Information and Communication Technologies for Women's and Children's Health

A PLANNING WORKBOOK

The Partnership for Maternal, Newborn & Child Health

World Health Organization

Innovation Working Group
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GSMA

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Table of contents

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The Partnership
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Executive Summary

Why was this planning workbook created?

A number of key partners in the reproductive, maternal, newborn and child health (RMNCH) community consider that information and communication technologies (ICTs), particularly, mobile health[1] (mHealth), are important in improving women's and children's health. While there are hundreds of ICT and mHealth pilot projects being implemented, there are relatively few large-scale examples. The workbook explores the issues that need to be addressed when such projects are being scaled up.

Purpose of this Planning Workbook

At its core, it is a discussion tool helping users to:

- **identify obstacles** to expand the use of ICTs in the area of RMNCH;
- **guide the exchange of ideas** on specific measures that could overcome, mitigate or otherwise manage these obstacles;
- **provide a framework** in which stakeholders can consider the question of scaling up the introduction of ICTs;
- **guide users on how to start the process;** and
- **provide useful information** resources.

The workbook should be used as soon as specific essential interventions have been selected to improve women's and children's health but before a large-scale programme starts. Although it was designed for use in policy-level multi-stakeholder contexts, programme and project managers have already found it useful.

Users of the Planning Workbook

The workbook addresses the needs of policy-level specialists, programme planners and project managers who are considering scaling up the use of ICTs. Its content can be used in a number of different scenarios, including:

- in a **dedicated workshop** devoted to how ICTs can be used for RMNCH essential interventions (such as integrated service delivery for mothers and children from pre-pregnancy to delivery, to the immediate postnatal period, to early childhood);
- as a **tool supporting wider discussions** on RMNCH essential interventions[2] (e.g. as part of the RMNCH Policy Compendium);[3] and
- to **support desk research**.

1 The term most commonly used in reference to the use of mobile communication devices, such as mobile phones, tablet computers and personal digital assistants (PDAs), for health services delivery and information dissemination.

2 A three-year international study identified key interventions to reduce maternal, newborn and child deaths in low- and middle-income countries.

3 The RMNCH Policy Compendium is a policy guide for Implementing Essential Interventions for RMNCH. It is the result of collaborative work among many partner organizations. The process was led by the World Health Organization and the Partnership for Maternal, Newborn & Child Health (PMNCH). This document is designed for an audience of policy-makers, programme managers and advocates who seek information on specific policies to promote the implementation of essential reproductive, maternal, newborn and child health interventions to address the main causes of maternal, newborn and child deaths.

Photo: Mobile Alliance for Maternal Action - MAMA

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Introduction

Linking reproductive, maternal, newborn and child health (RMNCH) and information communication technologies (ICTs)

We have made significant progress in improving women's and children's health, but a majority of countries are still expected to fall short of the targets under the United Nations Millennium Development Goals (MDGs) 4 and 5, to reduce child mortality and improve maternal health. Despite significant progress since 1990, we still lose nearly 18 000 children under five every day[4] – 40% of them in the first month of life. More than 700 women die each day.[5] The RMNCH community partners realize that innovative measures are now needed to accelerate the implementation of essential interventions to improve women's and children's health across the continuum of care[6] if we are to meet the MDGs' targets.

Information and Communication Technologies (ICTs) have the potential to transform the way in which health services are accessed and delivered. ICTs (and, more recently, mobile devices) are essential in facilitating the measurement of performance and progress, improving inclusiveness and transparency, connecting information systems for reporting and research, and delivering healthcare and advice to even the most remote locations.

A number of RMNCH community partners believe that ICTs and, in particular, mobile health (mHealth) are key to improving women's and children's health. Recommendation 6 of the UN Commission on Life-Saving Commodities for Women and Children calls for ICTs to be used to improve the supply of life-saving commodities, and Recommendation 3 of the UN Commission on Information and Accountability for Women's and Children's Health encourages countries to integrate the use of ICTs into their national Health Information Systems (HISs) and health infrastructure. Several countries are now making ICTs a central part of their future strategies to deliver essential health interventions and services to their citizens.

> *On October 16, 2012, President Goodluck Jonathan of Nigeria officially launched the "Saving One Million Lives" (SOML) initiative to scale up access to essential primary health services and commodities for Nigeria's women and children. The SOML initiative seeks to accelerate efforts to introduce ICTs by employing mHealth and e-health enabling technologies and services, and promoting public-private partnerships to align partners around common goals. ICTs will be used to empower patients and health workers, and provide a platform for shared accountability, inclusion, and equity and consideration for links to mobile financial services through conditional cash transfers.*

4 United Nations Children's Fund (UNICEF), World Health Organization (WHO), World Bank, United Nations Population Division (UN/DESA) (2013). Levels and trends in child mortality, report 2013. New York: UNICEF. (http://www.childinfo.org/files/Child_Mortality_Report_2013.pdf accessed 20 January 2014).

5 United Nations Children's Fund (UNICEF), World Health Organization (WHO), World Bank, United Nations Population Division (UN/DESA) (2012). Trends in maternal mortality: 1990 to 2010: WHO, UNICEF, UNFPA and The World Bank estimates. Geneva: WHO. (http://whqlibdoc.who.int/publications/2012/9789241503631_eng.pdf, accessed 20 January 2014).

6 Partnership for Maternal, Newborn & Child Health (PMNCH) (2010). Enable the continuum of care. In: PMNCH knowledge summary: women's and children's health, 2. Geneva:1–4. (http://www.who.int/pmnch/topics/part_publications/KS02_standalone_low.pdf, accessed 15 November 2013).

Many mHealth projects are being carried out in the area of RMNCH that target either the health consumer (mother/child/family) or the community health-care worker. Yet, the true potential of ICTs in improving women's and children's health is still to be realized, because of three main reasons:[7]

- First, efforts to use ICTs are not sufficiently harmonized. A lot of time and resources have been devoted to developing and piloting applications, drawing up standards, collating evidence, identifying sustainable models for ICT applications, has not been adequately disseminated. However, most of this work has taken place in isolation, and insufficient attention has been paid to scaling up successful interventions.
- Second, the RMNCH and ICT communities have not communicated effectively with each other. While the RMNCH community has not always articulated its needs well, the ICT community has often concentrated too much on technology. Part of the problem is the absence of multi-stakeholder platforms to facilitate interaction between the two disciplines.
- Finally, without the help of an evidence-based and consensus-driven decision-making process for ICT-supported interventions, policy-makers and implementers have found it hard to prioritize the use of technology in the health sector over more conventional methods (paper registries, verbal autopsies, demographic surveys etc.).

This Planning Workbook tries to address some of the above issues by creating a platform that enables collaborative, inclusive multi-stakeholder conversations on using ICTs. It provides a way to identify key obstacles to accelerating the use of ICTs via a dialogue tool, and focuses the attention towards finding potential solutions to those obstacles..

Understanding ICTs

While a significant proportion of health systems globally rely on paper to exchange information, ICTs are increasingly being used in a multitude of ways and have begun to replace paper. However, increasing the use of ICTs requires an understanding of the larger health information system of a given country and any supportive electronic-health (e-health) environment that may exist. HIS includes the protocols, standards, data dictionaries, methods and mechanisms for collecting, reporting and using health data (irrespective of whether electronic or paper-based information systems are used).

Rapid innovation in the field of mobile technology, and its wide adoption by populations in low-to-middle-income countries, has led to many pilot projects exploring the feasibility of delivering

BOX 1

Defining ICTs, mHealth and eHealth

ICTs can be defined as technologies that provide access to information through telecommunications, and includes networks, the Internet, wireless, mobile devices and other communications-related technology.

e-health can be defined as the use of ICTs for health (but this might also cover non-ICT policies that act as enablers, e.g. national standards for patient identifiers, or legislation for data privacy, etc.) – WHO definition.

mHealth can be defined as the provision of health services and information via mobile technologies such as mobile phones – WHO definition.

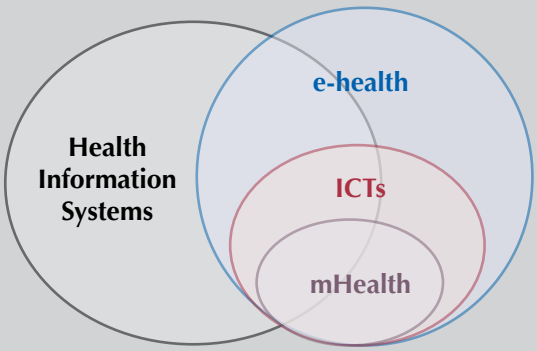
7 Examples: Mobile Alliance for Maternal Action (http://mobilemamaalliance.org/); mCARE for maternal, neonatal and postpartum care (Bangladesh); Saving mothers and newborns using RapidSMS (Rwanda).

improved health services using this technology. However, since many of the pilots were carried out in isolation from the larger HIS and e-health environment, it is difficult for stakeholders to see how they would move from piloting ICT or mHealth to its large-scale adoption.

This workbook attempts to bridge this gap and provide the means for productive dialogue between key stakeholders, which is essential in identifying the potential challenges and building strategies to mitigate them.

FIGURE 1

mHealth as part of a larger ecosystem of overlapping disciplines



Developing the Workbook with partners

The result of a collaborative effort between stakeholders, this workbook builds on and complements past and current efforts of the GSM Association, the Innovation Working Group (IWG), Johns Hopkins University Global mHealth Initiative, the mHealth Alliance, the U.S. Agency for International Development (USAID) and the World Health Organization (WHO), among others.

The process that informed the workbook involved four phases.

1. Extensive background data were gathered in order to assess the current status and involvement of ICTs and mobile technology across the continuum of care for RMNCH.
2. An advisory group was set up comprising key stakeholders (see Acknowledgements) to discuss the implementation of ICTs and mHealth within the scope of RMNCH interventions at country level.
3. Biweekly conference calls were held with the advisory group and one-on-one interviews were carried out with an extended group of experts. A project website was created through which mini-surveys of emerging topics were conducted. The website also provided real-time access to resources and results as research progressed.
4. The data gathered were processed using a qualitative methods approach and formed the basis of the analysis, which in turn led to the finalization of the workbook.

Two key messages that emerged from this process include:

1. There is a gap (knowledge, business model, capacity, etc.) between the technical feasibility demonstrated and the large-scale application of ICTs.
2. Key stakeholders (e.g. innovators, donors, implementers, Ministries of Health, NGO's and commercial entities) need to work together to help bridge the knowledge gap.

The output could have taken many forms (e.g. a decision-support tool, an online web tool, a self-administered assessment, etc.). However, it became clear during interviews that a tool that facilitated dialogue was the most useful starting point.

This current edition of the planning workbook can, therefore, be defined as a discussion-based planning tool. It is accompanied by an Excel spreadsheet for administering and visualizing the topics.[8]

It is important to note that most experts consulted during the development of the workbook felt that it is the dialogue process between different stakeholders that is most critical here, and not necessarily the answers to specific questions.

8 To come

Structure

This planning workbook can be used both when time is limited as well as when a group of stakeholders wish to explore the use of ICTs in RMNCH in depth. It is divided into two main sections.

1. **Getting started**. This section focuses on the link between RMNCH goals and essential interventions, and identifying the potential use of ICTs. It also provides suggestions for background research and preparation that should take place prior to carrying out the guided-dialogue exercise.
2. **Guided dialogue**. This section focuses on nine thematic areas that stakeholders should focus on. These are coupled with a scoring mechanism that helps highlight areas for discussion among stakeholders. Extra resources, expert opinion and clarification questions are provided for each thematic area to prompt mitigation strategies that might help overcome the highlighted obstacles.

The following visual cues have been designed to prompt users' participation.

Actions are numbered and highlighted as shaded, indented items, and are accompanied with a check-box, e.g.:

☐ **Action 1.** Brainstorm (or extract from background research) a list of initiatives, relevant stakeholders...

An *Assessment score* is used to present a question or statement that is to be scored, e.g.:

Question or statement	SI	LI	DI
Strong senior management...			

Assess the level of knowledge of the participants, the balance between preliminary desk based synthesis versus workshop based synthesis and the specific outputs. As much data as possible should be gathered so that the participants spend the majority of the time on assessment, dialogue and process, rather than on research.

Synthesise, as suggested in the Getting Started section, including inventories of ICT and mHealth projects, MDG and other key health indicators, copies of previous e-health and health information system (HIS) assessments, workplans and strategies, and copies of any outputs from RMNCH strategic planning activities (experience in similar exercises suggests that between one and two weeks of preliminary research are usually necessary).

The tasks and activities above should be completed prior to the formal multi-stakeholder dialogue taking place. These include articulating the health intervention and identifying the potential ICT solution(s), and completing the reality check and defining the success criteria for a project.

BOX 2

Competencies required for facilitator(s) of guided dialogue

1. Familiarity with both ICTs and RMNCH (or Public Health).
2. Experience in leading a multi-stakeholder group through the guided dialogue.
3. The facilitator must also be/become familiar with the use of existing ICT/mHealth frameworks developed by WHO, mHealth Alliance, and others.

Key tools and resources referred to include:

- mTERG mHealth and ICT Framework for RMNCH http://mregistry.org http://www.who.int/reproductivehealth/hrp/en/
- GSMA mHealth Tracker http://www.mobileworldlive.com/mhealth-tracker
- mHealth Alliance Health Unbound Portal http://www.healthunbound.org/
- WHO/ITU National eHealth Strategy Toolkit, 2012.
- WHO Global Health Observatory for Health Related MDGs http://apps.who.int/gho/data/view.main.1900?lang=en
- Latest Health Metrics Network (HMN) Country HIS Assessment http://www.who.int/healthmetrics/support/en/
- Any country e-health, HIS, ICT or mHealth strategic plans or policies.

