Mobile Technology Handbook

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DATE January 2014

Pact Inc., 1828 L Street NW, Suite 300

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January 2014

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Foreword

Mobile technology may be poised to change the field of development, especially monitoring and evaluation. Every month, cellular voice and data networks reach farther into developing countries; increasingly, international nongovernmental organizations are using mobile technology in their programming. There were more than 6 billion mobile phone subscribers in 2012, according to the World Bank,[1] and a billion mobile broadband subscribers in 2011, according to the International Telecommunications Union[2]; 75% of the world has access to a mobile phone. The ubiquity of mobile phones is well illustrated in a 2013 quote from the United Nations News Center: "Of the world's 7 billion people, 6 billion have mobile phones. However, only 4.5 billion have access to toilets or latrines."[3]

This handbook is intended to give people involved in international development work a framework for getting started with mobile technology. It is meant to be paired with training slides that provide more examples and context. It was created using training resources developed by myself and by Alison Koler, Jade Lamb, Joris Vandelanotte, and Reid Porter. Other contributors include Tim Michetti, Charles Guedenet, Daisy Kisyombe, Olufemi Akinmade, and Samuel Kuhlande.

We hope that the work reflected in these pages will help you use technology to make your work as development practitioners more innovative and efficient.

Kerry Bruce, DrPH

Senior Director for Results and Measurement

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[1] World Bank. Information and Communications for Development 2012: Maximizing Mobile. Washington, DC: World Bank; 2012. DOI: 10.1596/978-0-8213-8991-1. Available at: http://www.worldbank.org/ict/IC4D2012. Accessed January 18, 2013.

[2] International Telecommunications Union. ICT Statistics Newslog–Mobile broadband subscriptions to hit one billion in 2011. Available at: http://www.itu.int/ITU-D/ict/newslog/Mobile+Broadband+Subscriptions+To+Hit+One+Billion+In+2011.aspx. Accessed January 18, 2013.

[3] United Nations News Center. Deputy UN chief calls for urgent action to tackle global sanitation crisis. News [serial on the Internet]. 2013. Available at: http://www.un.org/apps/news/story.asp?NewsID=44452#.UgqX_pJOQyJ. Accessed April 14, 2013.

Glossary

Although many of the following terms will be discussed in detail in the coming chapters, it is helpful to begin to familiarize yourself with common mobile technology terms and concepts.

Airtime: The time spent talking or otherwise using the voice function of a mobile device; mobile carriers determine billing charges based on the airtime used.

Android: Popular operating system developed by Google that is used on many smartphones and tablets. Android's main competition in the smartphone market is Apple's iOS used on iPhones and iPads.

App: A small, specialized piece of software that can be downloaded onto a mobile device. "App" is short for "application."

Basic phone: Device with basic phone functionality (e.g., SMS and voice), very limited computing power, few connectivity options, and a basic user interface and numeric keypad.

Crowdsourcing: Obtaining information or input into a particular task or project by enlisting the services of a number of people, either paid or unpaid, typically via the Internet.

Graphical user interface (GUI): The screen that a user interacts with to operate a mobile device. Basic phones and some feature phones are display only. Other feature phones, smartphones, and tablets use larger touch screens for richer interaction and usability.

Feature phone: Midrange mobile device with a graphical user interface, basic apps, and more numerous connectivity options than a basic phone, but without a smartphone's computing power and QWERTY keyboard.

GIS: Geographic information system. A platform designed to capture, edit, analyze, and visualize geographic or spatial data, usually via a map.

GPRS: General packet radio service. A data transmission system similar to SMS but without limits on the number of characters or transmission size.

GPS: Global positioning system. A network of satellites that broadcast signals read by handheld GPS units or other GPS-enabled mobile devices to calculate a precise location using latitude and longitude coordinates.

GSM: Global system for mobiles. The most widely used cellphone technology globally. GSM-compliant phones have removable SIM cards, which enable you to transfer your mobile subscription account, contacts, and other data from one GSM phone to another.

ICT4D: Information communication and technology for development. The use of mobile and computing devices to improve development outcomes.

IMEI: International mobile equipment identity. The unique identification number found printed inside the battery compartment or listed under a device's settings menu.

Java: Popular operating system for a feature phone and some smartphones.

Mobile platform: The system that receives the data sent from mobile devices. The various mobile platforms have varied features and functions, including data storage, data verification, data analysis, and data reporting.

QWERTY: The standard layout of an English keyboard, with the letters q, w, e, r, t, and y positioned in that order, reading from left to right, on the top row of alphabetic characters.

SIM card: Subscriber identity module. A small card inserted into a mobile device on which phone numbers, contact information, and other data are stored.

Skip logic: Instructions programmed into a mobile-based questionnaire that will present a different series of questions to the user based on a previous response. Also known as conditional branching.

Smartphone: High-end, full-featured mobile device with touchscreen graphical user interface, on-screen or hard-button QWERTY keypad, advanced computing power, downloadable apps, GPS receiver, and multiple connectivity options.

SMS: Short message service. System for sending short messages of a fixed length—traditionally a maximum of 160 characters in English, with other lengths in other languages.

Tablet: Full-featured mobile device with large touchscreen graphical user interface, on-screen keyboard, advanced computing power, downloadable apps, GPS receiver, and multiple connectivity options. Tablets typically lack SMS and voice communication options.

Introduction

Mobile technology has already proven itself a powerful and efficient tool that accelerates achievement of project objectives and ultimately of development goals.

Efficiency and data quality gains have been accepted as the norm for many applications, and the frontier of possibilities expands daily.

Given the dynamic and evolving nature of the mobile technology field, the following chapters are not exhaustive and do not aspire to be. But whether you are a practitioner in the field or a project manager at headquarters, you will learn in these pages how to begin developing and putting in place a mobile technology strategy for development programming and how to select mobile platforms; case studies will show you how mobile technology has been used for development. You can use the handbook simply as a reference or make it the foundation for a workshop to spread learning throughout a team.

How to Use This Handbook

Start your process by reviewing literature on how mobile technology has been implemented in your specific technical field and/or country. Combining such contextual information with the overview of mobile technology provided here will support creative problem solving, stimulate project design, and help you begin to stay current on developments in this dynamic field.

Look for resources for continued learning throughout the handbook.

Chapter 1
Understanding Mobile Technology and Its Applications

CHAPTER LEARNING GOALS

- Understand information communication technology for development (ICT4D), including mobile technology—what it is and what it can do.
- Discuss the advantages of mobile data collection over traditional methods of collecting data.
- Learn how mobile technologies are being used in international development.

What Is Information Communication Technology for Development?

ICT4D is the application of common, everyday technologies to development. This handbook focuses on the mobile technology (specifically, on phones and tablets) and how they are being used around the world to accelerate development goals. Projects from diverse technical areas have adopted mobile technology to perform:

- Survey data collection
- Routine M&E
- Dissemination of general or targeted information
- Awareness and sensitization campaigns
- Patient tracking
- Surveillance and reporting
- Crowdsourcing
- Logistics management information systems
- Mobile banking and cash transfers
- Coordinating service delivery or referral services
- Conflict early warning systems
- Public dialogue

Refer to Appendix 1 to see how Pact has implemented mobile technology in its programming.

What Are the Advantages of Mobile Data Technology?

The advantages of using mobile data technology over traditional, paper-based methods include:

- **Faster, more accessible data**—Data collected in the field with mobile devices can be submitted and stored online or on home office servers, allowing for real-time access to data for analysis and decision making.
- **More reliable data—**Collecting data in the field with mobile devices eliminates the need to enter data from paper into a database, therefore reducing the opportunity for error or loss.
- **Cleaner data**—Mobile applications embed skip logic that directs respondents to specific sections of the questionnaire based on previous responses (e.g., different questions for males and females). Thus, data is never entered where it doesn't belong.
- **Ability to monitor data collection**—By monitoring GPS locations and time stamps of submitted surveys, you can track field worker performance and the quality of incoming data.
- **Richer data**—Integrated GPS coordinate collection, camera capabilities, and audio capture broaden the scope and type of information that may be collected.
- **Built-in data visualization**—In some systems, online interfaces permit data visualization or have dashboards that allow data to be manipulated, customized, and downloaded.
- **More than just data**—Mobile devices support a range of capabilities beyond data collection (e.g., mobile banking, patient tracking, and crowdsourcing, as well as communication).

Chapter 2
Developing a Strategy and Getting Started

CHAPTER LEARNING GOALS

- Develop your own mobile technology strategy document.
- Brainstorm ways in which mobile technology can improve a project.
- Identify data to collect and optimal data management processes.
- Identify and understand users.
- Conduct an initial feasibility assessment and considerations when choosing a mobile platform and mobile devices.
- Understand the costs and savings involved in implementing a mobile initiative.

Why You Need a Strategy

Developing a strategy for incorporating mobile technology into your work processes is critical. The strategy will ensure that the human, material, and financial resources you will need are available; that your intervention is appropriate for the project and its context; and that it will enhance program management or implementation.

When developing a strategy, involving all stakeholders is key, including those who will collect the data, those who will use or analyze it, and those who will manage the process.

Chapter 2 discusses how to get started and what questions you should be asking stakeholders as you develop the strategic plan.

