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The Use of Information and Communication Technology in Family Planning, Reproductive Health, and Other Health Programs: A Review of Trends and Evidence

Submitted to USAID by Management Sciences for Health

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Acronyms

AIDS	acquired immune deficiency syndrome
AMREF	African Medical and Research Foundation
ARV	antiretroviral
CHMI	Center for Health Market Innovations
CHW	community health worker
CPR	contraceptive prevalence rate
DGFP	Directorate General of Family Planning
DLC	distance learning center
eHealth	Electronic Health
EHSDI	E-Health Software Development and Implementation
FHI	Family Health International
FOOS	free and open source software
FSN	Foreign Service National
GAID	Global Alliance for ITC and Development
GHI	Global Health Initiative
HIV	human immunodeficiency virus
HR	human resources
ICT	information and communication technology
ICT4D	information and communication technology for development
IEC	information, education, and communication
ILS	integrated logistics system
IPPF	International Planned Parenthood Foundation
IRH	Institute for Reproductive Health
ISP	Internet service provider
IT	information technology
JHU CCP	Johns Hopkins University Center for Communication Programs
JSI	John Snow International
K4H	Knowledge for Health
KNH	Kenyatta National Hospital
MDG	Millennium Development Goal
MSD	Medical Stores Department
M&E	monitoring and evaluation
mHealth	mobile health
mHealthEd	mobile health education
MOH	Ministry of Health
m4RH	Mobile for Reproductive Health
MRS	medical record system
MSD	Medical Stores Department
MSH	Management Sciences for Health
NCK	Nursing Council of Kenya
NGO	nongovernmental organization
PEPFAR	President's Emergency Plan for AIDS Relief
PDA	personal digital [or data] assistant
PHN	population health and nutrition
PRB	Population Research Bureau

R4D	Results for Development
RH	reproductive health
SCIP	Supply Chain Information Portal
SDP	service delivery post
SMS	short message service
SSBCC	Strategic Social Behavior Change Communication
TB	tuberculosis
UHIN	Uganda Health Information Network
UNFPA	United Nations Population Fund
USAID	US Agency for International Development
VLDP	Virtual Leadership Development Program
WHO	World Health Organization

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Executive Summary

Since 2001, the US Agency for International Development (USAID) and its partners have been working to ensure that family planning and reproductive health remain a priority in the face of competing global health demands. The growing field of information and communication technology (ICT) can play an integral part in supporting these efforts to address family planning, reproductive health, and other health needs. The term “eHealth” was coined to describe the combined use of electronic communication and information technology in the health sector, but as one leading ICT scholar notes, “In a broader sense, the term characterizes not only a technical development, but also a new way of working, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology” (Pagliari 2005).

As these new ways of working take hold, existing ICTs—particularly mobile technologies—have the capacity to improve access to family planning and reproductive health information and services for women, men, and youth, with the ultimate potential to better both their health status and their quality of life. ICTs also have the potential to strengthen the health care workforce through education and training opportunities by reaching health care workers at all levels of the system and supporting other areas of the health system including health finance, health information and the logistics system for vaccines, medicines, and lab supplies and equipment.

This paper examines the current use of ICTs to advance family planning, reproductive health, and other health programs, and identifies the enabling conditions for further scale-up. The examples of ICTs at work are structured around specific elements of success that were captured in the 2008 USAID-funded report, *Elements of Success in Family Planning Programming*: (1) building a high-performing, well-trained staff; (2) providing strong leadership; (3) communicating effectively; (4) basing decisions on evidence; and (5) assuring contraceptive security with a strong logistics system (Richey and Salem, 2008).

Examples of ICT are being applied to support or advance family planning and reproductive health programs in many African countries. Examples from Ethiopia, Kenya, Rwanda, Senegal, Tanzania, Malawi and Uganda are examined here, complemented by a review of efforts in Bangladesh and India as well as several virtual global programs. The paper also takes a look at how digital platforms and mobile technology are being integrated into the overall health systems strengthening approach. The collective review of these programs illustrates the myriad ways in which technology is adapted to respond to local needs as well as to support national health programs and global health initiatives such as the Millennium Development Goals, the Global Health Initiative, and the President’s Emergency Plan for AIDS Relief (PEPFAR).