Photo: © 2009 Frederick Noronha, courtesy of Photoshare

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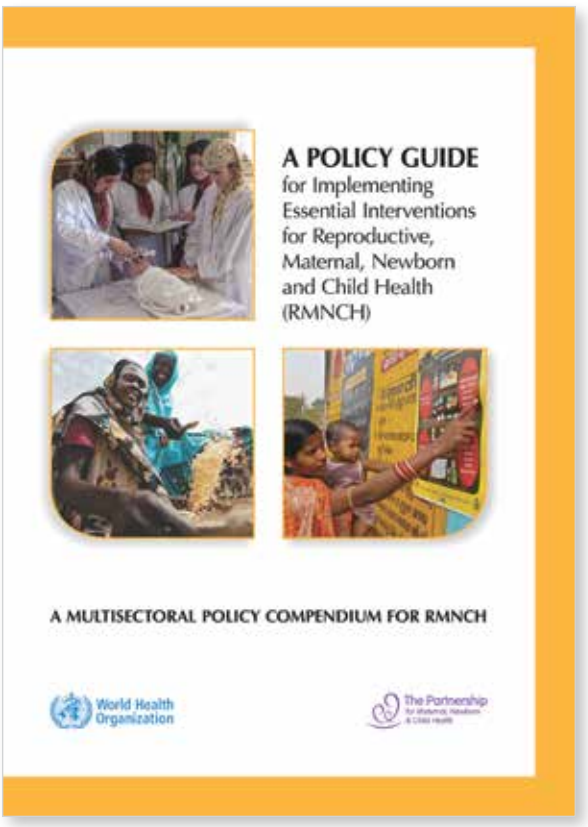
Getting started

Step 1: Identify country priorities for RMNCH

Evidence indicates that the majority of deaths in mothers and children can be prevented with effective (and affordable) interventions[9] that prevent or treat the most common causes of illness. These essential interventions have been demonstrated to be effective and suitable for use in low-income settings. Thus, the coverage and quality of these interventions need to be the focus of programmes.

The RMNCH policy compendium is recommended as a starting point for policy-makers and programme managers who are interested in improving the coverage and quality of RMNCH interventions. The compendium provides a technical reference for RMNCH policies and their content. It can therefore serve as the content guide for policy reviews, planning and development. It is also important that there is demand from the country for using ICTs to improve the coverage of RMNCH essential interventions across the continuum of care.



As recommended in the RMNCH policy compendium, a rigorous needs assessment or situational analysis can help in identifying policy priorities in RMNCH.

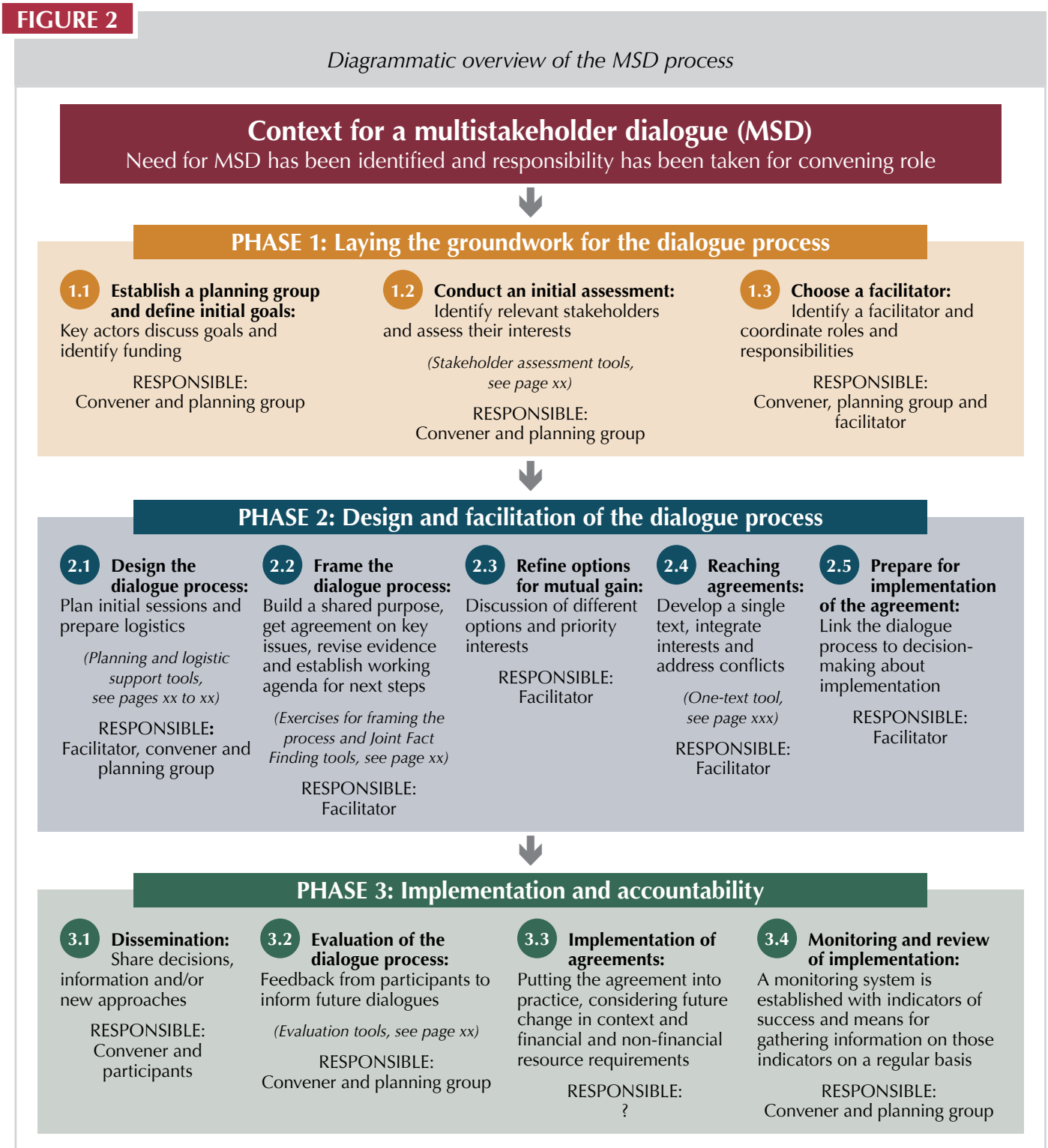
Multistakeholder coordination and advocacy groups can be particularly effective in such cases. A multistakeholder dialogue (MSD) is a structured, interactive process that brings relevant stakeholders into contact with one another to create mutual understanding and shared courses of action. All stakeholders— policymakers in health and related sectors, healthcare professionals and institutions, non-governmental organizations, civil society groups, multilaterals, researchers and academics, the private sector and donors—have an essential role to play in improving reproductive, maternal, newborn and child health (RMNCH). MSD processes can be used to better identify challenges for RMNCH, align stakeholder priorities and action, and assure accountability for resources and results.

9 Partnership for Maternal, Newborn & Child Health (2011). A global review of the key interventions related to Reproductive, Maternal, Newborn and Child Health (RMNCH). Geneva: World Health Organization.

The "Multi-Stakeholder Dialogues for Women's and Children's Health: A Guide for Conveners and Facilitators" guide developed by PMNCH along with several partners applies the principles and best practice of MSD to women's and children's health. It provides specific guidance and a toolkit for managing the entirety of MSD processes.

FIGURE 2

Diagrammatic overview of the MSD process



Step 2: Assess ICT landscape in country

A thorough inventory of the country's ICT/e-health context (policies, ICT literacy, infrastructure, etc) should be carried out, using source documents, datasets and, if necessary, some form of prior rapid survey to fill in or update available information.

There is a tendency to develop ICT solutions from scratch when. However, existing solutions (with some modifications) can often fill the gap. Thus, it is important that in addition to the RMNCH situational analysis, the existing pipeline of ICT/mHealth projects in the country is studied in some detail. This is discussed in greater detail later in the workbook.[10]

Actions

☐ **Action 1.** Using either the output of an RMNCH needs assessment and/or situational analysis, or via inputs from stakeholders (surveys, interviews), list the key RMNCH areas that are of concern.

☐ **Action 2.** Using the RMNCH multi-stakeholder dialogue process, list the RMNCH interventions that have been identified as priority areas for strengthening or implementation.

Note: *Both of these actions are designed to focus attention on the health outcomes as the starting point for considering ICT and mHealth solutions.*

☐ **Action 3.** Identify (either prior to or during the guided dialogue) a list of existing ICT/mHealth pilots and projects, and key stakeholders involved in them.

Note: *An inventory may already exist but in most situations is unlikely to be available or may, at best, be out-of-date. Refer to the GSMA mHealth Tracker and mHealth Alliance resources cited later in this section, and also the WHO regional or country websites.*[11]

☐ **Action 4.** List initiatives outside the Health sector that may have a bearing on adoption of ICTs and increase in demand for use of ICTs in service delivery of essential services across Health and other sectors (for e.g. mobile banking etc).

Note: *As an example, in Zimbabwe, a non-health ministry independently rolled out connectivity and a small local area network (LAN) to the finance office of district-level health facilities to support a new government procurement system. A programme in the Ministry of Health was unaware of this and were planning to implement their own connectivity project.*

☐ **Action 5.** As a reference, obtain the latest national figures (or time series) for key Millennium Development Goals (MDGs) related to poverty, health and infrastructure.[12]

10 Partnership for Maternal, Newborn and Child Health (2013). Multi-Stakeholder Dialogues for Women's and Children's Health: A Guide for Conveners and Facilitators. Geneva: World Health Organization.

11 As a starting point, see: http://www.who.int/countries/en/ (accessed 13 November 2013).

12 See: http://apps.who.int/gho/data/view.main.1900?lang=en or http://www.devinfo.org/libraries/aspx/Home.aspx (accessed 3 November 2013) and also http://www.countdown2015mnch.org/country-profiles.

☐ **Action 6.** List any key deficiencies/gaps in the health system from the HIS perspective, as well as any identified projects, investments and strategies that have been noted or planned to overcome them. Obtain the last country assessment on HIS (if available).

Note: *An excellent source for this material is the Health Metrics Network (HMN) framework assessments carried out in over 70 countries from 2005 to 2011. These assessments involved a comprehensive two-week in-country multi-stakeholder analysis of the six key components of the HIS*[13] *(resources, indicators, data sources, data management, information products, dissemination and use).*

Working area: *If a country HMN assessment is available, copy the overall score*[14] *into the area below. Also note any specific comments from the executive summary that seem useful.*

	Score (%)[15]	Comment
Resources	_____	_____
Indicators	_____	_____
Data sources	_____	_____
Data management	_____	_____
Information products	_____	_____
Dissemination and use	_____	_____

☐ **Action 7.** Study national policy/strategy documents (particularly those coordinated by the Ministry of Health) and identify key findings, recommendations or best practices relating to e-health, HIS or ICTs.[16]

Tip: *In some countries, health information system strategic plans have been completed; since there are no international repositories of all known e-health, HIS or other ICT strategies for countries' health systems, one of the best tools for finding any such documents (if they exist) is the advanced use of Google's search engine, e.g. search:*

countryname +(e-health OR e-Health OR "health information system") +(strategy OR assessment)

☐ **Action 8.** Go to key ministry websites (e.g. ICT, energy, education, telecommunications, etc.) and search for any relevant strategic reports or assessments on infrastructure, including intended plans, etc., as well as any subnational data for infrastructure (e.g. electricity coverage by region or state, mobile coverage by region or state, etc.).

Note: *In some countries, such information is considered sensitive and may only be available by official request from one ministry to another. In such cases, rapid assessments supported by the MoH may be essential in procuring such information.*

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13 For a list of countries and for a given country, download the assessment report (PDF) and scoresheet (Excel): http://www.who.int/healthmetrics/support/en/ (accessed 3 November 2013).

14 Normally in the executive summary or in the summary sheet of the score sheet

15 HMN scores are interpreted as: < 25% = inadequate; 25–50% = present, but inadequate; 50–75% = adequate; and >75% = highly adequate.

16 Also review the ITU survey of COIA countries. – http://www.itu.int/en/ITU-D/ICT-Applications/Documents/CoIA%20Background%20ICT4RMNCH.pdf

Step 3: Connect the stakeholders

The development of health systems projects involving ICTs or mHealth usually concerns more than one stakeholder. These can include:

- the MoH (or equivalent) and/or other ministries (e.g. ministries for ICT or infrastructure, etc.);
- academia, government, industry and civil society;
- international partners who are underwriting, encouraging or in some way supporting the project or initiative;
- the implementing health programme partner;
- the technology partner(s), which can include a mobile phone operator in the case of mHealth, independent software developers, etc.; and
- the recipients of health care (if the technology is in the hands of the health-system user).

Each stakeholder brings different perspectives and know-how to the table, and it is essential to bridge any gaps between these perspectives through dialogue and the shared exploration of key questions. One such gap, for example, is the perspective taken by national or state planners (which tends to be top-down) as opposed to the perspective of mHealth innovators (which tends to be bottom-up). Sometimes, another gap is the divide between technology innovators, who tend to focus on technology questions, as opposed to that of public health professionals, who tend to focus on health outcomes and health delivery.

When it comes to scaling up, all these stakeholders become important. Anecdotally, at least, it appears that the more successful ICT or mHealth projects are those with strong partnerships between at least three parties, typically the MoH, a supporting donor organization, and an implementing (sometimes commercial) partner.

Effective partnerships require that partners develop a common understanding around what success would mean for all the key stakeholders and partners involved. Thus, sufficient attention needs to be paid to forging consensus on the definition of success when it comes to interventions supported by ICTs. More on this under Action 12.

This planning workbook takes a structured approach to bridging these gaps by:

- ensuring that the desired health outcome is the starting point;
- ensuring the larger health system is the focus; and
- structuring the dialogue in a way that ensures that the non-technology obstacles are given equal visibility.

The rest of this section helps deliver on the first two items above, while the guided dialogue section helps deliver on the third.

Note: The following actions should ideally be completed prior to carrying out the guided-dialogue exercise.

Experts' corner

"The public sector is not used to working with the private sector… they need to explore where the shared value is… they need to establish strong trust."

"It's about improving the quality of care... the further away you get from helping the health-care worker the less useful it is to everyone."

"Partnerships also offer a mechanism for sharing costs and risks… understanding the incentives of various partners paves the way for constructive engagements."

"…we need to shift away from bilateral dialogue to more coordinated discussions and inter-agency working groups that cut across many of these stakeholder groups. Countries that have working

groups with good representation across types of stakeholders seem to be moving forward more strategically than those that don't."