Develop a Concept or Strategy Document

Why It Matters

It is critical to engage stakeholders at all stages of a project both in order to create buy-in and to minimize challenges in operationalizing your mobile strategy later on.

Toward these ends, a written document outlining your organization's mobile technology concept or strategy is essential. It will definitively communicate what you are doing and the rationale behind your activities, so that relevant stakeholders (e.g., mobile end users, funders, and staff) can provide feedback early on and reference as needed later on.

Having your strategy clearly articulated in a document will also help you and your colleagues stay on track as you implement your strategy. Finally, having a strategy document will help

ensure the long-term sustainability of your mobile initiative and will smooth transitions when project staff leave the organization or change jobs without it.

As you move forward and adapt to the rapidly changing field of mobile technology, you can improve and update your strategy document as needed.

What to Cover

A well-crafted mobile strategy document should describe the following:

- Purpose of the strategy document (including the challenge that mobile technology use will help you to solve)
- Goals and objectives of the mobile technology strategy
- Data to be collected via mobile devices
- Your planned mobile technology feasibility assessment, including:
  —Available network coverage in the areas where you will be working
  —Comfort and experience level of mobile device users
  —Data plans and costs
  —Security issues and management
  —Internal and external technical support required
- Tools and instruments selected and rationale behind selection
- General data collection procedures
- Reports that will be generated
- Integration of data into other systems
- Data management and security plan

Brainstorm How Mobile Data Collection Can Improve Your Project

To begin, it is important to consider how mobile technology will be useful for your project. Think about some problems you are having and how mobile technology can be the solution.

- **Problem: Slow data processing**—"Whenever we conduct surveys, data clerks are tasked with entering all the data. Given that this is in addition to their other work, it takes up to four months to obtain a completed dataset. This delays our ability to respond and make data-based programming decisions."
- **Problem: Poor data quality**—"Too many times, our data collectors don't follow skip patterns or questionnaire instructions. As a result, our data is poor."
- **Problem: Lack of geographic data**—"USAID has asked us to map services delivered to beneficiaries. We need to begin to collect

Myanmar Brainstorming

Pact Myanmar wanted to begin to use mobile technologies to monitor and track WORTH outcomes.

Problem: Every six months data are collected from WORTH groups on savings, loans, and dividends—a huge endeavor, given that there are more than 2,000 WORTH groups in Myanmar.

Solution: Mobile technology made data collection much more efficient

GPS data."

BRAINSTORMING EXERCISE

What data collection/dissemination problems are you facing? Is mobile technology a solution to any of them?

When Should You Continue Collecting Data on Paper?

In some cases, it may not make sense to use mobile technology:

- **Status quo satisfactory**—When your data is not urgent and your current system is already meeting your standards for quality and efficiency, changing data collection methods may not make sense.
- **Security concerns**—The cost of having servers host data in country can be prohibitive for small data collection exercises. If stakeholders have concerns about the security of data leaving the country to an international data host, collecting data on paper may continue to make sense.
- **For qualitative data collection**—When you are collecting a lot of *qualitative* data, using mobile devices for numeric or even QWERTY-keypad input will limit the amount of information that can be entered quickly. If audio capture is possible, it may mitigate this issue if the survey is limited in size. Otherwise, paper data collection is most flexible.
- **Use of mobile devices impractical or unsafe**—In some areas, using mobiles may make data collectors more vulnerable to violence or surveillance. Elsewhere, entering data on a mobile device as an interview is in process may be distracting for the respondent or even potentially bias responses, as when the respondent is concerned for his or her privacy or security.

It is important to consider the type of data you are collecting and who will be collecting it to make sure that the use of mobile technology is appropriate for the context.

BRAINSTORMING EXERCISE

What type of data could be most efficiently collected using mobile technology? How might you integrate mobile technology into your current data collection activities?

Identify Your Data

Based on your brainstorming exercise, think about the data you would like to collect.

- **Indicators**—If you are starting a new project, consider which indicators make the most sense to collect using mobile technology.
- **Tools**—If your project is already underway, think about which data collection tool(s) could most appropriately be adapted for mobile data collection.

- **New information**—If you could access data for analysis much more quickly after collection, as is possible with mobile technology, consider whether there are data that would be useful to have that you may not have otherwise have collected (e.g., conflict data).
- **New data types**—Remember that with mobile technologies you can collect not only text and numerical information but also photos, videos, GPS coordinates, audio, and biometric data.

REMEMBER

Mobile technology should simplify your life. For example, think of the large volumes of data that are waiting to be entered, or data that people have to travel far to submit.

Data Management

Once you identify the relevant questions, data collection tools, and data types for your mobile initiative, consider your data management processes to determine which platform will be the most cost-effective and best suited to your strategy for incorporating mobile technology into your work.

- **Frequency**—How frequently will the data be collected (e.g., "every month")?
- **Data collectors**—How many people are collecting data and how many will require mobile devices (e.g., "there will be 10 field workers, and all will need mobile devices")?
- **The tool**—How many items/fields are on the survey/data collection tool (e.g., "the survey is 15 pages long and has 65 items")?

Identify and Understand Users

As part of the process of deciding whether mobile technology will enhance your data collection and management processes, you need to identify and understand the end users of your mobile technology. Knowing your users will help you:

- **Obtain the right type and number of mobile devices and appropriate software**—How many mobile devices are needed? What language will the software need to use? Under what conditions will the devices be used? (For example, will there be access to power sources? Will there be rain or dust that might damage the devices? What level of technology is appropriate for the end users? Consider their age, experience with phones, literacy, and eyesight.
- **Tailor training to the users**—The most effective training content and delivery is responsive to end users' level of education, culture, and previous exposure to similar technology.
- **Get buy-in from the people who will be using the technology**—Securing end users' commitment to mobile technology during the design phase is the best way to ensure that your rollout is successful. Exposing stakeholders to the technology early on will test any

Pact Myanmar Mobile Device Users

In Myanmar in 2013, data from WORTH groups is collected by local volunteers, 200 of whom need phones. Most are not highly educated, and given that SIM cards are expensive, many lack experience with mobile devices.

assumptions you have made as to the appropriateness of mobile technology. Early user involvement also has the potential to greatly improve the level of participation and, ultimately, the speed and quality of implementation.

Conduct a Mobile Technology Feasibility Scan

After you have a general idea of how and who will be using mobile data technology in your organization, you will want to conduct an initial feasibility scan to help you understand the mobile infrastructure and the cultural, political, and economic environment. This scan will help you ensure that your strategy is appropriate and realistic. Ask:

- How widespread is network coverage? Which mobile service provider(s) make sense to use? If coverage is poor in the targeted area, are WiFi hotspots nearby, or is better coverage available elsewhere?
- What data plans are available, and how much do they cost?
- What are the data security and management issues to be aware of? Is privacy a consideration?
- What are the legal and regulatory frameworks that might cause concern?
- How will the use of mobile technology impact gender equity, ethnic relations, and access to power and resources? Will the use of mobile technology benefit some groups more than others?
- Will using mobile technology bring unwanted attention to respondents or field workers? Will privacy concerns or other factors bias the data in ways that a traditional approach would not?

Decide on a Mobile Platform and Mobile Devices

After defining your mobile strategy objectives, identifying end users, and conducting a feasibility scan, the next step is decide which mobile device and which platform are the most appropriate to your needs.

"Mobile platforms"—the systems that receive data from mobile devices—provide a variety of features and functions, including data storage, data verification, data analysis, and data reporting. *See* Chapter 3, Mobile Technology Platforms.

Choosing a Platform at Pact Myanmar

Pact Myanmar chose to use Magpi as its mobile technology platform because:

- Magpi supported the alphabet of the local language, Burmese.
- Given the large amounts of data collected, Magpi was more cost effective than other platforms that also supported Burmese.

On the other hand, Magpi does not provide survey set-up. For that reason, the team trained themselves to build forms in Magpi and have become expert at the process.

With so many different mobile devices on the market, each with different plans and features, choosing a mobile device can be overwhelming. To quickly narrow your options, consider the

nature of your mobile initiative (one-off versus long-term), data requirements, method of transmission, power sources, and budget.

Nature of Mobile Initiative: Think Long-Term

If you are starting a new five-year project, you will likely want to invest in technology that will grow with you. Thus, basic cell phones—which will be obsolete in fewer than five years—may not be the best choice.

If you are thinking of acquiring mobile devices for one-time data collection, consider how you might use them for another data collection project or for other monitoring purposes; then consider what type of phone would be best for all activities. If your mobile initiative is time-bound and you do not anticipate scaling up or continuing to use mobile technology beyond a defined period, ongoing data collection costs (e.g., airtime) and obsolescence will be less of a concern.

Data Collection: Mobile Features and Functions

Your data requirements will influence your choice of mobile device. Many basic phones on the market today come with features previously considered advanced, such as the capacity to take photos and videos. However, the quality of the images you collect may not be comparable in quality to those of smartphones and other mobile devices with more advanced technology. Also, basic phones may not be as reliable or as durable as more advanced devices.

Some features, such as Internet access and the ability to collect GPS data, are available only on more technologically advanced mobile devices.

Screen size may also be a factor.

