The possible units takes into consideration how commodities are sold locally. To make the price information useful, the organization will need to convert the units to a common unit (e.g. Kilos). Some programs ask the enumerator to do the conversion in the field before submitting information while others allow the enumerator to submit the local unit and then do the conversions on the backend in the database. Either way, for any degree of accuracy, the organization needs to spell out the measures and the conversions.

[8] In this latter case, if the request is coming via text as in a true crowd-sourcing model, the instructions would be limited to 160 characters. Alternatively, the organizations could post signs in markets requesting random people text in price data in a certain format. In this case, they could provide more detail on the sign.

Table 2: Database Output from SMS Response

| Phone number[9] | Market | Commodity | Unit | Currency | Price |
|---|---|---|---|---|---|
| +915676567 | Meru | Maize | Bushel | KSH | 564 |
| +915676567 | Meru | Beans | Bushel | KSH | 222 |
| +915676567 | Meru | Wheat | Kilo | KSH | 123 |
| +915676567 | Meru | Millet | Basket | KSH | 234 |
| +342887890 | Meru | Maize | Kilo | KSH | 654 |
| +342887890 | Meru | Beans | Basket | KSH | 543 |
| +342887890 | Meru | Wheat | Bushel | KSH | 456 |
| +342887890 | Meru | Millet | Bushel | KSH | 123 |

The primary advantage of using SMS is that it opens up the enumerator pool to anyone who has any type of mobile phone. It is also a relatively cost-effective method in that the organization does not need to purchase expensive devices in order to begin collection. Moreover, in general, the cost of a text is minimal. There are, however, several distinct disadvantages.

First, what happens if the enumerator types in something wrong? For instance, the enumerator might type in Melu instead of Meru. If there are many of these types of texting errors, there will need to be a big data-scrubbing process on the backend (those reviewing the collected data). This type of data entry issue can be mitigated by using codes (e.g. "1" for Meru, "2" for Kitale, etc.). However, in this case, the enumerator needs to remember what each code represents.[10]

Second, if the enumerator wants to enter data for all commodities, the user would either need to send four texts, which would greatly increase the personal cost of the transaction, or combine as follows:

> Meru#Maize#bushel#KSH#335#Meru#Wheat#bucshel#KSH#432#eru#Millet#baske t#KSH#234# Meru#Bean#Kilol#KSH#456.

Here again the challenge is in data entry. What if the responder forgets a pound sign or forgets to put in a unit of measure? The output on the other end would be very garbled and in need of scrubbing.

## Browser-Based Solution

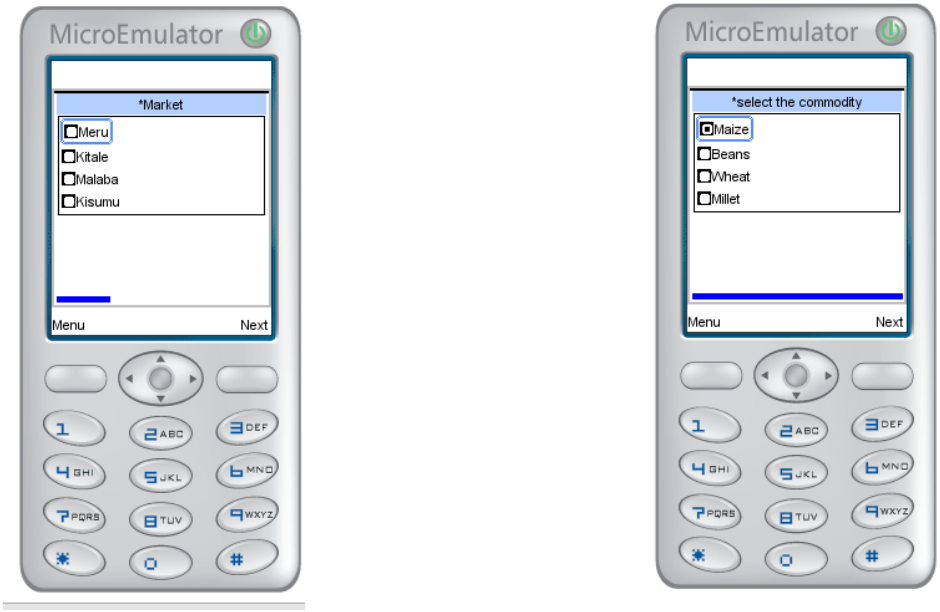
The primary advantage of a browser-based mobile solution is that one can control the entry and flow of data, minimizing measurement error arising from mistyping, while still taking advantage of the single-point data entry and timely transmittal of digitized data from remote locations. For instance, using our example, an enumerator could download the form to their phone and begin the survey. The phone would take the user through the survey step-by-step, not allowing the user to continue until certain