"It's not the answers that are important [at the moment]. It's the fact that questions are being put on the table as part of a dialogue between stakeholders with different perspectives."

Step 4: Identify opportunities for ICTs in RMNCH

There are a number of tools and resources that can be useful in identifying potential opportunities for using ICTs for RMNCH and linking them with the specific health-service interventions that are used across the RMNCH continuum of care. These tools should ideally be used together to clearly establish candidate health-service delivery functions where there is potential and resources for ICTs. A brief list is included here:

- the WHO mHealth Technical and Evidence Review Group (mTERG) mHealth and ICT Framework for RMNCH;[17]
- the GSM Association mHealth Tracker;[18]
- the mHealth Alliance Health Unbound online portal;[19]
- the mHealth Working Group Inventory of Projects;[20]
- USAID's mHealth Compendium produced by African Strategies for Health;[21] and
- the Center for Health Market Innovations Programs Database.[22]

This section provides a brief overview of the tools but is not intended to be a manual on their use. Therefore, the facilitator should be familiar with them and the available resources, if they are to be used as part of a guided-dialogue workshop.

It is recommended that the tools be used prior to the guided-dialogue exercise – either as part of a separate analysis or workshop, or as the first part of a longer workshop.

It is not necessary to use the framework in cases where existing or candidate solutions are either under consideration or have already been selected. However, it might still be worth using it at a strategic level to ensure that the candidate ICT or mHealth innovation matches the needs of the health service under consideration.

The mTERG, mHealth and ICT Framework for RMNCH

The mTERG[17] has been working in collaboration with the United Nations Children's Fund (UNICEF) and the Johns Hopkins University Global mHealth Initiative to create a framework for highlighting opportunities where mHealth and ICT could be applied across the RMNCH continuum of care.

The framework describes how to identify potential opportunities for applying innovations and points to the sorts of mHealth/ICT innovations that might be of benefit for every stage of the continuum of care. An example output (Box 1) using this framework (in combination with the GSMA/mHealth Alliance resources suggested below) is provided as an illustration (Figure 3).

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17 http://www.who.int/reproductivehealth/topics/mhealth/mterg/en/ (accessed 3 November 2013).

18 http://www.mobileworldlive.com/mhealth-tracker (accessed 3 November 2013).

19 http://www.healthunbound.org/ (accessed 3 November 2013).

20 http://www.mhealthworkinggroup.org/projects/mhealth-working-group-inventory-projects (accessed 7 November 2013).

21 http://www.mhealthworkinggroup.org/sites/mhealthwg.org/files/usaid_mhealth_compendium_vol_2_-_final_0.pdf (accessed 7 November 2013).

22 http://healthmarketinnovations.org/programs (accessed 7 November 2013).

FIGURE 3

Infographic template for the mTERG mHealth and ICT framework for RMNCH

BOX 3

Health system goal: increased safety and quality of care

Strategy 4. Decision support

Description: Decision support tools and systems that are automated and algorithm- or rule-based. Decision support tools may be used to identify and prioritize high-risk clients for health care where resources may be limited.

Examples of mHealth tools:

- protocols
- checklists
- algorithms
- electronic forms

Examples of mHealth strategies in use:

e-IMCI, mCheck, mLearning, risk profiling, D-Tree, Dimagi CommCare

UN EWEC IWG mHealth case example: Dimagi's CommCare platform provides an integrated system of tools including registration forms, checklists, danger sign monitoring, and educational prompts with audio, image and video clips to help Accredited Social Health Activities (ASHAs) to deliver health information and services in the community.

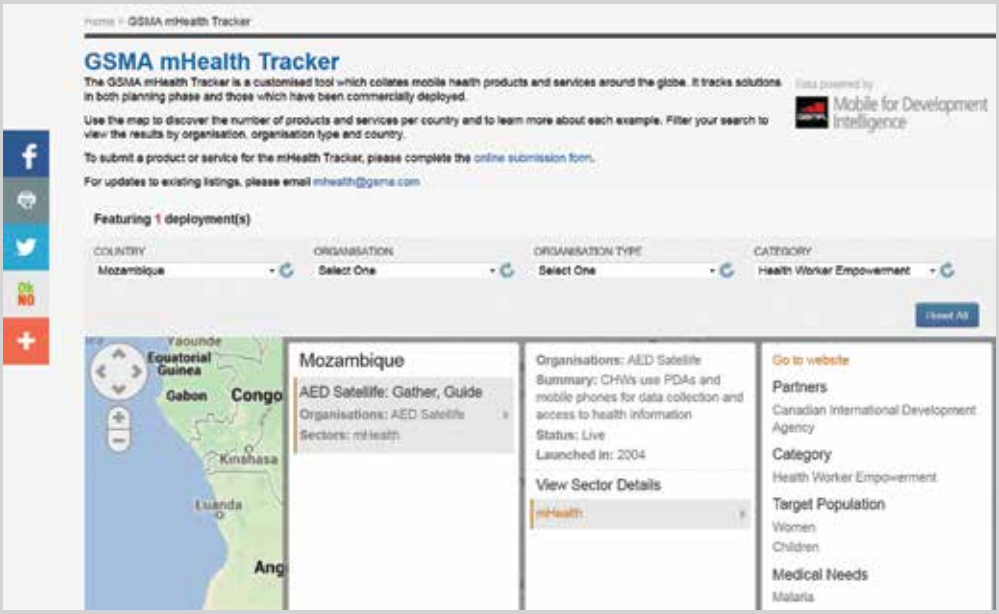
The GSMA mHealth Tracker

The GSMA mHealth Tracker registers mHealth projects across the globe and allows users to filter by country, organization type or category. Interactive details of each project are available. Figure 4 below highlights how the GSMA Health Tracker can be used. Using certain categories (Country, Organization, Organization Type, and Categories such as Health Systems), it is possibly to identify and find more information on certain types of mHealth solutions. Figure 5 illustrates the kind of information that can be obtained for each solution or project. It is important to note that this may not be a comprehensive database, and must be used in conjunction with other sources of information on projects in countries. Once candidate projects or pilots are identified, further details (e.g. project reports, evaluations, etc.) can be researched online.

Workshop participants are encouraged to become familiar with this online resource and to use it to help identify candidate projects and pilots that could fulfill the functional needs indicated in the framework tool.

FIGURE 4

Screenshot of GSMA mHealth Tracker



Source: http://www.mobileworldlive.com/mhealth-tracker (accessed 22 November 2013).

FIGURE 5

The GSMA mHealth Tracker tool provides important information about mHealth projects/solutions

Source: http://www.mobileworldlive.com/mhealth-tracker (accessed 22 November 2013).

The mHealth Alliance Health Unbound online portal

The mHealth Alliance Health Unbound online portal provides access to case studies, information about applications and platforms, organizations and research, as well as programmes and projects related to mHealth.

Participants are encouraged to become familiar with this resource, and to use it to identify and explore mHealth solutions that would be relevant to their needs. Registered users can create their own health unbound board and populate it with content that they are most interested in. Once candidate projects or pilots are identified, further details (e.g. project reports, evaluations, etc.) can be researched online.

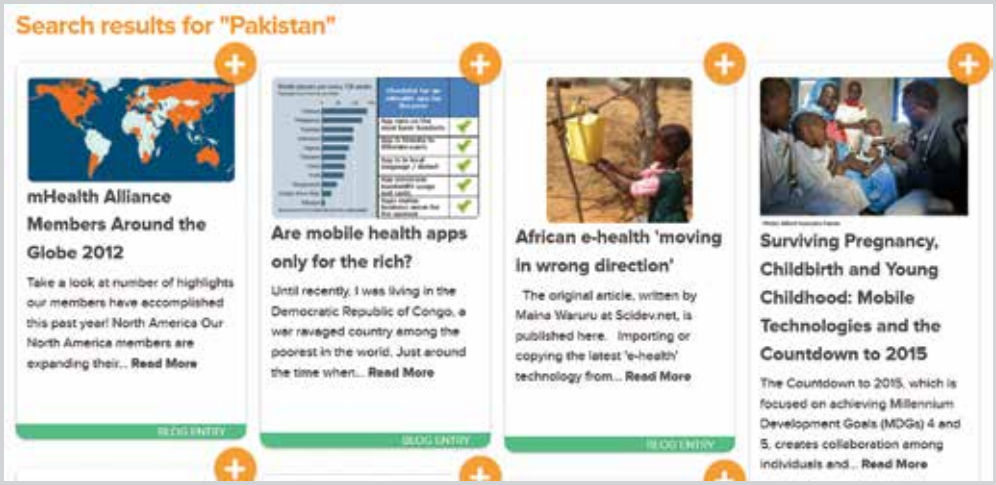
It also offers the opportunity to join the site and collaborate on topics of interest.

FIGURE 6

Screenshot of Health Unbound online portal

FIGURE 7

Health Unbound Search Results for Pakistan



Source: http://www.healthunbound.org

Actions

The following actions assume that some output is available from Actions 9 and 10 (i.e. there is a consensus on the RMNCH focus areas and RMNCH essential interventions have been identified).

☐ **Action 9.** Action items 1-8 should provide you with adequate information about the health-system functions in your country which would benefit most from ICT/mHealth solutions. List these areas.

☐ **Action 10.** Based on the resources identified in this workbook, identify essential characteristics of a desired ICT solution or identify specific solutions that you may have identified through the GSMA mHealth Tracker, the mHealth Alliance Health Unbound online portal, or other sources.

☐ **Action 11.** In addition to the GSMA or mHealth Alliance resources, list any other known ICT projects or pilots in the country (by MoH, NGOs, international partners) that might also be of interest in helping deliver the essential interventions (see Appendix D for references and useful information resources).

☐ **Action 12.** Define as a group what success means for the use of ICTs/mHealth. It is possible to have more than one criteria of success, but consensus across stakeholders should be the goal of this action.

Note: *Suggested attributes might include more cost-efficient or speedier delivery of a specific health service, or improved coverage or compliance rates, better data, etc., rather than improved health outcomes (which are often difficult to link directly to the use of a specific ICT or mHealth innovation).*

Continue to fine-tune the definition of success until it meets as many attributes of the SMART formulation as possible. In other words, the success criteria should be:

- ☐ **S:** Specific
- ☐ **M:** Measurable
- ☐ **A:** Achievable
- ☐ **R:** Realistic
- ☐ **T:** Time bound

Experts' corner

"…look for outcomes if possible. Reaching the right audience, reaching sustainability and efficiency are process objectives but in the end, the intervention must demonstrate better outcomes or the same outcomes with less cost."

"Improved health outcome seems to address only the end of the pipe, i.e. delivery of the health intervention. Ultimately, it's about better individual or public health (service delivery, quality, equity, etc.)."

"Put it in the frame of improving the quality of care. Focus on this as a priority. The further away you get from the health-care worker and helping them the less useful it is to everyone."

"Separate the project/programme implementation performance (e.g. on-time, within budget) attribute from the improved quality of service/coverage attribute."

"If ICT/mHealth is bundled as part of an integrated package (e.g. as part of an RMNCH essential intervention) then it is difficult to identify the direct contribution of ICT/mHealth to improved health outcomes. Improved speed, efficiencies, quality of data, coverage etc. are easier to measure, assuming of course that these indirectly impact health outcomes."

"I would also think through adding other perspectives would be useful, e.g. multi-stakeholder involvement in the project, adequate staffing for sustainability, longer term project roadmap laid out, project or intervention tied to a national health priority or global health imperative and perhaps that the project laid the groundwork for a replicable model or cross-border collaboration."

Step 5: Assess for Financial Feasibility and Preparedness

A reality check is needed to ensure that it is cost efficient to use ICTs and that the ICT infrastructure in the country (or state, etc.) is suitable to be able to deliver the selected RMNCH intervention.

Action 13 lists True/False questions that can help in thinking through these issues. Guidance is provided on how to interpret these questions.

Actions

☐ **Action 13.** As a group, discuss each of the following questions. Indicate how **True** or **False** the statement is.

Q1 – For each of the selected RMNCH intervention where an identified ICT or mHealth innovation might have potential, the intervention can continue being delivered without the use of ICTs. **T / F**

Q2 – The selected ICT or mHealth innovation is likely to cost significantly more in terms of capital investment (e.g. hardware and software costs), ongoing operational overheads and human resources than a manually delivered RMNCH intervention. **T / F**

Action 13 Interpretation

1. If ***Q1 is false***, this implies that the intervention cannot be implemented manually and therefore ICTs are essential for its implementation. In such a case, other factors need to be considered (overall costs, preparedness of the larger ICT/e-health environment).
2. If ***Q1 and Q2 are both true***, it is evident that the use of ICTs may not be recommended. At this point, the stakeholders need to discuss if there are any other mitigating circumstances that argues strongly in favour of pursuing the ICT innovation despite the failure.
3. If ***Q1 is true and Q2 is false***, then other advantages of using ICTs will become important (i.e. this means that high costs cannot alone be sufficient reason to reject the use of ICTs). List any such advantages in the working area.

☐ **Action 14.** As a group, discuss each of the following questions. Indicate how **True** or **False** the statement is.

Q1 – Does this statement describe the participants' health system? *"The use of ICT in the general population in this country is largely restricted to use of mobile phones. The commercial ICT market is fragmented, with little local expertise available. The government has little role in* **T / F**

funding and technical support for e-health related projects. This funding or support comes instead from aid agencies, donors, nongovernmental organizations (NGOs) and consultants."[23]

Q2 – The MoH has an ICT/HIS Unit. **T / F**

Action 14 Interpretation

1. If ***Q1 is largely true***, but the potential benefits of using ICT or mHealth innovation seem (or have been demonstrated to be) compelling, then stakeholders will need to carefully consider how to sustain the scaled-up use of ICTs. Stakeholders need to look beyond the implementation project and consider long-term investment and capacity building to ensure that obstacles to project success are overcome. If these systemic issues cannot be addressed or mitigated by the stakeholders, this is a strong indicator not to proceed. *This might be counterbalanced, however, by the fact that a specific mHealth innovation can reach bottom-of-the-pyramid populations despite the fragmented nature of the overall HIS.*
2. If both ***Q1 and Q2 are true***, but the potential benefits of ICT or mHeath innovation seem compelling, then it is essential to build MoH capacity to help ensure the HIS/e-health environment can be enhanced, in addition to any other mitigating actions suggested for overcoming Q3 systemic challenges.
3. If ***Q1 is false and Q2 is true***, it is essential to build MoH capacity to help ensure that the HIS/e-health environment where ICT scale-up is being considered can be enhanced. Stakeholders should articulate how this could be done sustainably (i.e. beyond the end of a project).