In addition, keep in mind that although Android devices are compatible with most mobile platforms, certain mobile devices are incompatible with certain mobile platforms; consult your platform requirements before settling on a specific device.

FEATURES AND FUNCTIONS TO CONSIDER

❒ GPS to collect location data.
❒ A camera to collect photos. Consider number of pixels you require for adequate image quality.
❒ Ability to take and store videos on the device.
❒ Data storage capacity. In areas with poor network connections, mobile users may need to initially store collected data on the phone until they can transmit the data.
❒ Ability to block certain uses of the phones and data. This may involve setting a password to prevent unauthorized app downloads or an app-blocker that restricts access to inappropriate apps, games, etc.
❒ Internet capacity.
❒ A touch screen.

❒ Screen size. If you will be using long forms to collect data (as opposed to SMS, for example), devices with larger screens may be easier to use. Screen size affects how easy images are to view on screen as well as how easy it is to type on the device, because of a larger screen means a larger on-screen keyboard.
❒ Battery life. Access to a source of power is important for mobile users, especially for those who are located in or travel frequently to rural or isolated areas where electricity is scarce and if the mobile devices you choose are heavy power users. Running out of battery power in the middle of data collection can cause delays or even severely disrupt work if no spare battery or access to a power source is available. Using backup batteries is possible with many phones, but not all. Look at manufacturers' claims and at battery life during your pilot test in the field. *(See* "Pilot Test the Technology in the Field," in Chapter 4, Implementing Your Strategy.) Consider whether your pilot test battery life meets your needs, given availability of power sources for recharging in the field and considering whether your budget can stretch to accommodate the cost of auxiliary power devices.
❒ Data transmission capability. Mobile devices can transmit data via SMS, GPRS, or both.
❒ Language capability. Do both the mobile platform and mobile device you are considering accommodate the language(s) and associated alphabet characters you want to use in your project?
❒ Suitability for your context. Will the mobile device you are considering be a target for thieves, or will it make your subjects uncomfortable, affecting their willingness to speak freely?
❒ Durability. Phones with moving parts (e.g., flip phones and slider phones) tend to wear out and break more quickly than phones without such moving parts.

Data Transmission Capabilities: SMS Versus GPRS[4]

Important differences in data transmission capabilities will affect your choice of mobile device and mobile platform.

Short message service (SMS) is available on nearly all phones. General packet radio service (GPRS) is more advanced but increasingly prevalent. Whereas SMS typically restricts each message to 160 characters, GPRS does not effectively limit the size of the form you submit.

In addition, the system that receives the data sent by a mobile device using SMS is different than for a device using GPRS. Whereas SMS is sent to a number recognized on a GSM network, GPRS data is submitted directly to your server over the Internet. With SMS, even where it is possible to connect your phone to a computer and then receive incoming data (e.g., on the FrontlineSMS platform), you can usually receive only a few messages per minute. If you expect to receive large volumes of data, you may need to use the service of a third-party SMS gateway provider to receive your data and then submit it to your server over the Internet—and this service comes at a price.

[4] Melissa Loudon, "Mobile Phones for Data Collection," 2009. http://www.mobileactive.org/howtos/mobile-phones-data-collection.

WHEN TO USE SMS

- If you are using basic phones (e.g., if your initiative is using the personal phones of data collectors who do not own more technologically advanced mobile devices—e.g., Java-enabled feature phones or smartphones).
- If data submissions are typically 160 characters or fewer in length.
- If total data volume is low.
- If data collectors lack Internet access.
- If your project is a small one-off initiative that will not be scaled up.
- If data collectors need to send their messages at no cost—that is, if you need the ability to reverse-bill SMS.

WHEN TO USE GPRS (INTERNET)

- If data collectors are equipped with more technologically advanced phones (e.g., Java-enabled feature phones or smartphones).
- If you need to submit large volumes of data at one time.
- If total data volume is high.
- If multimedia data (e.g., photos and videos) will be transmitted.
- If Internet access on the phone or via intermittent connection to wifi is not an issue for data collectors.

Data Collection Client Interface: Fixed-Format SMS, Java Platform, Web-Based Form

The data collection client interface is what mobile users interact with to enter and transmit data. The usability and features of the interface will affect your choice of mobile device and what orientation or training you will need to provide to users. The main differences among interfaces lie in what phones they can be used with; the requirements for setting up an application; how data can be transferred from the phone to your servers; and the interface's ease of use.

A data collection client interface using fixed-format SMS is the simplest of the three options. Most phones are SMS-enabled, and submitting data by SMS requires less orientation or training than for other options. An interface based on a Java platform—usable only on slightly more advanced feature phones—allows mobile users to enter and transmit data using GPRS, over the Internet when connectivity is available. A data collection client interface using Web-based forms can be used only on phones that have a Web browser and consistent Internet access. The advantage is that data entry and transmission is quick and relatively easy.

Summary of Data Collection Client Interfaces[5]

	FIXED-FORMAT SMS	JAVA MICRO EDITION PLATFORM (J2ME) APPLICATION	WEB-BASED FORM
What phones are supported?	All SMS-enabled phones.	All Java-platform phones or feature phones.	All phones with a Web browser—effectively, all Java-platform feature phones and smartphones.
What does the user need to do to begin data collection?	No software needs to be added to the phone. Users need to acquire the correct format for SMS data transmitted.	The application must be downloaded to the device from the Web or saved via data cable to the device's memory.	The phone must be set up to access the Internet.
What data transfer methods are available?	SMS only.	SMS or GPRS. Data transfer can be asynchronous with GPRS—that is, users save data to the device to be transmitted to the server when connectivity is available.	GPRS. Data transfer can be asynchronous with GPRS—that is, users save data to the device to be transmitted to the server when connectivity is available.
How easy is the platform to use?	It's easy to use, but mistakes are easy to make when composing the SMS. Training and follow-up are required.	If carefully designed, the interface should be easy to navigate. Training and follow-up may be necessary.	Using this interface is no different than filling in a form in a normal Web browser.

Mobile Devices from Basic to Advanced

	BASIC PHONE	FEATURE PHONE	SMARTPHONE (ANDROID)	TABLETS
DESCRIPTION	Inexpensive cellphones with voice and SMS.	Mid-range cell phones, can access Internet. Some have GPS capability and a camera.	Advanced cell phones. Can access the Internet. Most have GPS and a camera.	Low-cost tablets (come with wifi and may come with 2G(Edge)/3G/4G.
PROS	Ubiquitous, cheap, known. Low power use.	Variety of features available. Can transmit GPRS data. Moderate power user.	Software can be updated and upgraded. Can use any language.	Larger screens make for good visibility and ease of entering data. Low cost for some models.
CONS	Moving parts of flip phones and slider phones affect reliability and durability. Creating texts on basic keyboard challenging.	Not all have GPS. Language issues. Small screen.	Heavy power user; needs recharging frequently. Might be targeted by thieves.	Heavy power user; needs recharging frequently. Might be targeted by thieves. Some are more expensive than other mobile devices.
MANUFACTURERS	Nokia	Nokia, Siemens, Sony Ericsson (Java phones)	Samsung, LG, ZTE, Vodaphone, HTC, Apple	Aakash, UbiSlate, Google Nexus. Samsung, Apple

Develop a Budget

The costs associated with mobile data technology can vary greatly depending on how much data you plan to collect, the number of users, and the number of survey items, among other

[5] Melissa Loudon, "Mobile Phones for Data Collection," 2009. http://www.mobileactive.org/howtos/mobile-phones-data-collection.

factors. Although it often costs less to use mobile technology than traditional reporting technology, mobile technology can cost more if a monitoring system is already set up and you have startup costs associated with using mobile technology.

Pact Cambodia Mobile Pilot Costs

Total $2,040.20, including:

- External modem: $45
- Four Khmer language-enabled telephones: $80 each
- FrontlineSMS platform: free

Approximate cost of human resources

- Senior IT officer: 40 hours
- Volunteer monitoring and evaluation officer: 60 hours
- Training assistant/GIS officer: 5 hours
- Local partner setting up trial: 24 hours

Initial and Long-Term Costs

Consider the financial viability of using mobile technology over the long term. What are the costs to use mobile technology? Consider the initial cost of phones and additional power sources if required *(see below)*. Also figure in the cost of airtime. Unless you are collecting images, which are large files, the overall cost of airtime for data collection should be very low. The size of the files to be sent is small and should not be a major factor in a budget unless data is expensive in your country. Also consider the cost of replacement phones (and any additional costs for personal use of your organization's phones, if you are permitting that), as well as the cost of setting up and managing data collection, data storage, and data analysis processes. Initial tasks such as training and providing phones and airtime, as well as ongoing tasks such as managing data capturers and resolving technical problems, require time and resources; don't underestimate these.

Weigh the total costs you anticipate over the long term against the expected returns on the investment: time savings, faster transmission, increased accuracy of data.

Next, compare these costs with the costs of managing a paper-based system—printing costs, cost of pens and paper, staff time, transportation of supplies, and the like. Although it may not be possible to accurately quantify all the efficiency gains associated with using mobile technology, some costs should be relatively straightforward to compare.