[9] The system would automatically collect the phone number by nature of receiving the text. In a true crowd-sourcing model, this data might be all the organization has to identify the enumerator. In a trusted representative or outsider model, the organization would likely associate this phone number with other information about the enumerator.

[10] In a true crowd-sourcing model it would be difficult to use codes because there would be no way to tell the responder what each code means within the confines of a 160 character text.

information had been entered. Figure 1 shows a few screen shots from a survey we created in one of the tools.

**Figure 1: Mobile browser-enabled survey form**




The step-by-step process ensures high quality data in the correct format.

There are two primary limitations of using browser-enabled phones for data collection. The first is the cost and enumerator access to the more advanced type of phone.[11] The second limitation is that using a phone that requires GPRS limits the type of data collection model that an organization uses. Requiring the enumerator to download a form eliminates a true crowdsourcing model.

## Data Collection Models

The primary difference between data collection models is the type of population that serves as enumerators to collect the data. The 'Outsider' model uses non-locals who enter the community for the purpose of data collection. The 'Trusted Representative' model employs community members that are trained by the organization to collect and send requested data. Finally, a 'Crowd-sourcing' model leverages non-affiliated, untrained individuals send the requested data.

While these three theoretical models serve as reference points, the difference between them is blurred as organizations modify the models to better serve their clients' needs. Ideally, mobile data collection is envisioned as a low price, high volume market. A sustainable solution is one that leverages the potential for a wide range of services with varied revenue streams.

[11] More research needs to be done on the actual cost of a GPRS phone. It is not clear that this type of phone is not more prevalent than first expected and that the GPRS function just needs to be 'turned on'.

Some of the challenges FEWSNET must consider when developing a data collection model include:

- The Regulatory Framework. Given that mobile services are regulated by national governments and implemented through select service providers, any project will need to consider the regulatory implications.
- A localized understanding of the skill sets (e.g. education, literacy, technical expertise) of potential enumerators.
- A localized understanding of the services people value. Should the system implemented by FEWS NET eventually be sustained by others? If yes, one must consider the various opportunities and incentives that would encourage people to participate and "own" the data-collection network.
- Technology platform (SMS vs. browser-based technologies and trade-offs of cost, ease of use, etc.).

Taking into account these considerations, the next section examines each different model.

## Outsider Model

The Outsider Model is effectively a tradition survey data collection model. In this model, an organization would hire, train, and pay enumerators to collect data. While organizations often use this model for one-off surveys, it is not ideal for the long-term, on-going data collection needed for regular reporting such as FEWSNET conducts. Since it involves bringing in individuals from outside the community, personnel and travel displacement costs can potentially be quite high. Given the limited resources, this model may not be feasible for FEWSNET from a cost perspective.

## Trusted Representative Model

In the Trusted Representative Model, data collection services are provided via a local community members or agents. These local enumerators are generally well-respected community members who leverage their personal and professional networks to connect the community to the outside organization via the technology. These local agents generally need to have a certain level of education for they must be able to read and write so as to type information into the text or browser.