Most of the mHealth innovations tested in various settings in Africa and Asia have been from bottom-up efforts (perhaps involving NGOs, funding partners, mobile operators and a local health programme). The wide use of mobile phones among populations has proved a fertile ground for innovation. However, many projects tend to be time-limited, proof-of-concept pilots that may have demonstrated technical feasibility but have not scaled beyond this.

At the same time, recent top-down efforts by governments and the international community to assess countries' HISs have highlighted key weaknesses needing significant infrastructure investments in ICTs, human resources and the creation of an enabling e-health policy environment.

The successful scaling up of sustainable mHealth and other local ICT innovations will require the bottom-up and top-down approaches to find a balance that makes the most of good innovative ideas and is supported by the wider health system.

There is a perception among some stakeholders that mHealth provides the opportunity to replace manual approaches, yet the reality is that other factors are perhaps as important when considering the use of mHealth on a wider scale.

Most stakeholders agree that technology pilots need to be more rigorously defined to:

- include sustainability and scalability considerations; and
- monitor and/or evaluate for key strategic lessons and learning.

This is in addition to the more common use of pilots to test assumptions, compare solutions or manage risks.

Appendix B on the use of pilots has been included as several stakeholders and ICT/mHealth experts felt this would be a useful addition.

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23 Source: WHO (2012). WHO/ITU national e-health strategy toolkit. Geneva: World Health Organization.

Summary of expected outputs

Assuming that all parts of this section have been completed, the following outputs should have been generated:

- a clear link between a health intervention and the health-service delivery function to which ICTs/mHealth might contribute;
- a list of potential ICT solutions or example pilots and projects;
- a definition of how the group views the success of a project; and
- an initial reality check on the viability of scaling up ICT.

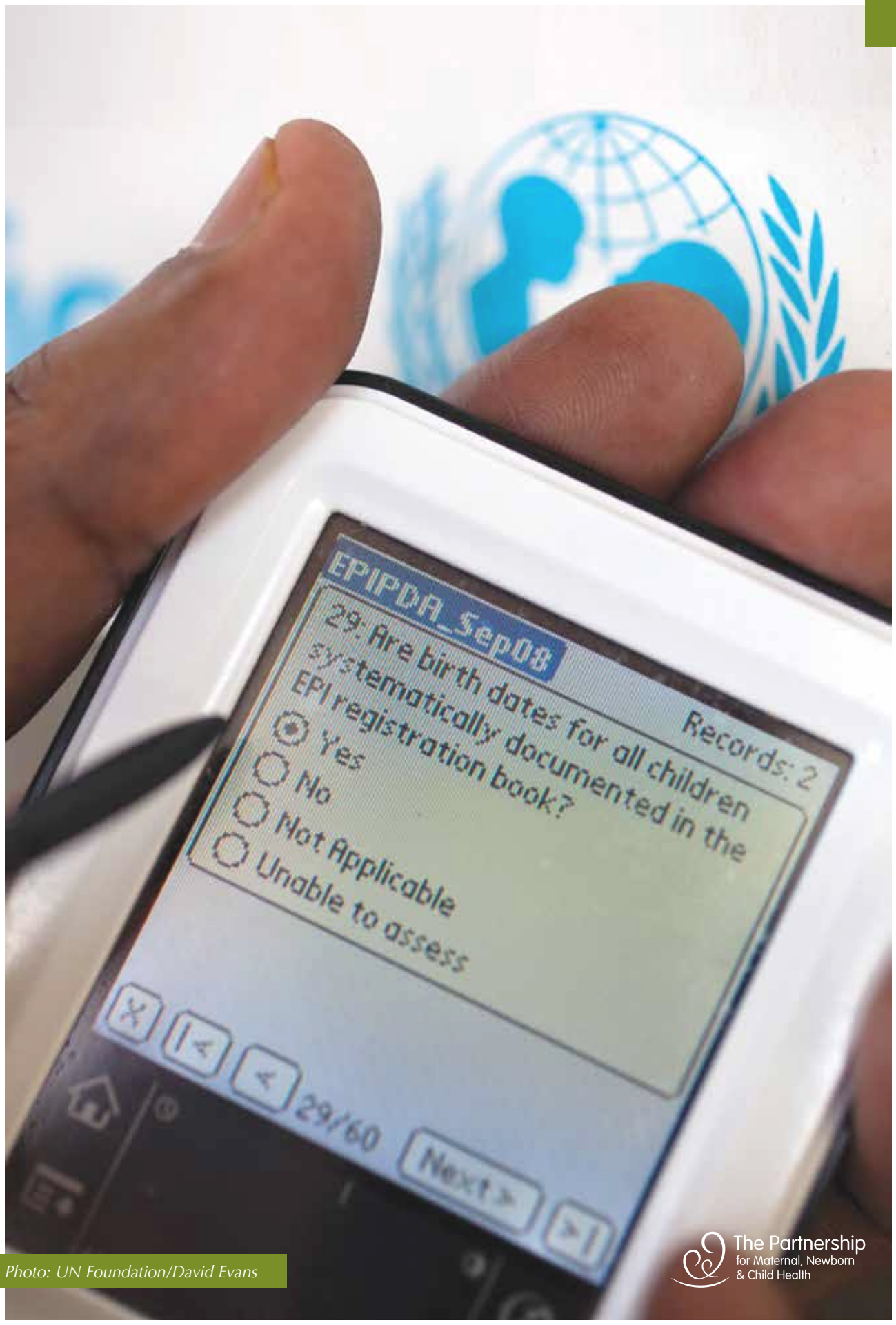


Photo: UN Foundation/David Evans

The Partnership for Maternal, Newborn & Child Health

Guided dialogue

Rationale for a dialogue-based approach

A large number of ICT projects fail. One of the main reasons for their failure is that the stakeholders rarely meet collectively to discuss the projects. The evidence from the studies of ICT projects suggests that many of the factors contributing to failure were not identified, adequately mitigated or managed during the planning and implementation phases of the project. Given the other contributing factors suggested above for LMIC contexts, the review group concluded that a mechanism that highlighted these factors and emphasized them for discussion by multiple stakeholders prior to project implementation would lead to more successful and sustainable projects at scale.

Over the last decade, annual research surveys and reports on the causes of ICT project failures in developed country settings have indicated that only about a third of all projects were considered a 'success'; nearly half were 'challenged' (i.e. not delivered on time or over-budget), with the rest being termed as 'total failures'.[24]

While the rates of success or failure noted in the latest report may be different for ICT projects in Low and Middle Income Countries (LMIC),[25] it is highly likely that the top five contributors to project failure are as relevant for ICT projects in developing country contexts. These contributors include:

- lack of adequate management or leadership support or commitment;
- lack of adequate user or stakeholder involvement (communities, health extension workers, donors, NGOs, etc.);
- incompletely articulated requirements (i.e. the objectives are not clear);
- lack of resources (personnel, financial); and
- unrealistic expectations (mismatch between technology and capacity).

Other factors that emerged from the literature review and interviews with experts, also likely to be relevant for applying large-scale ICT or mHealth innovations in LMIC, include:

- the ICT and e-health capacity in the MoH;
- e-health environment (infrastructure, network coverage, and interoperability);
- heterogeneous socio cultural norms;
- experience in planning, designing and deploying larger projects (e.g. project management, governance, etc.); and
- sustainability of the underlying 'business' model.

The workbook has therefore adapted the risk register concept for use as a dialogue tool. This concept is often used in the field of project management to first highlight potential obstacles, and then to encourage dialogue among key stakeholders to identify how the specific obstacles are to be managed or mitigated.

24 The Standish Group annual CHAOS reports (http://blog.standishgroup.com/).

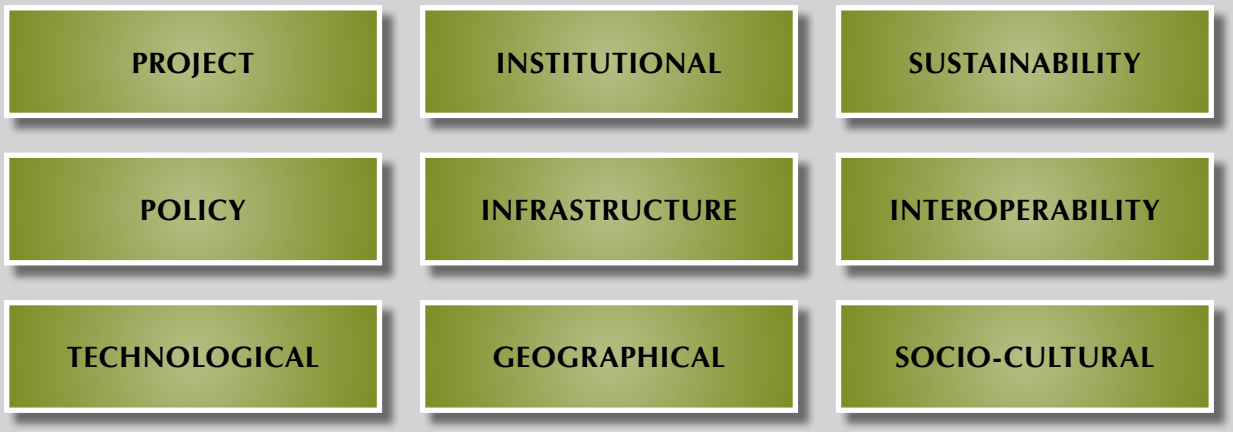
25 There has been little apparent research undertaken on the factors that impact on the success or failure of LMIC development projects involving ICTs.

Dialogue themes

The following themes (see Figure 8) have been used to structure the guided-dialogue process. Experts and much of the literature discussing ICTs and mHealth in international development contexts use some or all of this terminology.

FIGURE 8

Themes to structure the guided-dialogue process



These themes are dynamically linked with each other and continuously shape one another. A good understanding of these themes in the context of the ICT solution(s) being considered is helpful in identifying the enabling factors and obstacles for the success of the ICT solution(s).

The dialogue tool

The dialogue tool is derived from what is known in project management terminology as a risk register. A typical risk register has four components.

1. The stated risk (dialogue theme).
2. A score representing the impact of the risk identified above.
3. A score representing the likelihood that this particular risk will occur.
4. A mitigation or management statement(s) on how the risk will be tackled.

The scoring mechanism allows programme and project managers to identify high-impact/high-likelihood risks (obstacles) and to focus efforts on mitigating them.

This approach is useful because it allows for a structured discussion around the factors that can impact the success or failure of the ICT solution(s) being considered.

Key questions, resources and expert opinion are provided to prompt discussion, and form the basis for a multi-stakeholder dialogue. A compact version of the dialogue tool (Appendix C) can be used in time-constrained situations.

The scoring mechanism

If statements critical to the discussion are missing, participants should include them as part of the guided-dialogue exercise. While space is provided in the workbook for participants' responses, the use of the accompanying Excel spreadsheet is encouraged to both score and capture mitigation outcomes.

Each of the dialogue themes includes a number of questions or statements. An example is included below for illustration.

Question or statement	SI	LI	DI	Mitigating the scale challenge
New technology is being considered (e.g. electronic chip health identity cards, or 3G data collection).	*4*	*4*	*16*	*Does an alternative lowest common denominator technology exist (e.g. human-readable magnetic swipe cards, or an SMS rather than 3G solution)?*

Each question or statement is given two scores:

1. **Severity Index (SI)** indicates the potential severity of the impact implied in the given statement (1 = low, 5 = severe).
2. **Likelihood Index (LI)** indicates the likelihood that the risk implied in the statement will happen (1 = unlikely, 5 = very likely).

An overall dialogue index (DI) for the given statement is calculated by multiplying the SI and LI. A DI of 16 or over (high impact and very likely to occur) indicates an area that participants should discuss in detail, with a view to articulating mitigation approaches. The group's most important activity is to consider how the stakeholders can mitigate the obstacles with the potential to have a large impact (i.e. a dialogue index of over 16).

In the example above, the workbook user should ask the following two questions.

1. What is the implied impact should the new technology fail?
2. What is the likelihood that such a failure would occur?

Both the SI and the LI were 4, i.e. the impact of failure of the new technology would be severe on the overall project if it were implemented, and the likelihood of failure, given the known circumstances prior to project implementation, was also high.

Participants and facilitators at a Voluntary Counselling and Testing (VCT) workshop for HIV, held at the AIDS Resource Center (ARC), a unique one-stop center for HIV/AIDS education. Ethiopia.

Photo: © 2002 Center for Communication Programs, courtesy of Photoshare

Theme 1. Project

Implementing large ICT programmes is more complex than pilot projects, and requires careful planning of human and financial resources. The personnel working on large scale projects often need to spend a longer period of time in the field and need more developed project management skills. The focus often tends to shift from proving technology feasibility to financial feasibility of interventions. When scaling up, the technology requirements also pose different challenges vis-a-vis software and hardware requirements and maintenance.

In addition, one of the key success criteria of larger ICT projects is strong senior management and political commitment.[26]

The following statements (if false) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
Strong senior management and political support for extending the use of technology has been identified and there is willingness to champion state or national projects and/or programmes.			
A dedicated project manager with experience of running large-scale technology projects has been (or will be) made available.			
A strong governance mechanism is (or will be) in place with a dynamic monitoring, review and evaluation process.			
A strong multi-stakeholder project team is (or will be) assembled including representatives from groups of end users (e.g. communities, health workers, etc.).			
Technical resources (including public health specialists, business or systems analysts, content developers, etc.) are available if needed.			
Cost implications (human resources, training, equipment etc.) are clearly understood and have been included in project feasibility studies.			

Please add any additional obstacles.

26 The Standish Groups' annual ICT project analysis CHAOS reports.

The Ministry of Health of Costa Rica organized a side event on mHealth for non-communicable diseases during the 66th World Health Assembly.