Data Collection Cost Comparison: Mobile Technology Versus Traditional Paper

COST OF MOBILE DATA COLLECTION	COST OF PAPER-BASED DATA COLLECTION
• Number of phones (e.g., total number of data collectors plus backups or replacement mobiles). • Cost of submitting data (e.g., per SMS text message, or, if over the Internet, per gigabyte). • Charging devices. • Survey/database design. • Technical support for survey setup (if needed) • Training of data collectors. • Mobile platform (e.g., database, data verification, data analysis and reporting functionality). • Human resources (e.g., to manage mobile provision and data collection systems and processes). • Costs for printing, pens and paper, and transportation for a limited number of paper backup survey materials.	• Printing costs. • Pens and paper. • Transportation of paper surveys. • Training of data collectors • Human resources for data entry, transportation, supervision of data collectors, etc. • Database design, data entry, and data verification. • Storage of paper surveys (particularly if dealing with sensitive information).

Powering Mobiles

Costs related to powering mobiles may need to be budgeted as well.

OPTIONS TO ENSURE RELIABLE POWER

- Chargers that plug into car cigarette lighter sockets.
- External battery sources.
- Spare internal batteries.
- Solar chargers.

PREPARE TO EXTEND BATTERY LIFE

You can prepare for potential scenarios by creating a Standard Operation Procedure (SOP) that outlines how mobile users can prevent and respond to power failure.

- *Use app locks that block access to battery-draining, nonessential applications or simply delete other applications from the phone.*
- *Turn off WiFi, Bluetooth, and other systems when they are not needed.*
- *Turn down brightness to the lowest usable level.*
- *Ensure that all users report at the beginning of the day with a fully charged device.*
- *Advise staff not to plan on changing batteries of phones due to the potential of data loss.*
- *Advise on "emergency" sources of power, such as computer batteries.*

Chapter 3
Mobile Technology Platforms

CHAPTER LEARNING GOALS

- Gain an understanding of the primary considerations when choosing a mobile platform.
- Know the characteristics, benefits, and drawbacks of each platform.
- Choose the best platform based on the needs of your program.

Next Steps

This chapter will summarize the primary components of a mobile platform and provide an in-depth look at a selection of key platforms. This is not an endorsement of these platforms, rather a review of experience with these platforms that can help you to structure your search for the platform that is right for you. Many other platforms are suited for specialized applications, and we encourage you to explore other platforms not included in this chapter to find the best fit for your needs.

Mobile Platform Considerations

A number of mobile platforms offer a broad range of features and different pricing plans; several open-source options come at no cost.

To determine which platform is right for your mobile initiative, consider your needs and overall project budget. To a certain extent, your project's data needs and the frequency and type of data collection outlined in your mobile strategy will help you narrow your options.

Please keep in mind that platforms are changing rapidly and that features and price structures evolve over time; the latest information is always available on the platform's Web site.

When deciding among mobile platforms, consider: phone requirements; the data entry interface and transmission methods permitted; data storage, analysis, and reporting features; miscellaneous features; and the pricing structure.

Mobile Device Requirements

What type of mobile device (i.e., basic phone, feature phone, smartphone, or tablet) do you need for your mobile data collection? *See* "Decide on a Mobile Platform and Mobile Devices," Chapter 2, *above*.

Also, is there flexibility in your choice of phone or are you limited to phones that you or your data collectors already have? Not all mobile platforms may be compatible with all types of phones or with all models. Be sure to consult the platform Web site or online forum before making a decision.

Data Entry Interface and Transmission

The platform's data collection interface will affect how data collectors can enter data into their mobile devices. How easy it is depends largely on the type of data and transmission method (e.g., via SMS, forms, or Web portal). To compare different data types and transmission methods, *see* "Data Transmission Capabilities: SMS Versus GPRS" in Chapter 2. Platforms where data is entered on forms or online portals can offer such features as skip logic, which can significantly reduce data collection time.

Data Storage, Analysis, and Reporting

Are data stored on a local server or on a server in the cloud (i.e., remotely)? Platforms that use GPRS and cloud computing often incorporate security features to ensure that all data transmission is encrypted and secure. Data entered via GPRS or online typically disappears from a mobile device after it is transmitted; data that is sent by SMS or stored on the device for later transmission or transfer to a server is generally more vulnerable, as the phone can be stolen or lost and text messages accessed. Most platforms offer some form of basic analysis or reporting, but the quality and range of the visualizations (e.g., maps, charts) varies.

Additional Features

Platforms vary in other ways. The ability to collect and visualize audio, images, and video differs from one platform to the next. The same is true for language options. Most platforms permit questions in the language installed on your computer or mobile device, but sometimes coding makes this difficult and not all alphabets are available. Some platforms come in such common languages as Spanish, French, and Kiswahili.

Pricing Structure

Some platforms' pricing structure will be more cost-effective than others' for your mobile data collection; it will depend on how frequently you plan to collect data, the length of the survey (i.e., the number of questions), and the external support you need.

Most platforms allow at least a free trial, so if you find several that appear to meet your needs, test them out before committing. *(See* Appendix 2, "Pact Swaziland Case Study: Selecting a Mobile Platform.") Most platform pricing does not include airtime costs; these fees depend on the mobile network you are using. Typically, it costs vastly less to send surveys over data networks (e.g., GPRS, WiFi, 2G/3G/4G) than by SMS.

PRICING MODELS

- **Open source**—Use of the platform is completely free.

- **Freemium**—Basic service is freely available, but to use the platform at scale or to take advantage of such extras as SMS or technical support set-up, you must subscribe (for SMS) or pay a one-time fee (usually for set-up and usually somewhat steep).
- **Pay as you go**—You pay just for the amount of data collected.
- **Subscription**—After a trial period, you pay a monthly or yearly fee to use the service.

PRICING RESOURCES

Mobile Data Toolkit—A database of services and software useful for international development and social change work using mobile devices. Only a handful of mobile platforms are currently reviewed, but more are being added. **http://mobile.ictdev.org/**

NOMAD Selection Assistant—A good starting point. After you complete a survey on this Web site, it will match you with the appropriate mobile data collection solution(s) among the 24 in the site's database. However, the database may not contain the most recent information on the different mobile platforms. **http://humanitarian-nomad.org/online-selection-tool/**

Mobenzi

Mobenzi, a South African firm founded in 2006, has a versatile data collection platform, Mobenzi Researcher, that can be used to conduct surveys.[6] It can operate without network coverage; users can upload data after they return to an area with coverage.

Pros

- The database makes it easy to present survey data clearly, to manage and share results, and to use GPS data to monitor and communicate with field workers.
- Surveys are easy to set up on the Web.
- The same easy interface works on a restricted but still fairly large number of phones, including both feature phones and smartphones.
- Can accommodate several data collection forms.
- Data stored on the phone until the form is complete and then automatically sends as soon as there is a connection (improved data security).

Cons

- SMS data collection is permitted, but data entry is tricky.
- Does not work with Apple products (iPod, iPhone).
- Scrolling "back" to check on answers is tricky.

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[6] Mobenzi provides two other platforms: Mobenzi Outreach, for community health care data collection by community health workers, and Mobenzi Intelligence, which supports outsourcing of basic tasks and data analysis that cannot be automated by a computer. The pricing models, target markets, and purposes for these platforms are different than for Mobenzi Researcher. In this handbook, the term "Mobenzi" will refer solely to the Mobenzi Researcher data collection platform.

Features

- Data collection surveys. The original platform was specifically designed for health research.
- Capable of advanced level skip logic, which enhances data integrity.
- Works with multiple languages.
- Image and GPS capabilities.
- Compatible with entry level and higher level smartphones
- Operates with limited connectivity.
- Technical support available, although at extra cost.

Cost

Mobenzi has a pay-as-you-go pricing model, without setup or subscription costs. The only set cost is for transmission of completed surveys—generally $.01 per data field (a data field being a question or a small image). Example:

- A survey with 100 questions: 100 x .01 = $1.00 per survey.
- And 600 respondents: 600 x $1.00 = $600.

SURVEY SETUP

- Create your own survey = $0.

Or

- 400 rand (approximately $40) per hour for technical support.

OTHER SUPPORT

- 800–1000 rand per hour (approximately $80–$100 per hour).

Mobenzi Resources

- General information: **http://www.mobenzi.com/researcher/Home**
- Mobenzi case studies: **http://www.mobenzi.com/researcher/Case-Studies**

CommCare

The CommCare platform, a product of the Cambridge, Massachusetts–based Dimagi—a privately owned social enterprise that brings innovative technology to help underserved communities around the world—can be used both to collect data for field surveys and the platform's paid plans also support sending informational SMSs to a wide audience. CommCare has typically been used for health programs.

All data collected with CommCare is sent over a cellular data network to a remote cloud based server. When connectivity is not available, users can operate offline. Data is saved on the phone and can be sent automatically when connectivity is restored. After the collected data is transmitted to the CommCare cloud server, it can be viewed in standard reports.

Pros

- Survey setup is easy with the CommCare application builder; the large online support community can help.
- The free version permits use by up to 50 individuals.
- Authorized users can download data to Excel or to other third-party applications.

Cons

- It is possible to have only one form at a time on a phone—limiting if you are managing several different types of data.
- The free version does not permit SMS.