From a sustainability angle, this model is more attractive than the Outsider Model because it employs local community members, both reducing costs and maximizing social capital. The primary costs to the organization involve identifying and setting up this agent network, training the agents, and then paying them for their services (either through a direct salary, phone credit, etc.). As we will see, the challenge is in maintaining the agent network. The questions for FEWSNET is whether or not it wants to be responsible for such a network and if so, if it is actually feasible (from both cost and capacity) to maintain such a network.

Since a derivative of this model is likely the most feasible option for FEWSNET, we have researched several examples, two of which are described below.

## Example 1: Grameen Foundation CKW Program

The Grameen Foundation's Application Laboratory (or AppLab) focuses on promoting innovation in the provision and collection of data using mobile phones and other Information and Communication Technologies (ICT) to alleviate global poverty.[12]

Currently GF is piloting the project in two regions in Uganda whereby it identifies, recruits, and trains rural community members to build a distributed network of Community Knowledge Workers, or CKWs. Using their mobile phones, CKWs act as trusted representatives, serving both their community members, by providing information services to local farmers, and GF, by collecting data from their villages. Currently the CKWs provide the following to community members:

- Agriculture tips and advices (identify disease and pest outbreaks, soil preparation, etc.)
- Weather forecasts up to three days in advance
- Market prices for 42 commodities in 20 districts
- Market platform to link buyers to sellers
- Input supplier directory

**Technology Platform**

The GF program currently uses Android and/or Java enabled handsets on GPRS and 3G networks, where available. The backend system is a MySQL database, designed in Java. The interface allows data validation and survey approval/rejection, and the system is integrated with a Salesforce.com frontend to allow for custom reporting. The technology infrastructure is supported by one of Uganda's communications and network access companies, MTN Uganda.

**How It Works**

The Grameen's program is a two-way communication feed. CKWs provide local farmers access to a database of agricultural information including: markets, weather forecasts, and a directory of farm input dealers and farming best practices related to a variety of crops and animals. When a farmer requests information, the CKW searches the database either via the GF mobile application or by sending an SMS to the GF short code.

CKWs are also trained in data collection and serve as enumerators for organizations seeking farm-level data. Each survey response captures the respondent's profile and is geo-tagged. When creating surveys, organizations can use skip logic and automatic data validation.

The biggest challenge appears to be in maintaining and supporting their agent network. Since currently the GF must fund this cost, the organization is looking for ways to make this process more sustainable. Currently the GF relies on partnerships with other organizations. For example, currently, the World Food Program is involved in terms of recruiting, training, and supporting CKWs. The WFP has also developed information services and data collection for the project.

**Possible Collaboration with FEWSNET**

We believe the scalability of this model lies in leveraging this agent network to do many things for many organizations (e.g. collect price data for FEWSNET, collect health information for WHO, collect logistics data for WFP, etc.). In theory, these agents can provide a wide range of services both to the

[12] http://www.grameenfoundation.applab.org/section/about-applab

organizations that leverage them and potentially to the end-user (two-way information) by relaying relevant aggregated information back to community members.

As such, the most logical starting point for FEWSNET would be to see if the GF is willing to 'own' the agent network by providing the backstop, training, management of the data collection process, and software tool update. Then, we would work with other organizations (e.g. WFP, WHO, etc.) that would pay to use the network to collect data. Different models include providing agents with phones and paying them, having agents 'buy' the phone and get paid for services (both collection and dissemination).

## Example 2: Esoko

Esoko is a Ghana-based company that provides a comprehensive platform for the data collection and analysis of market information, helping to integrate different aspects of the market supply chain (e.g. dissemination of price data, putting buyers/sellers in touch, etc.). The organizational operation is based around the concept of market networks and focuses on how to link the different market actors together in more efficient ways.