Photo: PAHO/WHO

Theme 2. Institutional

In most countries, extending the use of ICT innovations into the health system inevitably requires the support and involvement of of the Ministry of Health and possibly several other Ministries. The capacity of the Ministry of Health to oversee, ensure interoperability, manage and sustain the expansion of ICT beyond the pilot or project implementation stage is critical to its long-term sustainability.

The following perspectives should be explored by stakeholders to identify where extra institutional support may be needed.

- the ICT/mHealth capacity in the Ministry of Health; and
- the general strength and stability of the Ministry of Health.

The following statements (if false) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
The Ministry of Health (or equivalent institution which delivers public health services) has an operational HIS or e-health unit that is (or will be) involved in some capacity in the project.			
The Minister of Healths' role changes only infrequently within the term of a government. When there is a change, it does not have a large disruptive impact on the health system (e.g. changes in senior staff, regional and district administrators, etc.).			
The Ministry of Health (or equivalent institution which delivers public health services) has strong political support and this is reflected in the prioritization of health in the national budget.			

Please add any additional obstacles.

Further questions presented below will highlight the gaps in institutional capacity to support ICT interventions. They should help participants articulate a profile that can be used in conjunction with the factors listed in the other themes (e.g. policy, sustainability). They should also help to determine both the viability of an initiative to expand ICTs given the existing environment, and where to focus strong cross-stakeholder capacity building, if such action is required to support a large-scale project.

These questions can help describe the institutional environment in a way that can contribute to an informed multi-stakeholder discussion on a project's viability and any support it might need.

Actions

Action 1. Answer the following questions with regard to IT/ICT capacity in the MoH (or equivalent institution which delivers public health services). List any specific responses or comments in the working areas following these questions.

Q1 – Does the MoH have a senior IT/ICT staff member (e.g. chief information officer, director of IT)? State the title of the position and its level in the MoH. _____

Q2 – How many staff work within the MoH at national level on IT/ICT/mHealth issues and challenges? _____

Q3 – Does the IT/ICT unit's remit in the MoH extend beyond supporting headquarters/regional IT infrastructure (e.g. health databases)? If the answer to the above question is yes, list the extra responsibilities. _____

Q4 – Does a computing environment exist within the MoH (e.g. a network with basic functions such as file sharing and a ministerial email system)? _____

Q5 – Do ICT resources exist outside the IT/ICT unit, but still within the MoH or equivalent institution? If so, list how many staff, and key areas of focus. _____

Q6 – Is there a functioning HIS (with clearly identified processes, documentation, definitions, etc.) that is the responsibility of an IT/ICT/HIS/e-health unit? _____

Q7 – Is there a budget, growth plan and adequate staffing for the IT/ICT/HIS/e-health function for the coming three to five years? _____

Institutional stability

This perspective provides a sense of the stability of the Ministry of Health and gives stakeholders an opportunity to discuss this in a group. For example, if the Minister of Health and other senior officials in the Ministry of Health have has changed several times in recent times, then this is a volatile environment in which to attempt large-scale ICT projects.

Actions

Action 2. Answer the following questions with regard to stability of the Ministry of Health (or equivalent institution which delivers public health services). List any specific responses or comments in the working areas following these questions.

Q1 – How often has the Minister of Health changed in the last decade? _____

Q2 – Do key divisional, departmental or unit heads change with each new Minister of Health? _____

Q3 – Does the funding and support for e-health and ICT in the health system come through the MoH (with strong institutional backing and coordination)? _____

Note: In some countries, e-health or ICT innovation is primarily funded (and delivered) through a network of bilateral, multilateral and NGO-type organizations, with technical support largely provided by international consultants.

Community health workers practise text messaging during FrontlineSMS training at St. Gabriel's Hospital in Namitete, Malawi.

Photo: © 2008 Josh Nesbit, courtesy of Photoshare

Theme 3. Sustainability

Sustainability means different things to different people, therefore it is important for the stakeholder group to agree on a definition.

Some of the more important dimensions of sustainability when considering the expansion of an ICT innovation are listed below.

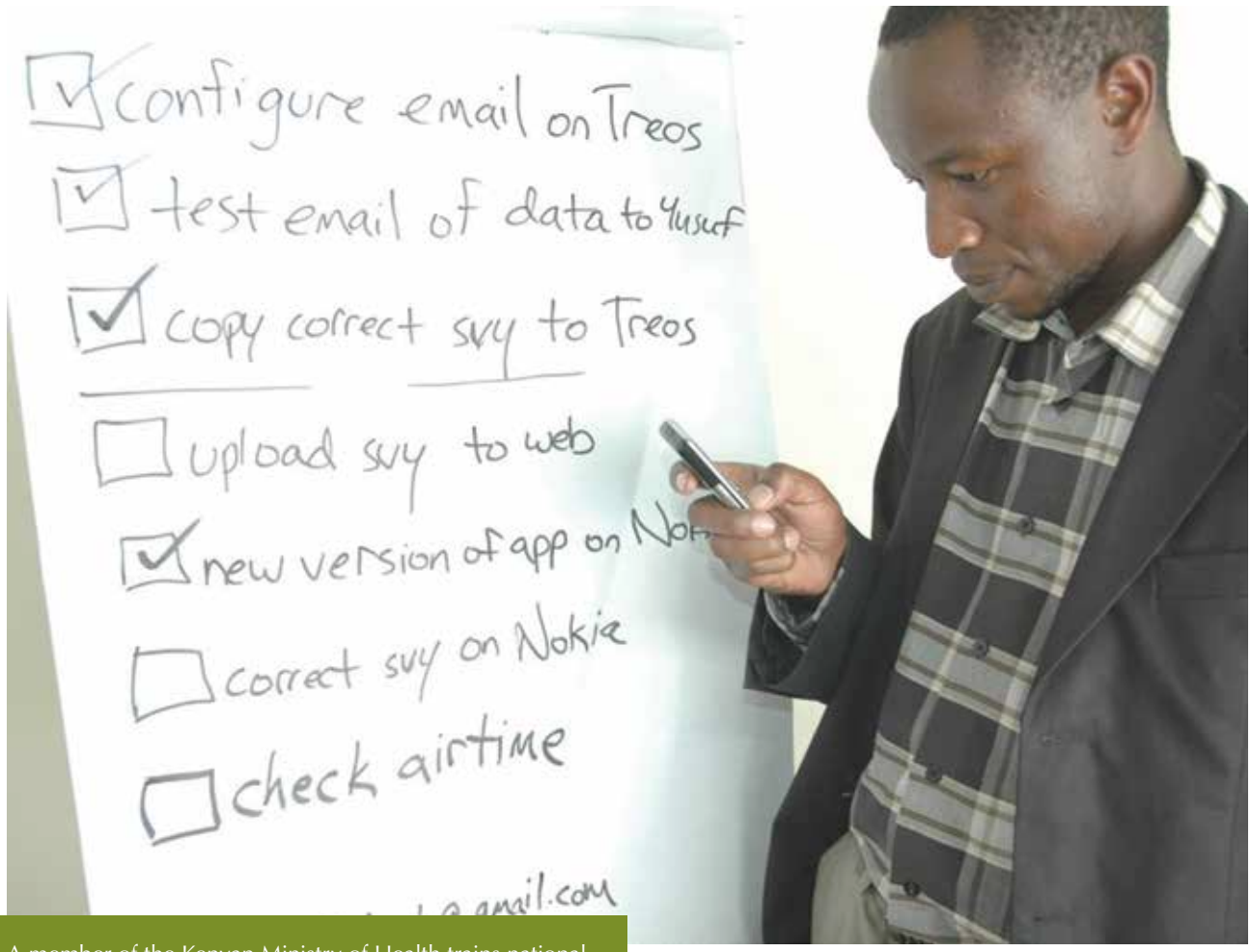
- **Operational:** those elements of the ICT solution (including technical support, licences, ongoing training, maintenance, etc.) that would be needed for its continued operation.
- **Socio-cultural:** those factors in the ICT solution that would contribute to the acceptance, trust and well-being of the target group (patients or health workers).
- **Technical:** the technical infrastructure elements that need to be installed for the large-scale application of the solution (e.g. mobile voice or 3G coverage, electrical distribution, computing ability to run a desired piece of software).
- **Financial feasibility:** the availability of funding (or viable business model) that could sustain the total cost of ownership (TCO) of a project over its entire life cycle (e.g. five years, 10 years, etc.).
- **Institutional:** for large projects, the institutional support that would be required at different administrative levels to ensure the success of the project.
- **Policy:** existing or planned support from government to create an enabling environment for e-health which would ease the integration of ICT innovations into the health system.

Some reports looking into the mHealth industry are questioning the business models that underpin the delivery of health services or functions (e.g. a reminder service) to those least able to afford mobile access. While the service may have demonstrated technical feasibility, it has not been assessed from the perspective of sustainability.

For the purposes of this exercise, two statements have been provided, one on ICT innovations directly targeted at the consumer of health services in low-income settings, and the other on the question of long-term total cost of ownership of an ICT innovation. The following statements (if false) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
For bottom-of-the-pyramid targeted services that intend to rely on local uptake (e.g. use of mobile phones), there is evidence that the value versus cost of the service is attractive, that the service does not have a catastrophic impact on out-of-pocket expenditure, and that it will remain inexpensive to the end user over the lifetime of the service (e.g. five to 10 years).			
A five to 10-year perspective for the TCO has been adopted (i.e. the cost of the project, the capital cost of infrastructure and equipment, and the cost of operations including training, maintenance, updates and support). Key funding for the TCO has been earmarked or can be identified from government, the MoH, international partners or other stakeholders over the period.			

Please add any additional obstacles.



A member of the Kenyan Ministry of Health trains national health workers how to use the EpiSurveyor data collection software for mobile devices.

Photo: UN Foundation/DataDyne.org

Theme 4. Policy

The ability for a country to fully utilise the potential of ICTs in the health sector is influenced by policies both within a sector (e.g. e-health policies) and with other sectors (e.g. policies enabling more affordable and easier access to satellite or mobile services for education services, as part of national licensing for operators).

While many ICT innovations have been demonstrated to be technically feasible via numerous pilots, scaling up such innovations will often need the support of national policies or even legislation.

Within the health sector, the existence or absence of a credible, enabling and effective e-health policy environment is likely to impact on the success or otherwise of expanding the use of ICT innovations.

The following statements (if not true) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
Policies that can facilitate the adoption of ICTs within the Health sector exist (these may include privacy laws, guidelines on use of patient data, etc.).			
A mechanism exists for facilitating cross-government policy formation that can be leveraged by the Ministry of Health.			
A national e-government policy framework exists that informs the development of services and is relevant for certain e-health approaches.			

Please add any additional obstacles.

Mobile phone charging, Uganda.

Photo: Image courtesy of kiwanja.net

Theme 5. Infrastructure

In this workbook we refer to technological factors as those directly linked to the ICT innovation. Infrastructure factors are those supporting factors that exist (or need to exist) for the innovation to work.

For example, an application on a 3G smartphone would be the innovation, while a 3G mobile network and ability to charge the mobile device, are considered as infrastructure factors.

It is important to make a distinction between the existence of infrastructure and its functioning. For example, even if power grids and other infrastructure are available, people may not have constant access to electricity because of low production capacity (vis-a-vis electricity).

The two key infrastructure elements that underpin the application of ICT innovations to health systems are electricity and telecommunications. The mix of footprint (i.e. their reach and reliability) provides the foundations upon which other services rely.

In the absence of reliable electricity infrastructure, alternative power sources are required (e.g. local solar, diesel generators, back-up battery banks, etc.), and, in the absence of fixed telecommunication networks, some form of mobile coverage (satellite, terrestrial radio/microwave, wireless or conversion to physical format, e.g. on a flash-drive, etc.) is needed.

The following statements (if not true) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
National electricity infrastructure reaches all main urban centres including the district hospitals and health facilities. The electricity supply is relatively stable with only occasional outages (i.e. load shedding in a district does not occur more than once a week or for more than 24 hours, and local back-up systems are in place for critical health-facility functions).			
National telecommunications infrastructure is able to reach at least the main district hospitals and health centres. For populations (or roaming health-extension workers) who may be reliant on mobile coverage, most urban and a significant portion of semi-urban areas have voice and SMS coverage.			

Please add any additional obstacles.

A further series of questions are presented below that can be used to improve the understanding of any potential infrastructure challenges. These should help participants elicit and articulate a profile that can be used in conjunction with the factors listed in the other themes (e.g. technological, institutional) to determine both the viability of an initiative to expand the system given the existing environment, and where to focus strong cross-stakeholder action to mitigate these challenges if such action is required to support a large-scale project.

National MoH infrastructure

Actions

Action 3. If relevant, answer the following questions with regard to the ICT and energy infrastructure within the MoH (or equivalent institution which delivers public health services), at national, state and regional levels. List any specific responses or comments in the working areas following these questions.

Q1 – What computer networks (if any) are in place within the MoH? _____

Q2 – Do the computer networks (if any) within the MoH (or state equivalent) extend to the first level of institutions (e.g. regional offices)? _____

Q3 – Does the MoH participate in any government-common computing or communications infrastructure (e.g. government fibre network or cloud computing environment)? _____

Q4 – Does the MoH have its own email system or do most people rely on cloud-based email services such as Yahoo or Google? _____

Q5 – Is the MoH computer network and ICT infrastructure protected by back-up systems and security systems? (e.g. anti-virus software, etc.) _____

Q6 – Do regional offices have reliable power supplies? _____

Q7 – Do national health management information systems (HMIS), electronic medical/health records (EMR/EHR), supply chains or other examples of a national ICT health application exist – either within the MoH or one of its programmes? _____

Q8 – If there is a local area network (LAN) within the MoH, who uses it? Is it solely used for senior management or do key health programmes also have access to computers and connectivity? _____

Local infrastructure

Actions

Action 4. If relevant, answer the following questions with regard to ICT and the energy environment at local levels (wherever key health-service delivery exists). List any specific responses or comments in the working areas following these questions.