Features

- Data collection surveys.
- Applications to prompt health care workers or other development workers to provide accurate information or to analyze information in the field can be developed for extra cost.
- Multimedia enabled (e.g., with capability to gather images, audio, and video).
- Supports multiple languages.
- Two-way communication, remotely manage fieldworkers.
- Image and GPS capabilities.
- Java and Android compatible.
- SMS capabilities available in pay plans.
- Survey set-up support available (at additional cost)

Cost

The free plan not only allows up to 50 mobile users but also includes multimedia support and gives you the ability to create your own applications, data exporting, and standard reports.

Paid subscription plans vary from $100 per month ("standard") to $1,000 per month ("advanced") and offer SMS capabilities, extra data analytical and reporting features, and additional technical support, among other features.

There are full service packages that include building applications and a full system for a project. While they are expensive, they are worth considering for projects where grant money will be used to set up the system, as on-going costs are lower.

CommCare Resources

General information: **http://www.commcarehq.org/home**
Current cost information: **http://www.commcarehq.org/software-plans/**
Case studies: **http://www.commcarehq.org/users/project_summaries/**

Magpi

Magpi, recognized as a leader in the field, is a versatile program for data collection that has been used extensively by USAID, the World Bank, and others to collect data from programs ranging from education to health and governance.

Pros

- The extensive basic dashboard that presents data results cleanly and clearly and that facilitates data visualization and analysis.
- The online tool that makes creating surveys easy.
- Advanced programmable skip logic and easier-to-use basic skip logic both available.

Cons

- Only a few languages built in. (However, Magpi will add a language if you provide the translation, and there is no restriction on the alphabets that can be used.)

Features

- Data collection surveys.
- Easy to build surveys with skip logic.
- Free basic version, with good technical support (at extra cost).
- Works on Java, Android, Blackberry, and Apple products.
- GPS capability.
- Works without Internet connectivity.
- SMS data collection capability at Pro levels.
- SMS, text-to-speech (TTS), and audio messaging service for communication (will be combined with data collection system for improved integration in summer 2014).

Costs

Magpi is free to use, subject to certain limits on forms per account, questions per form, uploads per month, and online data storage. Many projects and organizations find the free version to be adequate for their needs. However, medium or large-sized evaluations (with 1,000 or more respondents) or organizations engaged in large ongoing mobile monitoring may require the Pro or Enterprise paid subscription-based versions. The cost of this per project would be significantly less if you were to spread it across multiple projects and/or countries.

Magpi Resources

General information and sign-up: **https://www.magpi.com/**

Case studies: **https://datadyne.zendesk.com/entries/21282536-Case-Studies-Who-Uses-Magpi-formerly-EpiSurveyor-**

FrontlineSMS

FrontlineSMS is widely used, open source software that can be used to manage information gathered using mobile devices. Offering a simple, cost-effective way to collect and disseminate data to users, it requires Java-enabled phones, and data inputs (i.e., text messages) are length-restricted; long survey forms are unrealistic. Because FrontlineSMS runs on software installed on a single, stand alone computer, it does not require an Internet connection.

FrontlineSMS makes it easy to create and manage common SMS activities such as announcements, polling, and automatically replying to incoming SMSs. Incoming data from poll activity can be visualized; users can quickly understand results. Compatible with most other platforms and applications, it can be used alongside other tools (e.g., Crowdmap, for real-time GIS mapping).

FrontlineForms, introduced in 2009, combines the power of Java-enabled mobiles with SMS. The Forms module is more versatile than FrontlineSMS in that allows you to create, on your computer, copies of simple paper forms, and then send them to a Java-enabled phone by text message. It is a good tool for collecting simple survey data but because text messages in most languages are traditionally capped at about 160 characters, lengthy surveys are not really possible.

The FrontlineCloud module allows users to send and receive data over GPRS, WiFi, 2G/3G/4G, or similar networks. More data can be sent faster and usually at a cost lower than for an SMS. However, unlike FrontlineSMS, which is free to use, the cloud version requires a subscription, which costs $10 a month.

Pros

- Open source and software free to download and use.
- Will run on even very low-end Java phones.
- Simple and relatively low startup cost.
- Allows for two-way SMS communication with data collectors, including polling and visualization of incoming responses.
- Form designer included in FrontlineSMS Forms module.
- Active online community helpful in troubleshooting.
- Advanced skip logic included.
- Data export into Excel possible.

Cons

- The Forms client is not open source and is thus not customizable.
- Limited to SMS for data transmission, which can be expensive.
- SMS typically limits data transmissions to about 160 characters; no GPRS support.

Features

- Supports polling via SMS and distribution of informational messages.
- Free software; costs limited to equipment and data usage.
- Two-way communication channel.
- Group folders for targeted messages.
- Compatible with any SMS-enabled mobile device.

Costs

- Modem and unlocked SIM card.
- Software setup is free if you do it yourself; FrontlineSMS consultant services available for a fee.

FrontlineSMS Resources

General information: http://www.frontlinesms.com/
FrontlineSMS user guide: http://help.frontlinesms.com/manuals/
Case studies: http://www.frontlinesms.com/impact-of-frontline/guides-tools-and-case-studies/

Crowdmap

An open-source platform for information collection, visualization, and interactive mapping, Crowdmap is oriented towards mapping geospatial information. Crowdmap is one of a suite of platforms associated with Ushahidi. Meaning "testimony" or "witness" in Swahili, Ushahidi was developed in Kenya in 2008 to map incidents of violence and peace efforts based on reports submitted by phone or over the Web. Crowdmap is essentially Ushahidi in the cloud, a hosted version that does not require the user to set up the system on their own server.

The Crowdmap platform enables real-time, spatial information sharing and interaction involving an unlimited number of users. As a result, it has been used effectively for disaster management and response.

Ushahidi also offers another popular product known as Swift River. Swift River is not a data collection platform like Crowdmap. Instead, Swift River receives unstructured data (i.e., descriptive text messages) and then codes this data into a structured format by variables (e.g., location, time, event, user group). By coding and sorting data and utilizing algorithms set by users, Swift River enables data to be cross-analyzed in different ways. Content can be then aggregated, clustered, searched, and filtered according to user requirements.

Pros

- Strong information visualization and sharing.
- Can receive and organize unstructured data (i.e., text).
- Can collect and aggregate reports from the news, Twitter, e-mail, SMS, or any other electronic source; reports are then geo-located.
- Easy to set up and use.
- Supports multiple languages.

Cons

- Requires a reasonable level of technical know-how to use Ushahidi online platforms.
- Not designed for data collection. (Developed primarily as an information-sharing platform, although Swift River now includes data synthesis and analysis features.)

Features

- Crowdsourcing information possible via SMS, e-mail, and Twitter.
- Interactive maps possible to visualize data.
- Capacity to tap into local knowledge to map ongoing events or conduct assessments.
- Data storage in the cloud.
- Free to use and maintain.

Cost

The Crowdmap platform is completely free to use. Ushahidi offers consulting services to help set up and tailor projects as well as to train staff on the platform. However, these services are not essential, because the program is very easy to use.

Crowdmap Resources

General information: **http://www.ushahidi.com/**
Ushahidi wiki: **https://wiki.ushahidi.com/pages/viewpage.action?pageId=294916**

Highlights of Key Mobile Platforms

MOBILE PLATFORM	TYPE OF PHONE	DATA ENTRY INTERFACE AND TRANSMISSION	SURVEY SETUP	DATA STORAGE, ANALYSIS, AND REPORTING	OTHER FEATURES	PRICE STRUCTURE
Mobenzi	Java, Android, Blackberry	Uses Java forms	Do-it-yourself and survey support available; skip logic	Storage in cloud server; data filtering; maps GPS data	Supports multiple languages; collects image and GIS data; SMS communication with data collectors	Pay-as-you-go; roughly $.01 per data field
CommCare	Java, Android	Uses SMS (paid plans), forms, or Web portal. Transmission: SMS (paid version), GPRS.	Do-it-yourself and paid survey support available	Storage in cloud server; free version includes standard reports	Supports multiple languages; skip logic (requires coding skills); collects audio, video, images, and GPS export into Excel possible	Free version allows for up to 50 mobile users; paid plans $100 to $1,000 per month
Magpi	Java, Android, BlackBerry, Apple	SMS (at Pro level pricing), forms, Web portal Transmission: SMS, GPRS	Do-it-yourself; tech support at extra cost	Storage in cloud server; extensive dashboard	Includes a few languages (possible to add more if translation is provided); collects GPS data; SMS, Text-to-Speech, and audio messaging	Free version allows 20 forms, up to 100 questions per form, 6,000 uploads per year; Pro version $5K per year, Enterprise version $10K per year
FrontlineSMS	Most low-tech phones; Forms module requires Java	SMS, forms Transmission: SMS	Do-it-yourself; advanced skip logic	Stored on mobile and local server; basic data aggregation and reporting	Export data into Excel possible; collects images	Free
CrowdMap	Any	Web portal or SMS Can be used with other tools like FrontlineSMS	Intended for monitoring; not structured for surveys	Storage in cloud server; strong visualizations, including interactive mapping	Supports multiple languages; collects and aggregates news, Twitter, e-mail, and information from other electronic sources, which can then be geolocated	Free

Other Platforms

This field is evolving quickly, and many other platforms are also available.