The Esoko data collection model is a combination of the Trusted Representative and Outsider models. While enumerators are hired either by Esoko or the organization using their services, they are generally recruited locally. Esoko customers are primarily associations, governments and NGOs that have a pre-defined target group who can be 'profiled.'[13] Esoko, in operation for five years, has operations in 16 countries, tracking 496 commodities in 833 markets and in 20 currencies. In addition, Esoko has mobile operator agreements in eight countries.

### Technology Platform

Esoko boasts a robust, cloud-based technology platform that captures and reports on market data (e.g. commodity prices, bid/offer spreads, etc.) in real-time. Data can be loaded to the system via web, excel upload, smartphone, or SMS. Similarly, Esoko provides multiple ways in which to view collected data, including SMS pushes of data, web reports, call center services, or smartphone dashboards.

**Figure 1: Esoko Technology Platform**


[13] In some cases Esoko sells subscriptions directly to farmers

**How It Works**

An organization purchasing Esoko first 'profiles' its customers, inputting customer data into the system (e.g. name, phone number, gender, interests (e.g. price data, buyers, etc.). Next, the organization (with Esoko's assistance) identifies and trains enumerators who ultimately go out into field and collect data from farmers, markets, etc. using mobile phones (SMS, Java or Android platforms). If there is mobile network coverage, on send, data is automatically uploaded to the Esoko platform.

Esoko calls its network of enumerators Information Agents (IAs). These individuals collect weekly wholesale and retail market price data. While Esoko's various clients use different incentive models, the one found most successful in Ghana is to train these IAs as part of the Esoko team (t-shirts, motivation conferences, etc.) and pay them a part-time salary (approximately: $25/month). The IAs are given phones and phone credit for doing the uploads. In addition, IA's get paid bonuses for meeting data collection quotas (e.g. $0.30 per price). However, to get paid, the data must be verified through Esoko's online QA process. The successful formula seems to be to make the IAs part of the team. When this is not the case, they have seen higher turnover, resulting in high training costs.

Esoko has a two-way model of communication with end-users. It collects price and other market information from end-users via IA's. In addition, it provides content to interested users. If new content fits an organization's customer profile it is pushed out to that customer via phone or email. The customer can choose how it is delivered (e.g. one-offs, weekly message, etc.).

**Additional Features**

The Esoko Scout feature allows users to set up simple polls, pushing out a question via SMS. The system then receives, tracks and analyzes the responses[14]. Esoko has a sophisticated reporting and visualization interface. In addition, the system provides multiple levels of permissioning so pieces of data can be shared among partner organizations.

To ensure quality data, Esoko has as well-defined data approval process. Incoming responses (e.g. prices) automatically get queued to a list that an administrator must approve before they are posted to the site. The system makes this easy for the administrator by providing details about the enumerator and the data (including percent variations from the previously uploaded price). Esoko provides a platform for measuring performance by tracking the data enumerators have uploaded to the system against specified data targets. The system can keep track of reward amounts, but currently does not have a way of automatically remunerating an enumerator via phone credit or mobile money.

**Possible Collaboration with FEWSNET**

In theory, FEWSNET could work with Esoko in a similar manner as proposed with the Grameen Foundation. However, Esoko is a for-profit company and charges a fairly steep fee for their platform and services. Typically Esoko sells packages nationally ($64,000 – which includes platform, hosting, and training). However, for a program such as FEWSNET which potentially will span multiple countries, Esoko is willing to consider deep discounts and alternative pricing mechanisms.

## Crowd-Sourcing Model

The idea behind a Crowdsourcing Model is to engage as many people as possible in collecting discrete bits of data for minimum compensation which, in turn, the technology aggregates for analysis. The primary advantage of this type of model is that there is no 'agent' network to train and maintain,

[14] New feature, in beta right now.

drastically reducing costs. One big limitation is overcoming the challenge of getting enough of a 'crowd' to provide data in quantities that allow for statistically-representative data. In addition, a true crowd-sourcing data collection model will only work using an SMS solution. This is because an organization cannot rely on anonymous individuals to download an application to their phone to enter data. Therefore, challenges associated with SMS-based collection (e.g. the 160 character limit and non-intuitive design) are very relevant.