Q1 – Are there locally available ICT skills within the MoH and what level of skills are they (try and answer this question for two levels of the health system – regional and provincial, etc.)? _____

Q2 – What is the general ICT literacy levels of the end-user (health workers or the general population)? _____

Q3 – Do non-MoH ICT projects exist in the health system at regional, provincial or district levels? What is the support environment for these projects (e.g. technical support, dedicated staff, etc.)? _____

Q4 – Do health staff have previous exposure to ICT projects? _____

The 2012 mHealth Summit explored, examined and debated the ways mobile technology is transforming health care delivery, research, business and policy for the 21st century both in the United States of America and internationally, including developed and developing nations.

Photo: Foundation for the National Institutes of Health

Theme 6. Interoperability

Most of the health software applications used in LMICs over the last decade were developed to address a specific programmatic challenge, therefore, these applications do not necessarily speak to each other. Experts are beginning to recognize the importance of the interoperability of ICT components of a national HIS and in particular the ability to exchange data (e.g. the exchange of data from patient records' systems into aggregate HISs exchange of data. One such critical interface is the exchange of data from patient records' systems into aggregate HISs.

For the purposes of this workbook, we will not delve extensively into the technical challenges of interoperability. However, this section will help you identify some of the key issues that need to be thought through clearly from an interoperability perspective.

The following statements (if not true) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
For the innovation under consideration, opportunities to interoperate with other HIS components of the health system have been identified.			
Consideration has been given to how this innovation could be leveraged or integrated into a larger HIS context in the future.			
The mHealth or ICT solution allows the extraction of data that it collects or handles in a documented format (e.g. a comma-delimited file).[27]			
The intended mHealth or ICT solution meets existing national standards for privacy and security of data.			

Please add any additional obstacles.

27 A data format where a comma separates each piece of data. This is a popular format for transferring data from one application to another, because most database systems are able to import and export such data.

Village payphone, Uganda.

Photo: Image courtesy of kiwanja.net

Theme 7. Technological

These factors are specific to the technological elements of the overall solution that is being considered for large-scale implementation. As stated in Theme 5 (Infrastructure), the technological factors focus on the applicability and replicability of the ICT or mHealth innovation.

There is a tendency to assume that a technically feasible ICT innovation in a limited local setting can be successfully scaled-up. Both technological innovators and key stakeholders sometimes focus excessively on the technological factors and not sufficiently on the other risk factors that might need to be managed.

As a general rule, for resource-constrained, geographically heterogeneous environments, it is preferable to select the lowest common denominator when looking at technology as part of a solution. For example, while a 3G-based mHealth solution may have shown technical feasibility during a pilot, the reality of scaling it up may be questionable. Therefore, a lowest common denominator approach may indicate that SMS is a more viable option.

These questions provide some indication (in combination with other factors) of the viability of scaling up the use of a given technology. It is assumed, for the purpose of this exercise, that the ICT innovation being considered has already been piloted or trialled in the country or in a similar context in another country.

Question or statement	SI	LI	DI
New technology is being considered (i.e. it has not been used before within the health system), for example, the use of electronic chip health identity cards (smartcards), or of a mobile data collection application that relies on 3G connectivity.			
The scaling up of the ICTs to state or national level requires duplication of the technology element. For example, one or more computers (with back-up, support, power, etc.) are required in every facility or district health office, or every mother needs access to a mobile phone for the health-delivery function to operate effectively.			
There is a capable local support environment within communities that can service ICTs (rather than such skills only being available in the capital or main urban centres of the country).			

Please add any additional obstacles.

A man guides a 'donkey charger' to power up cell phones in remote regions of Rolpa District, Nepal.

Photo: © 2010 Shishir Dahal, courtesy of Photoshare

Theme 8. Geographical

Even relatively small countries can have significant geographical and demographic divergence (e.g. remote semi-arid and sparsely populated areas, inaccessible mountainous areas, densely populated fast-growing urban areas, different infrastructure quality and cultural diversity).

Several experts have indicated that assumptions are often made about the widespread access to infrastructure when planning a national service, which does not reflect the reality on the ground. Often, the ICT needs to be customized to the local context, which adds to the cost, but also contributes to more success at community level.

Scaling up the use of technology (e.g. from a successful pilot) is not the same as replicating that technology, as many other factors come into play. If the following statements are true, assess their impact on the overall project and the likelihood that they will occur.

Question or statement	SI	LI	DI
There is wide geographical and demographic diversity in the country (e.g. densely populated fast-growing urban areas, remote semi-arid and sparsely populated areas, remote accessible mountainous areas, etc.).			
Infrastructure varies significantly across geographical areas (i.e. the electricity or telecommunications footprint cannot be considered widespread or homogenous, even at state, provincial or district levels).			

Please add any additional obstacles.

Women use a mobile phone in a fishing village on Île de Fitiné, an island in Lake Chad, Lac Region.

Photo: UNICEF/NYHQ2011-2197/Patricia Esteve

Theme 9. Socio-cultural

There are a number of socio-cultural factors that have an impact on the adoption and success of health interventions. Similar factors can also have an impact on the adoption of technology.

Expert opinion suggests that socio-cultural factors are important for the widespread adoption of technology-oriented services, and that the localization of services is a critical success factor.

The following statements (if not true) are likely to have a negative impact on attempts to scale-up a project. The severity level of the impact and the likelihood of these obstacles occurring should be assessed.

Question or statement	SI	LI	DI
The end user (particularly of mHealth services targeting local populations) has access as needed to the technology (e.g. women can overcome gender or status challenges and access a mobile phone in a family setting).			
The demographic target for the technology and/or service is able to easily learn to use it, and the intended solution can be localized to meet the language and literacy levels of the intended audience (e.g. younger generations tend to easily adopt SMS and/or smartphone applications while older generations may be more comfortable with voice and perhaps basic SMS).			
There are areas of the country with large populations that have diverse socio-cultural norms (e.g. religious, tribal affiliation or educational differences). Such variation appears to create differences in the uptake and use of technology. These need to be taken into account in the design of a project to scale-up the use of ICTs.			

Please add any additional obstacles.

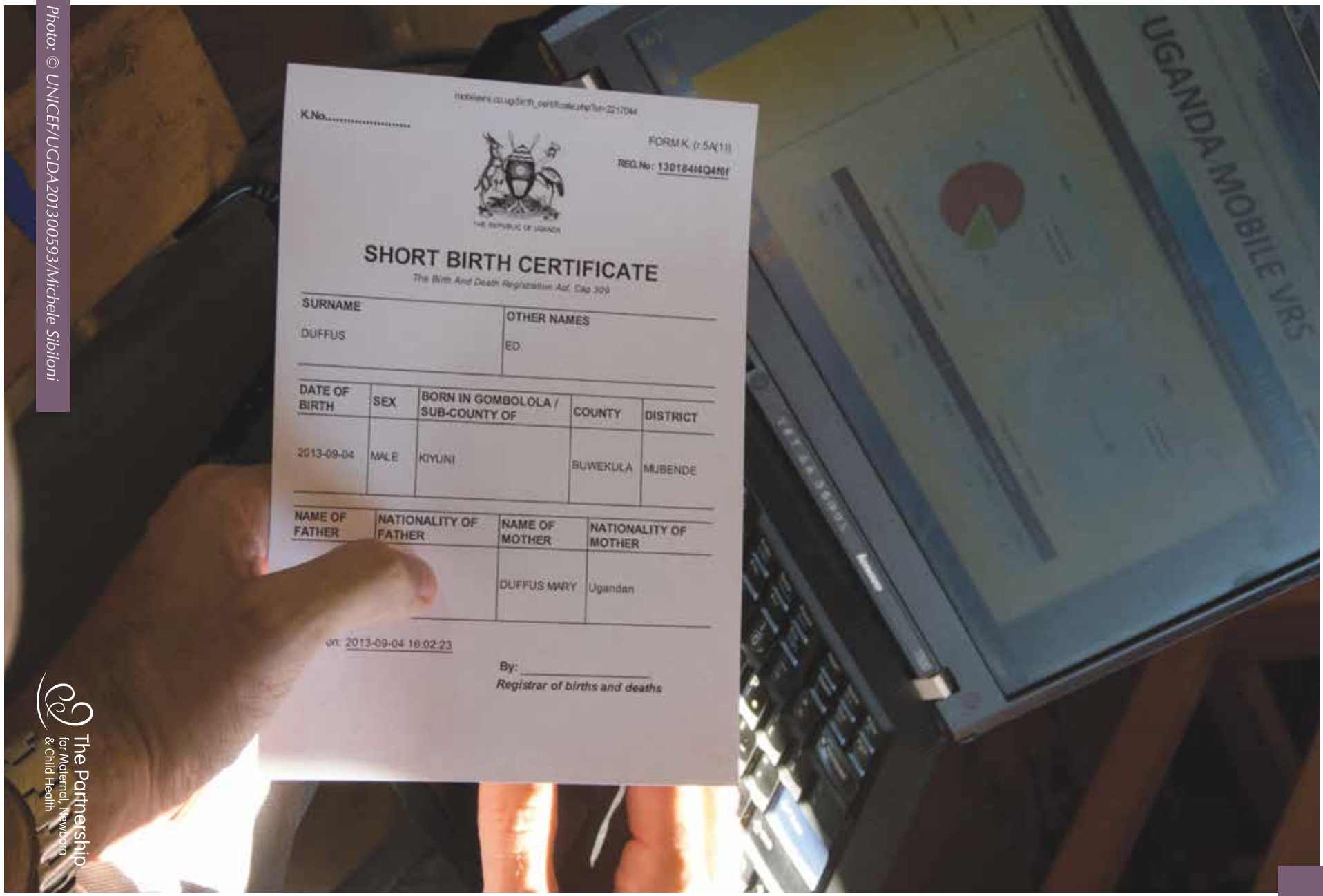


Photo: © UNICEF/UGDA2013000593/Michele Sibiloni

The Partnership for Maternal, Newborn & Child Health

Appendices

Appendix A. What next?

It is expected that participants should have generated at a minimum:

- a clear link between a selected health (RMNCH essential) intervention and the health-service delivery function to which ICTs/mHealth might contribute;
- a list of potential ICT solutions or example pilots and projects; and
- a risk profile for scaling up the use of ICTs with the beginnings of a mitigation strategy for high-impact/high-likelihood obstacles.

If an in-depth workshop or analysis was undertaken, then participants will also have generated:

- a high-level profile of key health and infrastructure indicators;
- inventories of existing projects, strategies and key national documents; and
- an in-depth set of responses to a set of questions, arranged around key success or failure categories.

If there is a sense among participating stakeholders that the scaling up of an ICT innovation has merit given all the data and dialogue that has occurred, then the information captured during the process can form the starting point for defining a project business case.

The project business case should contain at least four types of information.

1. A high-level profile of the health issue being addressed and the rationale for considering using ICTs to support a specific health-service delivery function.
2. A high-level description of the potential ICT solution (not necessarily a specific technology vendor).
3. A comprehensive analysis of the different dialogue categories and how any high-impact obstacles will be mitigated.
4. A financial feasibility analysis that models the likely TCO over a five to 10-year period.

The first three items above can leverage the output of this workshop. The fourth item is a separate activity that needs to be undertaken.

Appendix B. The use of pilots

So-called pilotitis is a label that has been making the rounds in the last three to five years as small-scale pilots or projects in the field of ICT or mHealth began to proliferate (e.g. some low-to-middle-income countries experiencing up to 30 mHealth initiatives in a given year).

Pilotitis has been stated elsewhere as:

> "Within health service development, 'pilotitis' might be understood as dissatisfaction (of service funding agencies, government departments and service providers) with isolated pilot projects which may have been successful, but were not rolled out into enduring changes in broader service provision or policy."[28]

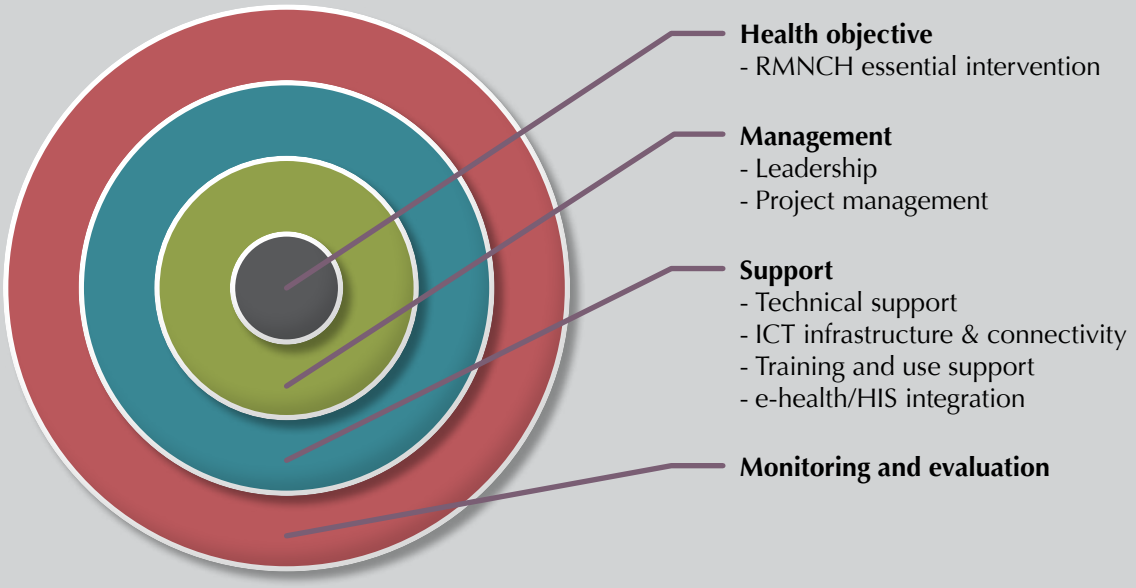
While many of these pilot projects have ostensibly demonstrated technical feasibility and functional effectiveness (i.e. the technology was demonstrated to work in the local context of the pilot and the health-service component functioned adequately), the business models, scalability, long-term sustainability or integration into the larger health system have not usually been assessed or addressed.

This planning workbook is not attempting to stifle innovation or proof-of-concept pilots, but to lay out an approach for the more strategic use of pilots as part of a longer term view on the application of ICT and mHealth innovations to the health system.

It has been suggested that a systems-based approach to pilots ensures that all the elements (see Figure 9) are considered as part of the planning activity for the pilot.