Preliminary List of Other Platforms, 2014

PLATFORM	WEB SITE
DataWinners	**https://www.datawinners.com/**
Formhub	**https://formhub.org/**
iFormbuilder	**https://www.iformbuilder.com/**
Open Data Kit	**opendatakit.org/**
TexttoChange	**www.texttochange.org/**
Viewworld	**www.viewworld.net/**

Additional Resources

Kerry Bruce, Jade Lamb, and Andrea Selva. “Evaluation Option: Mobile Data Collection,” Better Evaluation Beta, updated January 2014, **http://betterevaluation.org/evaluation-options/mobile_data_collection.**

Chapter 4
Implementing Your Strategy

CHAPTER LEARNING GOALS

- Plan to obtain and manage your mobile devices.
- Build own forms for mobile data collection.
- Set up your mobile devices.
- Pilot test the technology in the field.
- Train data collectors.
- Collect data.
- Conduct follow-up with data collectors.

Next Steps

Now that you have developed your strategy and have defined your mobile technology goals and objectives, taking into consideration your specific project needs and constraints and selected your platform, you are ready to begin implementation. The following pages will walk you through important logistical considerations and implementation steps recommended as you roll out mobile technology.

Plan to Obtain and Manage Your Mobile Devices

Procurement

Do not underestimate how long it will take to procure mobile devices. Depending on how many you need, it may be difficult to obtain all your devices from one vendor. Online vendors have a larger stock but usually require a credit card to purchase.

SUGGESTED ONLINE DISTRIBUTERS OF MOBILES AND TABLETS

- **3G Mobile**—3G Mobile supplies and distributes mobile phones and tablets to major retailers in South Africa and throughout Africa. http://www.3gmobile.co.za/
- **GSM-Superstore**—Located in South Florida, GSM-Superstore exports unlocked new and factory-refurbished GSM phones in most international brands and models to Latin America, the Caribbean, and other parts of the world. http://gsm-superstore.com/about-us/

Inventorying Your Phones

You will want to inventory your mobile devices. This entails labeling them with an inventory number as well as the data collection log-in information (if relevant and compatible with

security needs) to minimize problems in the field. It's optimal to track IMEI, SIM card, and battery serial numbers in a centralized database, along with associated users, to better monitor data submission.

Mobile devices typically have an electronic serial number known as an IMEI (international mobile equipment identity). To find the IMEI for a mobile device, simply enter the following five-digit string of characters as if you were dialing a phone number: *#06#. The IMEI should automatically display. Alternatively, look for the IMEI on a label underneath the battery. With Android phones, go to the home screen, press Menu, then Settings, then About Phone, and then Status. Your IMEI will become visible on the screen.

Be sure to inform all staff and data collection workers that the phones, SIM cards, and batteries have been inventoried and are associated with a unique user. This knowledge will encourage them to take better care of their phones and discourage such practices as swapping out the battery from the new mobile device for an older battery from an older mobile device.

Ownership

If you are distributing mobile devices to data collectors, determine early on in your project whether ownership will reside with your organization or with the collector and under what conditions. For nonroutine data collection such as evaluation surveys, it likely makes more sense to issue and collect devices at the end of data collection. However, for routine data collection, consider giving the devices to the collectors, either upon issuing them or after a period of time. There may be lower levels of loss, theft, and breakage among data collectors who own or expect to own their mobile devices. Secondly, after a few years of use, the devices will likely become obsolete and would not be used for future projects. Lastly, managing a large inventory of devices takes time—time that you won't spend if the data collectors themselves own the devices.

It is important to have an official policy that addresses ownership as well as the consequences for loss, breakage, or theft of mobile devices.

Build Your Forms for Mobile Data Collection

If you are collecting more characters of data at any one time than is permitted for the language you're using for your mobile device (i.e., 160 characters for English), it is likely that you are not using SMS to transmit data but rather the Web, which allows data collectors to enter their data into a form either on the mobile device itself or by accessing an online portal.

Pay close attention to the form design—it affects the quality of the data collected and the ease with which a survey can be completed. Mobile technology alone will not build a good survey! To make sure that you have included all your questions and that the skip logic is clear, the best course is to design the form on paper first. Doing so gives you the opportunity to reconsider

what data you really want to collect and will use as well as to eliminate duplicate questions—which tend to occur more frequently on electronic forms than on paper forms.

The format of forms on a mobile device differs from that of paper forms, and survey tables on paper do not translate well to mobile devices.

REMEMBER

In general, limiting the number of qualitative entries will yield stronger, cleaner data. Even if open-ended questions, it is preferable to add what you expect may be some common answers as multiple-choice options and, in addition, leave a space for "other."

Converting Paper Survey Tables into Electronic Forms

What a Table Looks Like on Paper

NO	NAME	GENDER	AGE	EDUCATION	EMPLOYED? (Y/N)
1					
2					
3					

What a Table Looks Like on a Mobile Phone

IDN: 123

For the first family member, please answer the following questions:

Name _____

Gender M/F

Age _____

Education *(multiple choice)*

❒ No education

❒ Did not complete primary

❒ Primary

❒ More than primary

Is the person employed? Y/N

(Repeat until completed)

Unique Identifiers

A good practice when creating forms is to put a unique identifier at the top of each form. This code will allow you to more easily, later, match the respondent or subject (e.g., if you are surveying the same person repeatedly) or locate the record (e.g., as part of a data quality audit). Field workers will need to enter this code into a separate sheet. If you are piloting the data

collection tool or simply practicing, assign a "dummy" code (e.g., 555), so that you can recognize data that are not part of the dataset.

Some operators of mobile platforms (e.g., Mobenzi, CommCare) offer assistance in developing survey forms. Platform operators that do not offer such assistance often have good basic training materials; some provide training. Many platforms profiled in this manual have online troubleshooting forums, and most are responsive to questions.

REMEMBER
Test your form on the Internet or on your phone before sharing it with others!

Setting Up Mobile Devices

After you have settled on a platform and acquired your mobile devices, you can begin setting them up and downloading software—sometimes from the platform Web site, or, if you have an Android phone, from the Google Play store. Several platforms permit you to download software from a link in an e-mail. If your mobile device lacks Internet access, you can probably download to a personal computer and transfer the software to your phone using a cable or a USB key.

Be sure to install the software before introducing the phone to users, to give yourself a chance to test the application, become familiar with its functionality, and troubleshoot if necessary. Do not underestimate how long phone set-up can take. It is best to have all of the phones set up with the application(s) you are planning to use prior to any training or pilot event.

Below are step-by-step instructions on how to install each of several key mobile platforms.

Mobenzi

- Go to the Mobenzi Web site: http://www.mobenzi.com/r/apps/
- Choose the mobile device you are working with.
- Click on the link to download. (You may have to navigate to the download folder in your phone to install.)

Or

- After you have registered the phone in the platform, a link to download the software can be sent to a phone via SMS.

CommCare/Dimagi

- Download CommCare from the Google Play store. Two options:
  —Go to bit.ly/getccodk.
  —Go to the Google Play store and search for "CommCare ODK v2."
- Download forms (CommCare calls them applications). This is the complicated part. For in-depth instructions, go to https://confluence.dimagi.com/display/commcarepublic/Installing+CommCareODK+Android+Applications

Magpi

- Set up a Magpi account at https://www.magpi.com/
- Open the Google Play store on your phone (the Android Market on older phones).
- Search for Magpi.

Or

- Go to https://www.magpi.com/m and download the Magpi app specific to your phone model.
- Go to Settings—Downloads. You will see the application there.
- Click on the application.
  —Change your settings to Unknown Sources if asked to do so, so that the software will download.
  —Don't forget to restore your settings.
- When download is complete, the application will ask you for login information. Provide the username and password for the account you created earlier on the Magpi Web site.
- If you have subscribed to Magpi on its Web site, a link can also be sent to a phone via SMS.

FrontlineSMS

- Download FrontlineSMS on a computer. Go to http://www.frontlinesms.com/the-software/download/
- After installing the software, open it. A new tab will open in your browser.
- From the browser, you can create messages or activities and either enter new phone numbers or select recipients from a list of previously used phone numbers.

Crowdmap

- On your phone, open the Google Play store (the Android Marketplace on older phones).
- Search for Ushahidi.
- Select Ushahidi, and tap Install.
- Go to Settings—Downloads, and you will see the application.
- Click on the application
  —Change the settings to Unknown Sources if asked to do so, so that the software will download.
  —Restore your settings when you have finished.
- When the download is complete, the application will open.

Pilot Test the Technology in the Field

Pilot testing phones in the field allows the team to identify data collection issues early and avoid unforeseen complications. Allocate two days for field-testing the mobile devices, the survey platform, and the survey questions. To allow time to address technical issues and refine the survey, schedule the test at least three days before beginning data-collector training.