Despite the challenges, we do foresee ways in which FEWSNET might take advantage of a derivative of a crowd-sourcing model. For instance, FEWSNET could leverage a trusted representative agent network to post simple signs in high-traffic areas such as a market, that explain how to supply price information in return for a phone credit.

## Data Collection Software Tools

Intended to capture and manage the data generated under any of the models described above, many mobile data collection software tools exist on the market. While browser-based tools that require a more advanced GPRS or smart phone dominate this market, the number of SMS-only options is rising as organizations increasingly seek to use these tools in developing countries where simple GSM phones are most prevalent. We reviewed both purely application-based tools as well as those with SMS-only options to ensure a comprehensive comparison:[15]

- Episurveyor
- Webfirst
- Nokia Data Gathering
- Iformbuilder
- Poimapper

Software that allows communication via SMS will work with any type of phone. However, software that requires a download to a phone browser needs to be optimized for each type of phone. Nearly all the application-based tools we reviewed require phones to be GPRS-enabled and to be able to run JavaScript programming (j2me). EpiSurveyor has tested their application on the most extensive list of phones and phone types, while Nokia Data Gathering works only on Nokia phones. The most limited tool we reviewed was iFormBuilder, which works only on Apple iPhones, iTouchs, and iPads.

Most tools on the market have similar features, although some features that work when using the tool's application may not be available when using it for SMS-only. For example, both EpiSurveyor and WebFirst offer the ability to geo-tag respondents' coordinates. However, because this feature uses the GPS in GPRS and smart phones, respondents using SMS would need to manually key-in their location (the SMS survey would need to request these coordinates accordingly). All tools reviewed have some variation of visualization, or reporting, features including mapping, creation of charts and graphs, and/or export functions. Table 3 provides a comparative snapshot of these features.

[15] Other technologies to review Frontline SMS, Rapid SMS,

**Table 3: Mobile Data Collection Tool Snapshot**

| Tool Name | Cost | SMS option | Minimum mobile require-ments | Visualization tools (reporting) | Advanced Skips | Geo-tagging | Survey Upload from .csv | Send alerts | Supports multiple Languages |
|---|---|---|---|---|---|---|---|---|---|
| Episurveyor www.episurveyor.com | $5000/ year (Pro version) | ✓ | J2me (java) GPRS | • Export to .txt or .mdb (Access)<br>• Graphs and charts | ✓ | ✓ | X | X | ✓ |
| Webfirst | ?? | ✓ | J2me GPRS | • Charts and graphs<br>• Mapping | X | ✓ | | ✓ | X |
| Nokia Data Gathering https://projects.developer.nokia.com/ndg/wiki | Free | X | J2me GPRS Nokia only | • Mapping<br>• Export to Excel or .csv | ✓ | ✓ | ✓ | ✓ | ✓ |
| Iformbuilder*<br><br>www.iformbuilder.com | $5000/ year | X | iPod touch iPhone iPad | • Mapping<br>• Graphs<br>• Export to .pdf or .xls | ✓ | ✓ | ✓ | X | ✓ |
| Poimapper<br><br>www.poimapper.com | One-way: €0.15 / uploaded form. Two-way €20/ active user/ mo. Min €500/ mo | Must use local partner, Shimba (www.shimbamobile.com) | J2me GPRS | • Mapping<br>• Export to .xls | Can add sub-questions, but not skips | ✓ | i free if they can reuse with other customers | Can be done by adding comments to existing forms. | X |

*in iForm Builder the user must be connected to the internet to download or upload forms, but the user does not need a connection when collecting data – stored on the phone.