FIGURE 9

Systems-based approach to pilots



Source: http://www.gesci.org/assets/files/Knowledge%20Centre/pilot-ICT-projects.pdf (accessed 22 November 2013).

28 Kuipers K, Humphreys JS, Wakerman J, Wells R, Jones J, Entwistle P. (2008). Collaborative review of pilot projects to inform policy: a methodological remedy for pilotitis? Aust New Zealand Health Policy.5:17. doi:10.1186/1743-8462-5-17.

The reality check: do we need a pilot?

A pilot project **should not be** considered as the first phase of a large-scale technology deployment. There are several reasons why a pilot is usually carried out, including:

- it is often easier to get funding for a pilot;
- it can reduce obstacles to scaling up ICTs by assessing whether a concept is technically and/or operationally feasible;
- it may be used to establish baseline costs or other outcome indicators;
- it can form part of a pilot series to test several alternative solutions or approaches to a given problem; and
- it can be used as a training and lessons-learnt exercise.

While there is a continuing debate among stakeholders about the pros and cons of pilots, there is an emerging consensus that many pilots have not been effectively evaluated for expansion or sustainability.[29]

From the perspective of considering the use of an ICT or mHealth innovation as part of an RMNCH intervention, it is essential to establish whether or not a new pilot is necessary. It is likely that a similar pilot or small-scale project has already been carried out in the country in question or in other countries in similar contexts.

Actions

Action 1. Make an inventory of existing in-country ICT or mHealth pilots from across the RMNCH continuum of care or in other health areas in the country.

Working area: *List any existing in-country ICT or mHealth pilots/projects.*

_____

_____

_____

_____

Action 2. As a group, take each of the following questions and discuss. If the answer is **YES**, tick the box to the right of each question.

Q1 – Has an mHealth or ICT project with similar functions already been trialled in the country? ____

Q2 – Are you introducing new/unique technology (as opposed to utilizing existing, commonly available technology, such as existing mobile handsets)? ____

Q3 – Are you piloting a change in technology (the use of smartphones with apps)? ____

29 Based on the findings of the second global survey on ehealth (2011), only 12% of the countries had evaluated their mhealth projects. See: http://www.who.int/goe/publications/goe_mhealth_web.pdf (accessed 20 November 2013).

Working area: *If any of the answers to questions in Action 2 was 'yes', articulate the mitigating arguments in favour of proceeding down the path of a new pilot as opposed to assessing and evaluating existing experiences.*

Experts' corner

"Organizations are not documenting what they are doing let alone documenting how to scale."

"Sustainability and scalability factors must be built into the programme from the beginning."

"Identify existing similar initiatives and players. Do not duplicate efforts; collaborate with other organizations for deeper impact."

"Align the mHealth programme (including objectives and target out-comes) with the local and national health priorities and any existing health information systems."

"Implementations may work sustainably on a small scale but may not translate to implementation on a larger scale."

"Despite the strong promise demonstrated by mHealth tools and applications, the current landscape of mHealth development in developing country contexts is characterized by a proliferation of unsustainable pilot projects that often expire once initial funding is exhausted."

"In Uganda alone there were 23 mHealth initiatives in 2008 and 2009 that did not scale-up after the pilot phase."[30]

An effective way of scaling up ICT is to link the mHealth programme with other relevant programmes in the area, and build on their successes and learn from their failures. According to Sean Blaschke, Health Systems Strengthening Coordinator for UNICEF Uganda, the goal should be to collaborate in extending existing efforts rather than to run parallel solutions and duplicate efforts. Duplicating efforts can dilute the efficacy of mHealth and can prevent the programme from acquiring funds and partners.

30 Many of these are direct quotes from the report: Lemaire J (2011). Scaling up mobile health: elements necessary for the successful scale up of mhealth in developing countries. White paper commissioned by Advanced Development for Africa. New York (NY): Actevis Consulting Group. http://adaorganization.org/docs/ADA_mHealth_FV_singlepages.pdf (accessed 20 November 2013).

Appendix C. Compact dialogue tool

A compact version of the statements and score columns is available here for ease of access and as a spreadsheet template. The spreadsheet template provides an area where mitigation strategies can be captured.

Severity Index (SI) indicates the potential severity of the impact implied in the given statement (1 = low, 5 = severe).

Likelihood Index (LI) indicates the likelihood that the risk implied in the statement will happen (1 = unlikely, 5 = very likely).

An overall dialogue index (DI) for the given statement is calculated by multiplying the SI and LI.

Project statement	SI	LI	DI
Strong senior management and political support for extending the use of technology has been identified and there is willingness to champion state or national projects and/or programmes.			
A dedicated project manager with experience of running large-scale technology projects has been (or will be) made available.			
A strong governance mechanism is (or will be) in place with a dynamic monitoring, review and evaluation process.			
A strong multi-stakeholder project team is (or will be) assembled including representatives from groups of end users (e.g. communities, health workers, etc.).			
Technical resources (including public health specialists, business or systems analysts, content developers, etc.) are available if needed.			
Cost implications (human resources, training, equipment etc.) are clearly understood and have been included in project feasibility studies.			

Institutional statement	SI	LI	DI
The Ministry of Health (or equivalent institution which delivers public health services) has an operational HIS or e-health unit that is (or will be) involved in some capacity in the project.			
The Minister of Healths' role changes only infrequently within the term of a government. When there is a change, it does not have a large disruptive impact on the health system (e.g. changes in senior staff, regional and district administrators, etc.).			
The Ministry of Health (or equivalent institution which delivers public health services) has strong political support and this is reflected in the prioritization of health in the national budget.			

Sustainability statement	SI	LI	DI
For bottom-of-the-pyramid targeted services that intend to rely on local uptake (e.g. use of mobile phones), there is evidence that the value versus cost of the service is attractive, that the service does not have a catastrophic impact on out-of-pocket expenditure, and that it will remain inexpensive to the end user over the lifetime of the service (e.g. five to 10 years).			
A five to 10-year perspective for the TCO has been adopted (i.e. the cost of the project, the capital cost of infrastructure and equipment, and the cost of operations including training, maintenance, updates and support). Key funding for the TCO has been earmarked or can be identified from government, the MoH, international partners or other stakeholders over the period.			

Policy statement	SI	LI	DI
Policies that can facilitate the adoption of ICTs within the Health sector exist (these may include privacy laws, guidelines on use of patient data, etc.).			
A mechanism exists for facilitating cross-government policy formation that can be leveraged by the Ministry of Health.			
A national e-government policy framework exists that informs the development of services and is relevant for certain e-health approaches.			

Infrastructure statement	SI	LI	DI
National electricity infrastructure reaches all main urban centres including the district hospitals and health facilities. The electricity supply is relatively stable with only occasional outages (i.e. load shedding in a district does not occur more than once a week or for more than 24 hours, and local back-up systems are in place for critical health-facility functions).			
National telecommunications infrastructure is able to reach at least the main district hospitals and health centres. For populations (or roaming health-extension workers) who may be reliant on mobile coverage, most urban and a significant portion of semi-urban areas have voice and SMS coverage.			

Interoperability statement	SI	LI	DI
For the innovation under consideration, opportunities to interoperate with other HIS components of the health system have been identified.			
Consideration has been given to how this innovation could be leveraged or integrated into a larger HIS context in the future.			
The mHealth or ICT solution allows the extraction of data that it collects or handles in a documented format (e.g. a comma-delimited file).			
The intended mHealth or ICT solution meets existing national standards for privacy and security of data.			

Technological statement	SI	LI	DI
New technology is being considered (i.e. it has not been used before within the health system), for example, the use of electronic chip health identity cards (smartcards), or of a mobile data collection application that relies on 3G connectivity.			
The scaling up of the ICTs to state or national level requires duplication of the technology element. For example, one or more computers (with back-up, support, power, etc.) are required in every facility or district health office, or every mother needs access to a mobile phone for the health-delivery function to operate effectively.			
There is a capable local support environment within communities that can service ICTs (rather than such skills only being available in the capital or main urban centres of the country).			

Geographical statement	SI	LI	DI
There is wide geographical and demographic diversity in the country (e.g. densely populated fast-growing urban areas, remote semi-arid and sparsely populated areas, remote accessible mountainous areas, etc.).			
Infrastructure varies significantly across geographical areas (i.e. the electricity or telecommunications footprint cannot be considered widespread or homogenous, even at state, provincial or district levels).			

Socio-cultural statement	SI	LI	DI
The end user (particularly of mHealth services targeting local populations) has access as needed to the technology (e.g. women can overcome gender or status challenges and access a mobile phone in a family setting).			
The demographic target for the technology and/or service is able to easily learn to use it, and the intended solution can be localized to meet the language and literacy levels of the intended audience (e.g. younger generations tend to easily adopt SMS and/or smartphone applications while older generations may be more comfortable with voice and perhaps basic SMS).			
There are areas of the country with large populations that have diverse socio-cultural norms (e.g. religious, tribal affiliation or educational differences). Such variation appears to create differences in the uptake and use of technology. These need to be taken into account in the design of a project to scale-up the use of ICTs.			

Appendix D. References and other information resources

Below is a list of resources either accessed as part of the research in the preparation of this planning workbook or as a resource referenced in the text.

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Other resources

Health information systems

Health Metrics Network: http://www.who.int/healthmetrics/en/

ICTs and accountability

United Nations:
http://www.everywomaneverychild.org/resources/accountability-commission/implementing-recommendations

ICT statistics and research

– ITU: http://www.itu.int/ITU-D/ict/index.html
– World Bank: http://go.worldbank.org/CAJTL0L1C0

Innovations in mHealth

– United Nations Innovation Working Group (IWG) catalytic grant competition for women's and children's health: http://www.mhealthalliance.org/our-work/iwg-grantees
– Center for Health Market Innovations: http://healthmarketinnovations.org

mHealth ecosystem

mHealth Alliance: http://www.mhealthalliance.org/our-work/hub

MNCH priorities

Countdown to 2015: http://www.countdown2015mnch.org/

National e-health strategies

WHO: http://www.who.int/ehealth/en/

Standards and interoperability

Joint ITU-WHO workshop on e-health standards and interoperability: http://www.itu.int/ITU-T/worksem/

Research on mHealth for RMNCH

WHO RHR mTAG and HRP Innovations Catalyst: http://who.int/reproductivehealth/topics/innovations

ITU publications and surveys

– National eHealth Strategy Toolkit: http://www.itu.int/pub/D-STR-E_HEALTH.05-2012
– ITU survey in COIA countries:
http://www.itu.int/en/ITU-D/ICT-Applications/Documents/CoIA%20Background%20ICT4RMNCH.pdf

Appendix E. Terms and definitions

The following terms are either used in this planning workbook or are commonly used in many of the resource materials referenced in the text. This is not meant to be a definitive list and for more precise definitions, further online research is recommended.

– **Aggregate data:** Economic, health and other data normally reported by national governments that have either been collected via routine health information systems (and aggregated at each level, e.g. clinics, districts, regions/states, etc.), or via surveys such as the demographic health surveys.

– **Application:** Refers to a software application that can be deployed on servers (e.g. the email system for the MoH), workstations and notebooks (e.g. Epi Info™, that allows ad hoc epidemiological data collection and analysis), or mobile devices such as smartphones, PDAs or tablets (e.g. Magpi™, a data collection application for mobile phones). See also Solution.

– **Architecture:** At a general level, this term refers to a description (graphical or textual) of how sets of components work together to deliver a larger system. It is often used in the RMNCH domain (e.g. global financing architectures), but in the context of ICTs, the term refers to how the component pieces of a technology and/or information system fit together. See also Enterprise architecture.

– **Biometrics:** Refers to the identification of humans by certain measurable biological characteristics. ICTs are sometimes used to scan and/or collect such characteristics.

– **Civil registration and vital statistics (CRVS):** The civil registration of births, marriages and deaths are key datasets that form a critical information component for heath-system planning. Vital statistics, the basic demographic and epidemiological measures needed in national planning, require a well functioning civil registration system. A key WHO initiative to improve the monitoring of vital events is known as *Monitoring of Vital Events, including through the use of Information Technology* (MOVE-IT).

– **Confidentiality:** The principle in health ethics that patient data is private and there are certain limits on how and when it can be disclosed.

– **Data:** Generally considered to be factual data that have been measured (or derived) for reference or analysis. Data can include both quantitative (e.g. weight, height, blood pressure, etc.) and qualitative (name, address, age, gender, etc.) items.

– **Data administration:** The function of looking after data (whether paper or electronic), normally in a central location (e.g. individual patient records in a health facility, aggregated tally sheets in a district facility, etc.).

– **Data architecture:** The models, policies and standards that govern which data are collected, how they are stored, and how they are used (in this case) within the health system. There may be more than one data architecture in a health system (e.g. routine immunization reporting versus minimum patient clinical datasets versus national HIS-derived minimum datasets).

– **Data dictionary:** A description about a dataset (sometimes referred to as metadata) that formalizes elements such as meaning, relationships to other data, origin, usage, and the format of specific data elements. A prerequisite for an integrated national HIS is the definition of several national health data dictionaries (e.g. the minimum clinical patient data dictionary).

– **Data mart:** Defined as a subset of a larger data warehouse that is organized to be of use to end users for analysis or reporting purposes (e.g. morbidity and mortality data for mothers and children under the age of five might be visible as a reporting data mart for policy analysis).

– **Data model:** Normally refers to the concept of a set of descriptions of the properties and relationships between a set of data elements that together represent some real world objects or systems. Data models are often represented visually, but can also be described formally in a list format known as a data dictionary. National HISs are founded on data models that describe the data that the systems need to capture, store, manage and manipulate.

– **Data quality assurance:** The process of examining collected data for inconsistencies or missing elements. Data

quality assurance methods can range from simple to the very sophisticated. It is often used in health systems as a measure of the performance of facilities or districts in terms of the accuracy of their data. For example, a simple quality assurance measure might be whether the 'patient ID' field of a patient registry entry is filled in or not. A more sophisticated use in an automated environment might be to use data elements to auto-correct items and increase accuracy, for example, if a patient has a birth recorded but the 'gender' field is male, then this field might be corrected to female on the basis that males cannot have a birth event.