To conduct a pilot test, anticipate and recreate the conditions of the actual survey to the greatest extent possible. When planning a pilot test, consider:

- **Location**—The test should occur in the field, preferably as close as possible to the area to be surveyed. This will help flag any data connectivity issues that may require offline data

collection and thus adjustments to phone settings. Any lack of access to electricity in the field will reveal the mobile devices' operative battery life. If batteries do not last long enough to go from charge to charge with life to spare, you will need to provide additional batteries or plan for midday charging.

- **Duration**—The pilot test should replicate two full days of data collection. Confirming that the phones work in the field is not enough. The biggest drains on phones' batteries are the screen and the cellular radio. Manufacturers often overestimate how long a phone will run on one charge, so you cannot rely on the specifications on the box. Only keeping phones in full operation for an entire day will reveal how long the battery lasts under field conditions.
- **Test subjects**—Running through the survey several times with a variety of respondents will reveal any problems with skip patterns or the flow of questions. Potential test subjects could include office staff not affiliated with the survey, residents not living in the area to be surveyed, even data collection workers. Be sure to test every skip pattern to ensure that no logic errors exist and that the survey skips to the appropriate question in every situation.
- **Error reporting**—Devise an efficient system for reporting errors that occur during the pilot test. Even minor glitches need to be addressed to ensure that the actual survey goes smoothly. Any deviation from expected operation of the platform, the survey, or the devices themselves should be logged.
- **Submitting data**—Although pilot test data will eventually be purged from the final survey, be sure to upload it to check for platform connection problems and to ensure that project staff can receive responses from the field. Delete pilot test data from both devices and platform before beginning the real survey.
- **Receiving data**—Office staff members play a critical role in the pilot test even though they are not in the field. Those who will be monitoring the survey should confirm that the data being sent in from the field display correctly—both survey responses and any GPS data. Customized dashboards should be created, and staff members should familiarize themselves with the platform's monitoring and reporting capabilities.
- **Backup plan:** Have a day's worth of paper surveys on hand in case the technology fails.

Remember, although pilot testing may seem excessive, it is better to discover issues before you start surveying. All parties must understand that this phase is critical to data quality and to completing the survey on time and under budget. Failing to identify and troubleshoot issues early on could lead to later widespread reporting problems and worker confusion.

Taking GPS Locations

The GPS receiver on a mobile phone can collect location data even when there is no mobile data connection. However, getting an accurate GPS location requires a clear view of the sky and good satellite signal reception. Avoid collecting GPS locations when inside buildings or when standing next to large obstructions. If you don't have a clear view of the sky, your location will not be recorded accurately.

Recruit and Train Data Collectors

No matter how well the mobile technology works in the field, insufficient training of data collectors can compromise the survey—and data collection utilizing mobile devices requires a higher level of technological literacy and competency than data collection on paper. Recruiting qualified candidates and providing rigorous training are both key to a successful survey.

Recruiting

During recruitment, ask about candidates' familiarity with the mobile device to be used, and then test their familiarity by having them send and receive SMS notifications, make and answer calls, monitor battery life and device connectivity, navigate through menus (if any), troubleshoot problems, and properly care for the device.

Training

Conduct training both on basic operation of the mobile device and on how to conduct the survey on the platform you have chosen. Integrate standard training on research skills, interview techniques, and traditional survey delivery with training on mobile technology.

Allocating two days is optimal, to allow users to become familiar with the device and platform and to acquire sufficient hands-on experience.

SUGGESTED AGENDA

- Overview of project and goals.
- Overview of survey objectives.
- Basic research and interview skills.
- Overview of the mobile device being used and its operation.
- Explanation of the buttons and symbols on the screen (e.g., battery and reception).
- How to send and receive SMS notifications.
- How to download new versions of the survey.
- How to ensure that surveys are sent.
- Daily maintenance procedures (e.g., charging the device and connecting to send data).
- Policy on airtime, making calls, sending SMS, etc.
- Policy on lost, stolen, or damaged phones.
- Practice conducting the survey with other data collectors acting as the respondents.

Collect Data

Purging Pilot Test Data

Before beginning data collection, take measures to ensure that no pilot test or training data can be confused with actual survey data. Take the time to clearly identify—or preferably, to delete—all data and surveys both from your mobile devices themselves and from the central database. In the rush of commencing a survey, it may seem more convenient to separate test data from actual data after the survey is complete, using either the collection date as a divider or by

filtering out data that is incomplete or that contains the word "test." Because this practice may compromise data quality, the best policy is to wipe out everything that could be misconstrued as real data—and only then initiate formal data collection.

If You Revise the Survey

At the same time you delete test data, make sure that the most recent survey is downloaded to each device on the first day. If any revisions are made during data collection, be sure that the new version is downloaded to each mobile device as quickly as possible and versions deleted to keep them from being used.

Changes to Field Supervision Procedures and Troubleshooting

As data collection effort begins in earnest, staff should be prepared, both in the office and in the field, to monitor and troubleshoot the technology if issues arise.

Office staff may also monitor the performance of individuals through the reporting platform and use the information for performance management. A particular individual's dispatching of numerous surveys from a single GPS location may arise from a technical difficulty—or it may flag false data entry intended to speed the data collector's work. Similarly, consistent underreporting by some workers relative to their colleagues may highlight a need for additional training—or it may point to excessive break time. Make sure that office staff review GPS locations and time stamps for all collected data and contact individual data collectors about their performance if necessary.

Office staff should also monitor incoming data for repeating errors on the part of more than one data collector. Additional instruction may resolve the problem—or the questionnaire may require revision.

Keep in mind that mobile and electronic surveying can both greatly reduce requirements for field oversight and improve communication between office staff and data collectors. Rather than waiting to speak with a worker face to face, monitoring staff can be in contact by SMS or by phone, depending on connectivity and airtime policy. Alerts for a new version of the survey can be broadcast and a confirming response requested from data collectors after they have made the update.

Follow Up with Data Collectors

Exercise the same diligence at the end of the survey as at the beginning. Take time to ensure that all surveys on all phones have been sent and uploaded. Check in any equipment that will be reused. Deal with lost, stolen, or broken equipment following official policies.

Checking for Data Quality

Mobile data collection greatly reduces the time and resources needed to clean and process data, compared to paper-based surveys. However, data quality checks to ensure that are suitable for analysis are still a good idea. For example, if a new version of your questionnaire was

distributed at any point during the survey, check data collected before the update to ensure that it corresponds correctly to the newer data.

Data Analysis

As data analysis begins, basic visualizations provided by the platform serve as a good starting point. Export the data from the platform in the appropriate format to the data analysis tool of your choice to conduct more robust analysis.

Look Ahead

Be sure to document lessons learned and how the data was used for decision making. Sharing not only the data but also information about its collection, about the challenges and opportunities brought because of the use of mobile technology, and about the findings of your analysis will help speed adoption of mobile technology among other actors. Consider sharing read-only data and data visualizations with the collectors themselves as well as with other stakeholders such as donors, government ministries, and chief strategy officers.

As you consider how you might integrate mobile technology into your programming, continuously scan your environment for innovations in ICT4D. If you yourself encounter challenges relating to the integration of ICT4D into your data collection, or opportunities for doing so, we encourage you to share your story with the broader ICT4D community via LinkedIn groups and professional networks specializing in mobile technology and ICT4D. You may find others in the development field who have grappled with the same issues or that you are in fact breaking new ground!

We hope that you find the materials in this Mobile Technology Handbook helpful and informative. In Appendix 3, you will find additional online resources for using mobile technology. There are of course many other resources available on the Internet. Mobile technology is changing rapidly with each passing day, so be sure to stay abreast of all the latest developments.

We wish you the best of luck in getting started with mobile technology.

Appendix 1
Pact's Mobile Technology Use

Pact uses mobile technology to facilitate data collection that is faster, cleaner, better monitored, and made richer by integrated GIS and camera capabilities. A data collection form is made through an online platform and sent to data collectors, monitoring staff, or beneficiaries—individuals who can respond via SMS, on simple mobile devices, or using smartphone applications. Collected data is immediately sent to a cloud-based central database, and results can be reviewed for quality control and analyzed as they come in. Data that needs to be collected on paper can be entered later into the database through a Web portal. Workers must be trained to use the technology just as they must be to use any form. Mobile technology permits real-time data monitoring, eliminates the need for data entry and data double entry, and makes it possible to immediately grasp and respond to common issues.

Pact has been using mobile technology since 2007 to enhance project activities and to improve monitoring and facilitate evaluation, and launched an intensive training and adaptation period in 2011 to familiarize individuals on all projects with the potential of using mobile technology. Pact has utilized a number of platforms, including FrontlineSMS, Mobenzi, and Magpi. Some examples of our experience with mobile technology follow.

Pact Activities Using Mobile Technology

Africa

South Sudan

Pact tested the viability of mobile technology in South Sudan in March 2013 and found several viable platforms. Development of forms for the National Civil Society Strengthening project is ongoing. Pact is also developing mobile technology for the Access to Justice project to monitor court cases and legal aid support. *Contact: Rachel Beck, rbeck@pactworld.org.*

Tanzania

The baseline for a quasi-experimental evaluation design on programming for orphans and vulnerable children (OVC) was conducted using mobile technology for data collection. This rigorous evaluation will track changes in key child outcomes among intervention and nonintervention communities and will measure the program's attribution towards results.