## EpiSurveyor

EpiSurveyor is a cloud-computing application that was designed for use in the field of international development. Administrators begin by logging in online to create survey forms and questions. When enumerators download the application to their mobile phones, they can then download survey forms. After completing each form, the enumerator must upload it to the central server which collects and aggregates the data.

EpiSurveyor has recently added an SMS-only survey method. Administrators begin by creating simple forms, then enter mobile numbers and a simple (less-than-160 character) message with instructions, for example, "*Please reply with this week's prices (per kilo) in the following format: 12206#MaizePrice#SorghumPrice#WheatPrice#MilletPrice#CowpeaPrice*."

Collected data can be viewed real-time on the EpiSurveyor website via graphs, charts, and maps. Survey data can also be viewed on mobile phones. All data is encrypted and access to it is restricted via user passwords.

## PhiCollect

PhiCollect is WebFirst's cloud-based, mobile data capture platform that is based on Open Data Kit and Drupal 7, both open source technologies. Rather than creating each component, PhiCollect downloads open source modules and integrates them into their data collection system, allowing for relatively easy and inexpensive addition of extra features. PhiCollect offers a good visualization platform including graphs, charts, and Google mapping. While the system does not currently support skips (e.g. if you answer A, skip to question #4), it has the ability to collect multimedia data (pictures and video) and to push reminders to multiple phone numbers, ensuring that enumerators do not forget to enter weekly data. PhiCollect can capture data via its application or through SMS texting, although geo-tagging does not work on basic GSM phones. Data collected with this application can be integrated with social networking applications like Facebook and Twitter for data sharing. All data is secured by industry-strength, Drupal-based authentication.

## Nokia Data Gathering

Nokia Data Gathering is Nokia's solution to mobile data collection, which is offered free to the public as open source software, allowing organizations to modify it for their own needs. Like EpiSurveyor, administrators begin by creating a form on the server. Unlike EpiSurveyor, administrators initiate the process of downloading the application to each mobile phone by registering it. The software then sends an SMS to each registered phone with instructions on installing the application. Administrators can send population questions either by manually creating them or by uploading a .csv file.

Nokia Data Gathering allows survey writers to group questions by categories, use skip logic, and utilize a number of different question types, including images, which can be image-specific geo-tagged. When enumerators open the application on their mobiles, they will see a list of surveys and can select the one they want to complete. Surveys are stored on the devices until the users select to send their results to the server, allowing data to be collected offline and uploaded when service is available. This tool also allows administrators to send SMS alerts including reminders or additional information. Results can be mapped or exported to other programs for more full reporting and visualization. The software is equipped with the ability to encrypt data both on the mobile device (if encryption is enabled) and when it is being transmitted to the server.

### iFormBuilder

The iFormBuilder application is a data collection tool built for Apple iOS devices, which is functional on the iPhone, iPad, and iTouch. The app uses Zerion Mobile Behaviors, an extensive form behavior framework that allows for the creation of dynamic surveys including features such as: advanced skip logic, conditional elements, multiple languages, and multi-level subforms. Survey-building is intuitive and consists of an extensive 27 element types including geo-tagging, multimedia, and signatures. Data can be collected offline and uploaded when service is available, and its validation is completed as it is entered. The standard client uses industry-standard SSL encryption, and an enhanced security client is available.

### PoiMapper

PoiMapper is a mobile data collection tool focused on collecting and utilizing point-of-interest data. The emphasis of the tool is on GPS capture and data visualization on layered, digital maps (such as Open Street Maps or Google maps). With GPS tracing, routes and areas can also be recorded. In addition, PoiMapper can record official administrative area hierarchies and associate administrative areas with each collected data point. A key feature of PoiMapper is that users can download complete datasets from the central database to their phones, allowing for existing data to be updated from the mobile device. In addition, each update is saved, allowing for versioning over time. Data collected with this application can be integrated with social networking applications like Facebook and Twitter for data sharing. One of the downsides to PoiMapper is the need to install a desktop client on the users' PCs in addition to downloading the mobile app to users' phones.