– **Data security:** Covers an enormous number of sub-topics, two of which are of key concern when information technology is being introduced into health systems: (a) data privacy, or the ability to ensure the security of patients' data against intentional or accidental exposure; and (b) data back up, or the ability to recover data if information-system components fail.

– **Data standards:** Used to ensure that different components of health-system architecture can reliably exchange and/or represent data. Data models and data dictionaries are often used to describe a data standard and they allow different vendors to build 'compliant' applications. MoHs will normally specify that technology components of the HIS must comply with commonly used data standards (e.g. HL7).

– **Data warehouse:** Is a central repository of data (stored in a database) that normally aggregates data from many sources. The data stored in a data warehouse is usually for reporting and analytical purposes and is therefore not considered a 'transactional' database, i.e. it is not a database that supports live ongoing operational activities. Many countries are now beginning to develop national data warehouses of their health indicators, often based on aggregating the data from across the country (e.g. from regional databases or sometimes district databases, if such data exist in electronic format).

– **Database:** A database is used to store an organized set of data, often mirroring the properties and relationships described in a data model. Transactions are entered, updated and/or deleted by a software application. Often, databases are 'invisible' to the end user of an application, but are vital to the functioning of the application. Databases are the foundations upon which a HIS depends.

– **Dataset:** A collection of data, often corresponding to a single table in a database, where columns represent the elements of an entity type while rows represent distinct instances of that entity. For example, a table could represent the entity type 'patient visit', with each column representing an attribute of the patient (such as age, gender, name, date of visit) and each row representing a unique instance of a patient visit. In such an example, this could also be described as the dataset of patient visits. Health professionals often extract datasets from databases as spreadsheets for further analysis.

– **Demographic health survey (DHS):** Such surveys are often undertaken in developing countries by national statistics offices to supplement the routine data collected by the health system. While the core data collected by the health service focus on maternal and child health, and nutrition, countries add other modules to target specific questions of interest to the given country.

– **e-health**: The WHO defines e-health as "…the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research..."[31] mHealth (mobile health or the use of mobile phones in the health context) is a sub-discipline of e-health.

– **Electronic medical record (EMR):** The digital version of a medical record. It is used interchangeably with the term electronic-health record (EHR).

– **Enterprise architecture (EA):** No agreed official definition exists for this term, and it means different things to different practitioners of information systems architecture. Generally considered to represent the concept of a formal description of the IT architecture and processes supporting the functioning of a modern business or enterprise, the concept is also gaining some traction in the HIS arena to formally describe the IT architecture and processes of a national HIS.

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31 WHO (2005). Resolution WHA58.28. eHealth. In: Fifty-eighth World Health Assembly, Geneva, 16–25 May 2005. Resolutions and decisions. Geneva: World Health Organization;121–123 (WHA28/2005/REC/1). http://www.who.int/healthacademy/media/WHA58-28-en.pdf (accessed 19 November 2013).

– **Extract, transform and load (ETL):** A term often used in the field of data warehousing to describe the process of moving data from source databases into the central data warehouse.

– **Geographic information system (GIS):** Used to capture, manage and manipulate geographic data. Such systems are beginning to be used more generally in health systems to help with the analysis and planning of health interventions (e.g. the villages in which there is an outbreak of polio).

– **Health informatics:** The general term used to describe the discipline at the intersection of information technology and health care.

– **Health information system (HIS):** Used to represent the sum total of all the information-related components of a health system (whether they be paper-based or digital). The HIS includes patient systems, supply-chains systems, health-management information systems, financial systems, human-resource systems, data warehouses, databases, data centres, data dictionaries, data standards, e-health policies, and more.

– **Health level 7 (HL7):** Refers to specific interoperability standards for the exchange of health data (most commonly clinical data).

– **Information and communication technology (ICT):** Used to describe the integration of information systems and telecommunications systems, and is now also widely used in literature to refer to any and all components of a system related to the capture, storage, retrieval and transmission of data.

– **Information architecture:** The discipline of organizing and designing the various information elements of a complex system.

– **Information security:** See data security.

– **Information technology (IT):** See Information and communication technology.

– **Infrastructure:** Typically refers to the technical components that make up a society (roads, bridges, dams, transmission lines, telecommunictions networks, etc.), and is also used in the context of health systems. For those looking at HISs, infrastructure may refer to technical components that are necessary for the HIS to function (e.g. computer networks, power supplies, communications networks, etc.).

– **International classification of diseases (ICD):** More properly known as the *International Statistical Classification of Diseases and Related Health Problems*, it is a medical classification list published by WHO.[32] It is the standard diagnostic tool for epidemiology, health management and clinical purposes. Used widely around the world, it is one of the core standards by which health systems are monitored and managed, and is the basis for the compilation of national mortality and morbidity statistics.

– **Interoperability:** The ability of various components of a HIS to work effectively with each other. Standards are the essential enabler of system interoperability.

– **Laboratory information management system (LIMS):** Refers to the set of applications or software modules that allow for the management of a modern laboratory. It may include data tracking, workflow management, and the collection, storage and retrieval of specimen data, etc. A generic description of a LIMS has recently been published, which has subsequently been used to develop an open-source version that laboratories in low-resource settings can download and use.

– **mHealth:** The concept of using mobile devices (such as mobile phones or tablets with remote connectivity capability) to help deliver some of the services that are needed by the health system. Hundreds of examples now exist of mHealth-enabled health services that range from something as simple as sending out reminders to patients for regular clinical visits through to more complex interactive clinical data-entry systems. The breadth and depth of uptake in mobile phones in developing countries has made it extremely attractive for the innovative delivery of health services.

– **Minimum dataset (MDS):** WHO uses the concept of minimum datasets to describe the minimum data elements that need to be collected for a given purpose. Health systems often use this concept to define, for example, the

32 http://www.who.int/classifications/icd/en/ (accessed 3 November 2013).

minimum clinical dataset for patients, or the minimum dataset indicator for the health management-information system. They are often represented as a data dictionary.

– **Network:** In HIS contexts, network often refers to a computer network, i.e. the elements that allow computers to communicate with each other (and typically include cables, switches, routers, wireless components and a network management server). Facilities will often need to implement computer networks for some of the more sophisticated health informatics components to function (e.g. a hospital-wide EMR system).

– **Sample Vital Registration with Verbal Autopsy (SAVVY):**[33] Used to describe the collection of vital life events (including causes of death).

– **Solution:** Used across the software and technologies industries (particularly by vendors and ICT departments) to refer to a combination of software applications and technology components that solve a particular business, or health-system problem. For example, the SmartCare[34] Electronic Health Record (EHR) system currently used in Ethiopia and Zambia would be considered as a solution consisting of a suite of EHR applications, touch-screen monitors, smartcard readers/writers, printers and mobile devices.

– **Statistical Data and Metadata Exchange (SDMX):**[35] A standard to facilitate the exchange of statistical data. WHO is working on a sub-version SDMX-HD for the exchange of health-related statistical data that some applications are now starting to incorporate (e.g. OpenMRS).

– **Unique patient identifier:** The concept of assigning every patient in a health system a unique identifier. The need for a unique patient identifier becomes critical once the design of a HIS moves beyond that of the local facility, particularly the goal is to track patient histories over time. There are significant technical and policy issues that need to be resolved for the successful introduction of unique patient identifiers.

33 http://www.cpc.unc.edu/measure/publications/ms-07-26-ob (accessed 3 November 2013).

34 http://www.smartcare.org.zm/ (accessed 3 November 2013).

35 http://www.sdmx.org/ (accessed 3 November 2013).

Appendix F. Working area

Actions 1 and 2: Summarize the key RMNCH focus areas and/or the essential interventions to be targeted (if known).

Action 3: List below any existing ICT or mHealth projects using any existing inventories or other available resources. Note also if the list is considered to be non-existent or incomplete.

Action 4: For Action 2, list any known initiatives, projects or programmes outside health related ICTs or mHealth. If the list is sparse, note that observation below and consider initiating a rapid assessment/inventory exercise.

Action 5:

1.01 Population below US$1 (PPP) per day (%) _____
1.08 Prevalence of underweight (moderate and severe) (%) _____
1.09 Undernourished population (%) _____
2.03 Literacy rate of 15-24 year-olds (%) _____
4.01 Under-five mortality rate (U5MR), deaths per 1000 live births _____
4.02 Infant mortality rate (IMR), deaths per 1000 live births _____
4.03 One-year-old children immunized against measles (%) _____
5.01 Maternal mortality ratio (MMR), deaths per 100 000 live births, metadata _____
5.02 Births attended by skilled health personnel (%) _____
5.03 Contraceptive prevalence rate (CPR) (%) _____
5.04 Adolescent birth rate, per 1000 women _____
5.05 Antenatal care (ANC) coverage for at least four visits (%) _____
5.05 Antenatal care (ANC) coverage for at least one visit (%) _____
5.06 Unmet need for family planning (%) _____
6.01 People living with HIV (%) _____
6.02 Condom use at last high-risk sex (%) _____
6.03 Population 15–24 year-olds who have comprehensive correct knowledge of HIV/AIDS (%) _____

6.04 Ratio of school attendance of orphans to school attendance of non-orphans _____

6.05 Proportion of population with advanced HIV infection with access to antiretroviral drugs (%) _____

6.06 Death rate associated with malaria, per 100 000 population _____

6.06 Incidence of malaria, per 100 000 population _____

6.07 Proportion of children under-five sleeping under insecticide-treated bednets (%) _____

6.08 Proportion of children under-five with fever who are treated with appropriate anti-malarial drugs (%) _____

6.09 Death rate associated with tuberculosis, per 100 000 population _____

6.09 Incidence of tuberculosis, per 100 000 population _____

6.09 Prevalence of tuberculosis, per 100 000 population _____

6.10 Tuberculosis detection rate under DOTS, (%) _____

6.10 Tuberculosis treatment success rate under DOTS (%) metadata _____

7.08 Proportion of population using an improved drinking-water source (%) _____

7.09 Proportion of population using an improved sanitation facility (%) _____

8.13 Population with access to essential drugs (%) _____

8.14 Telephone lines, per 100 population _____

8.15 Cellular subscribers, per 100 population _____

8.16 Internet users, per 100 population _____

Action 6: Highlight findings from HIS assessments (state or national) in addition to any HMN assessment.

_____

_____

_____

_____

Action 7: List below any key findings, weaknesses, recommendations or action points of relevance to scaling up the use of ICTs.

_____

_____

_____

_____

Action 8: List below any further key findings, weaknesses, or action points of relevance to scaling up the use of ICTs.

_____

_____

_____

_____

Action 9: Summarize the potential project-specific mHealth and ICT functions from Action 9.

Actions 10 and 11: Summarize the potential (Action 10) or existing (Action 11) mHealth or ICT projects or pilots that could be used.

Action 12: Summarize the (SMART) success criteria you have agreed as a group.

Action 13: If Q1 and Q2 are both true, articulate the mitigating circumstances for still considering the use of ICTs.

Action 14: If Q1 and/or Q2 are true, particicpants should articulate how the stakeholders could alleviate these systemic weaknesses.

Theme 1: List potential mitigation or management responses.

Theme 2: List potential mitigation or management responses.

For **Action 1, Q1**, list the title and level within the MoH of the top ICT position.

For **Action 1, Q2**, list the number of staff that work centrally for the IT/ICT unit.

For **Action 1, Q3**, list the central IT/ICT's functions or responsibilities beyond an internal MoH network, email or other IT support (particularly those functions related to the health system, e-health or the HIS).

For **Action 1, Q4**, list the key IT systems in use by the MoH.

For **Action 1, Q5**, list any other IT/ICT/e-Health resources, either in dedicated units responsible for HIS/e-health, etc., or in various health programmes.

For **Action 1, Q6**, state whether a functioning HIS exists (note: a well articulated and functional HIS is important for scale-up of ICT enabled interventions).

For **Action 1, Q7**, state whether the extent of support, both in terms of human and financial resources, can be considered adequate in your viewpoint.

For **Action 2, Q1**, indicate how many Ministers of Health have been in-charge at the Ministry in the last ten years?

For **Action 2, Q2**, indicate whether the staff turnover in the heads of departments, divisions or units is high.

For **Action 2, Q3**, state the general nature of the support for e-health and ICT innovation (internal or external).

Theme 3: List potential mitigation or management responses.

Theme 4: List potential mitigation or management responses.

Theme 5: List potential mitigation or management responses.

For **Action 3, Q1**, provide your response, if appropriate.

For **Action 3, Q2**, provide your response, if appropriate.

For **Action 3, Q3**, provide your response if appropriate.

For **Action 3, Q4**, provide your response, if appropriate.

For **Action 3, Q5**, provide your response, if appropriate.

For **Action 3, Q6**, provide your response, if appropriate.

For **Action 3, Q7**, provide your response, if appropriate.

For **Action 3, Q8**, provide your response, if appropriate.

For **Action 4, Q1**, provide your response, if appropriate.

For **Action 4, Q2**, provide your response, if appropriate.

For **Action 4, Q3**, provide your response, if appropriate.

For **Action 4, Q4**, provide your response, if appropriate.

Theme 6: List potential mitigation or management responses

Theme 7: List potential mitigation or management responses.

Theme 8: List potential mitigation or management responses.

Theme 9: List potential mitigation or management responses.

Appendix G. Abbreviations

e-health	Electronic Health
HMN	Health Metrics Network
HIS	Health Information System
ICT	Information and Communication Technology
MDG	Millennium Development Goal
mHealth	Mobile Health
mTERG	WHO mHealth Technical and Evidence Review Group for RMNCH
MoH	Ministry of Health
NGO	Nongovernmental Organization
PMNCH	Partnership for Maternal, Newborn & Child Health
RMNCH	Reproductive, Maternal, Newborn and Child Health
TCO	Total Cost of Ownership
Tech4Dev	Technology for Development
WHO	World Health Organization

The Partnership for Maternal, Newborn & Child Health

World Health Organization
20 Avenue Appia, CH-1211 Geneva 27
Switzerland
Fax: + 41 22 791 5854
Telephone: + 41 22 791 2595

pmnch@who.int
www.pmnch.org

The Partnership for Maternal, Newborn & Child Health

World Health Organization

Innovation Working Group
WE SUPPORT
EVERY WOMAN EVERY CHILD