In Tanzania, Pact has also used mobile technology to collect baseline data in artisanal and small-scale mining on behalf of the Ministry of Energy and Minerals. Data documented household economy, child labor in mining, and health and safety, as well as alternative livelihoods for artisanal and small-scale miners. *Contact: Daisy Kisyombe, dkisyombe@pactworld.org.*

Namibia

Pact used Mobenzi to survey staff at partner organizations on their perception of capacity development assistance rendered by Pact Namibia. This exercise was part of a Pact-wide community of practice meeting, where Pact monitoring and evaluation staff from around the world were trained in mobile data collection and then went into the field to collect data. *Contact: Stephanie Posner, sposner@pactworld.org.*

Swaziland

Pact developed the capacity of its local partner, Save the Children, to use mobile technology to collect child profiling data on OVC in Swaziland. The survey employed mobile phones to collect data on OVC status and needs. GPS coordinates were also collected to map service coverage and target areas with high need. *Contact: Sam Kuhlande, skuhlande@pactworld.org.*

Nigeria

In 2013, a project in Nigeria developed an innovative mobile application to provide tailored health education messages to registered HIV-positive pregnant women on testing and prenatal care. This system tracks patients and provides health workers with messages to follow up with patients who have not returned for their appointments. A baseline survey of this population using mobile technology was also conducted. *Contact: Olufemi Akinmade, oakinmade@pactworld.org.*

Ethiopia

Pact trained implementing partners to provide basic data results to improve the rapidity of data availability to program decision makers. *Contact: Metalign Ayehu, mayehu@pactworld.org.*

Asia / Eurasia

Nepal

Pact used mobile technology for a major baseline survey data collection in 2013. A SMS-based conflict reporting system that will monitor conflict in real time using on-the-ground reporters has been developed. *Contact: Raju Kandel, rkandel@pactworld.org.*

Thailand

Here, Pact used Android-based phones and the Mobenzi platform to collect baseline OVC data. *Contact: Worachanok Youttananukorn, worachanok@pactworld.org.*

Cambodia

Pact uses FrontlineSMS as part of a participatory monitoring, reporting, and verification system to prevent deforestation. Community monitors were trained in the technology and send in regular reports on observed activities as a standard SMS form, supplemented with GIS data collected simultaneously. *Contact: Sarah Sitts, ssitts@pactworld.org.*

Myanmar

Coca Cola funded the savings group project, Swan-yi, which used Magpi and Android smartphones to collect baseline data on women enrolling in savings groups in central Myanmar. Because SIM cards were prohibitively expensive, data collectors uploaded all data collected at once from central WiFi points. Now, Pact's Shae Thot project is beginning to test Magpi for part of its regular maternal and child health monitoring and data collection. *Contact: Jade Lamb, jlamb@pactworld.org.*

Vietnam

In Vietnam, Pact will conduct a baseline survey of a WORTH project (similar to that in Myanmar) during 2014. *Contact: Dang Thi Thanh Binh, dtbinh@pactworld.org.*

Ukraine

Pact's partner in the Ukraine, the International HIV/AIDS Alliance, plans to implement a data collection survey and then to build an information portal using GIS technology. In 2014, the RESPOND project will also map services for vulnerable populations in three regions, using mobile mapping techniques, to demonstrate lack of access outside of regional centers. *Contact: Alyona Gerasimova, agerasimova@pactworld.org.*

Kyrgyzstan

In Kyrgyzstan, under the Civic Advocacy for Reform and Stabilization (CARS) project, Pact staff provided training to CARS grantees on the use of free FrontlineSMS software to send and

receive text messages and to manage relevant information. One key grantee, Legal Assistance to Rural Citizens (LARC), used the technology to conduct a land tenure rights awareness campaign and a survey on land tenure rights. To spur public debate around social and political issues in Kyrgyzstan, radio stations used text messaging to make programming more interactive, increasing listener participation and enhancing public debate.

Mongolia

Nomadic herders who were previously state supported and have become business operators in a market-based economy are now able to make better business decisions about how to time sales of primary produce. Herders can maximize their profits by making data-based decisions using factual, real-time market price information. Pact Mongolia's national network of market watchers gathered prices for 64 commodities in local markets five days a week. Information and communication technology enabled prices to be sent to a central database for daily, weekly, and quarterly analysis and distribution. This market information was broadcast via radio, television, and text message, through a Mongolian cell phone provider working in partnership with Pact. More than 700 text message price requests were received during the first three months of 2007. The service was especially valuable during the depth of winter, one of the most trying times for herding-dependent businesses, with fewer commodities to sell and extreme weather conditions.

Latin America

Brazil

Here, Pact developed a partnership with a leading telecommunication company (Vivo) to send educational SMS messages to all male clients aged 18 or above in Recife, Rio de Janeiro, and Federal District based on the area code of clients' cellular phones. The first SMS included a short message providing the number of people in Brazil who were estimated to be HIV positive but did not know their status, and then provided the link to the program's blog, where recipients could find more information about local HIV testing sites. By monitoring the number of hits to the program's blog, Pact was able to determine that SMS messages increased Web site usage. At each HIV testing location, clients were asked to identify how they learned of this testing site, allowing for the effectiveness of SMS messaging promoting voluntary counseling and HIV testing to be monitored.

El Salvador and the Dominican Republic

Inadequate access to information on worker rights and responsibilities generates barriers to labor justice. To address this issue, Pact initiated a project to train attorneys, free-legal-assistance providers, and labor rights advocates on the efficient, cost-effective use of SMS to communicate with stakeholders and disseminate labor rights information. Pact trained attorneys and labor rights advocates in El Salvador and the Dominican Republic on FrontlineSMS software. Pact's partners sent text messages directly to the cellular phones of workers involved in labor disputes. These messages included notifications and reminders

about important events (e.g., court dates and upcoming labor rights trainings). In addition, Pact's partners used FrontlineSMS technology to carry out labor rights public awareness campaigns, conduct surveys, and refer workers to free legal assistance services. Four organizations used FrontlineSMS to disseminate labor rights information.

Appendix 2
Pact Swaziland Case Study: Selecting a Mobile Platform

Pact Swaziland conducted an assessment of mobile platforms for a child profiling survey they planned to carry out on 17,000 orphans and vulnerable children.

PAPER-BASED DATA COLLECTION	UNIT COST	NUMBER	COST
Paper and printing	$0.05	49,200	$2,460
Single data entry (assuming 5 minutes per form)	$40.00	170	$6,833
Database development	$750.00	1	$750
Transport of paper data from region	variable	variable	variable
Total Cost			$10,043

MOBILE PLATFORM A	UNIT COST	NUMBER	COST
Phones (Java-based feature phones)	$60.00	30	$1,800
SIM cards	$3.00	30	$90
Data uploads/airtime	$0.10	16,400	$1,640
Platform use per data field	$0.01	738,000	$7,380
Total Cost			$10,910

MOBILE PLATFORM B	UNIT COST	NUMBER	COST
Phones	$120.00	30	$3,600
SIM cards	$3.00	30	$90
Data uploads/airtime	$0.10	16,400	$1,640
Monthly subscription for platform	$500.00	2	$1,000
Monthly fee	$0.25	15,400	$3,850
Total Cost			$10,180

MOBILE PLATFORM C	UNIT COST	NUMBER	COST
Phones	$120.00	30	$3,600
SIM cards	$3.00	30	$90
Data uploads/airtime	$0.10	16,400	$1,640
Monthly subscription for platform	$299.00	2	$598
Total Cost			$5,928

The above cost analysis of the different platforms shows that platform C would be the most cost-effective. However, functionality and features were also considerations.

Swaziland tested both platforms A and C in country and ultimately decided to go with platform A. Despite the higher costs, the platform A's functionality and features were a better fit for Pact Swaziland's data collection needs.

REMEMBER

Although cost is a big factor, it should not be the only factor.

Appendix 3
Online Mobile Technology Resources

IC4D 2012: Maximizing Mobile. The World Bank™

This report analyzes the growth and evolution of applications for mobile devices, focusing on their use in agriculture, health, and financial services as well as their impact on employment and government. The report also explores the consequences for development of the emerging "app economy," summarizing current thinking and seeking to inform the debate on the use of mobile devices for development. It's no longer about the phone itself but about how it is used and about the content and applications that mobile devices bring.

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/0,,contentMDK:23190786~pagePK:210058~piPK:210062~theSitePK:282823,00.html

Mobiles in-a-Box

Mobiles in-a-Box from the Tactical Technology Collective is a collection of tools, advocacy tactics, how-to guides, and case studies designed to help advocacy and activist organizations use mobile technology in their work.

http://mobiles.tacticaltech.org/

Mobile Solution Selection Data (NOMAD)

This online questionnaire determines data needs and existing resources connected with a particular project, then filters them through the capabilities of more than 30 mobile platforms to propose all possible workable solutions. Although NOMAD is useful for sorting through the increasingly crowded market space, it is optimal to go through the survey several times and adjust your responses, wherever a constraint is not critical, in order to obtain a full list of potentially workable solutions. Remember that platforms are constantly adding new capabilities, and the NOMAD tool may or may not be up to date.

http://humanitarian-nomad.org/online-selection-tool-2/