## Reflections from a Panel of Experts in ICTD

The New America Foundation recently hosted a panel discussion entitled, "Mobile Disconnect: Can Mobile Solutions Really Combat Global Poverty?" in which experts discussed whether the emerging field of Mobiles for Development (M4D) is a viable solution or whether it is another passing trend.[16] The panelists felt that there currently exists a distinctive dichotomy between development researchers and practitioners: some advocate M4D the silver bullet while others are hyper-cynical about M4D and its potential ability to bring about change. Indeed, one panelist, Ms. Katrin Verclas referenced Gardner's "Hype Cycle," which explains that after the Introduction of a 'new technology,' there are 'inflated expectations,' which are followed by a 'trough of disillusionment' and finally level out onto the 'plateau of productivity.'

The sentiments among the panelists ranged from expectant advocates to cynical critics to those with more realistic expectations. Mr. Michael Tarazi of CGAP promoted the opportunity of mobile banking. Mr. Kentaro Toyama, a researcher at Berkeley, was the skeptic of the group. Ms. Maura O'Neill of USAID articulated a hopeful yet cautious perspective: "We are at M4D 1.0," indicating that the field is in an exploratory phase and that the inherent opportunities and challenges have not fully been flushed out. The final conclusion was that the field may hold promise for stakeholders in developing countries, but,

[16] Panelists included: Maura O'Neill, Chief Innovation Officer and Senior Counselor to the Administrator, USAID; Katrin Verclas, Co-Founder and Editor, MobileActive; Michael Tarazi, Senior Policy Specialist, CGAP, The World Bank; Kentaro Toyama, Researcher, School of Information, University of CA, Berkeley.

like any development-related tool or theory, it is not a silver bullet solution, and both researchers and practitioners should be mindful of risks and unintended consequences.

Areas in which the panelists perceived potential for impact include mobile money/banking, mobile health, democratization and regime stabilization, remittances and streamlining of markets in the agricultural sector. USAID has conducted pilot studies in which civil servants thought they received a 30% raise when paid via a mobile, as intermediaries were unable to skim cash off the top of their payments. Mr. Tarazi indicated that while banks have existed for more than 40 years in Kenya, there are currently more mobile money users than bank accounts, only four years after introduction. He also noted that of nine branchless banking organizations, half reached more unbanked clients than the largest microfinance institution in the same country. Ms. Verclas noted the way the Arab Spring demonstrated the potential impact of mobile technology on democratization.

Still, the experts expressed hesitancy. Ms. Verclas voiced apprehension over the fact that development agencies and many governments do not have policies governing the use of data collection and the protection of personal data. A common concern was that organizations may focusing too much on M4D at the expense of other important issues, like basic health and transportation infrastructure. In some cases, the local population may not have the capability to leverage mobile technology (lack of literacy). Another key concern was a lack of substantive data proving the field, although Ms. O'Neill did mention this is a priority for USAID. Mr. Toyama urged researchers and practitioners to be critical of existing data: often M4D is measured in terms of adoption rates, access and affordability, however these metrics do not necessarily serve as indicators for development goals. Stating "technology *only* magnifies the underlying human intent and capacity that is there," he reminded participants that the use of technology is not necessarily net-positive, but can be used for net-negative or net-neutral purposes as well, and that "killer apps" already exist – as entertainment and adult content.

Throughout the discussion were references to the digital divide. While most technologies are too expensive for the poor, mobile phones are more feasible options. Still, one participant referenced that in some countries, owning a mobile can cost up to 40% of a poor person's income. And the advance of M4D may not necessarily close the digital divide: in many cases, there gender-related barriers may inhibit mobile access for women, and a new divide may even emerge between those with advanced, internet-accessible phones and those with so-called dumb phones. Finally, as the digital divide closes, the disadvantages to those who continue to lack access may increase in severity.