This paper identifies nine overall enabling conditions for ICT use and scale-up in family planning and other health programs, as follows:

1. **Appropriate Infrastructure:** While the ICT infrastructure in Africa has dramatically improved during the last decade, the Internet is said to still be in its infancy in sub-Saharan Africa. Efforts to advance broadband capacity are just beginning, and fiber optic cables have been put in place around the African continent. A recent report on ICTs indicates that the next major challenge on the horizon for policy makers in this region is the delivery of broadband Internet access at a reasonable cost to consumers.
2. **Cost:** Health systems have competing priorities, and some people within the system consider ICT a luxury, particularly the current mobile and digital versions. In addition to the costs related to

broadband Internet access, hardware and software quickly become obsolete, necessitating additional investments and adding further financial burdens to already stretched health budgets. Civil society organizations, nongovernmental organizations (NGOs), the public sector, and other stakeholders should join forces to leverage their collective power to negotiate lower rates from private sector telecom providers.

3. **ICT Literacy:** Overburdened health workers may view ICTs as just another work requirement for which they must struggle to make time. Many health workers may not have received basic computer training, and some from rural areas may never have used a computer. Successful engagement with health workers is crucial to the integration and scale-up of ICTs in family planning and reproductive health efforts, and that engagement is much easier when there is a clearly perceived value and sufficient training and support.
4. **Standards and Interoperability:** The proliferation of digital and mobile ICTs has created systems that, though well intentioned, are often incapable of sharing information. Research indicates the need for interoperability standards in health information systems that would allow different ICT applications to be shared, replicated, and scaled up. Applications based on open source, as well as open standards, can further ICTs that can be more broadly shared, more effectively evaluated, and more cost effective for resource-poor countries.
5. **National Policies and Regulations:** In the past, leaders did not need to put much focus on telecommunications in crafting national health policies and regulations. With the exponential growth in eHealth, officials and policy makers must now distinctly consider ICTs in their official approaches. Many countries in Africa must also overcome the challenge of restrictive telecom regulations that hinder ICT progress.
6. **Contextual Understanding:** Sociocultural contexts shape behavior and attitudes toward family planning, and much of family planning counseling takes place outside the formal health sector, delivered by local community health workers (CHWs). Marrying the complexities of counseling with the resources available to locally based service providers requires a focus on the needs of the community members themselves, including support to adopt and adapt new technologies.
7. **Sound Management:** The influx of huge volumes of information created by ICTs presents a challenge for managers who need to decide what technologies are most appropriate for their staff, which are most cost effective, and which will increase productivity. Building the capacity of health workers and other intermediaries to be able to effectively use, work with, manage, adapt, and develop appropriate ICTs is an ongoing task.
8. **Language:** With the exception of radio and television programming, the issue of language is frequently ignored in ICT programs, most of which offer very little content in local languages. Improving health workers' capacity to deliver effective family planning or other health services involves providing these workers with updated information and guidance in a language they can easily understand—preferably their own.
9. **Evaluation:** Many technologies look like sure successes while in the planning stage, but fail to deliver what they promised when implemented. Evaluation measures impact and allows corrective measures to be taken where necessary and offers opportunities for sharing lessons and exchanging knowledge.

In the face of rapid change, many health and health systems needs remain constant: the need for reliable, accessible family planning methods and services; the demand for continuing education for health workers at all levels of the health system; the need to overcome gender inequities so women are able to take control of their own health; and the need for reliable health information. While it seems

that technology is changing every nanosecond, the astounding pace has led to many advances in the global health community, as the examples in this paper illustrate. ICTs can play an even greater role in the delivery of quality health care services and the overall support of the health system, especially if the scale-up of ICT interventions takes into account the conditions for success outlined in this paper.

Introduction

I'm beginning to sense a continuing shift towards a better understanding and appreciation of appropriate technology in the information and communication technology for development (ICT4D) field. People are beginning to make the right noises—local ownership of technologies and tools, local content, and projects where end-users drive the process among them—and as new projects emerge... I hope we'll see actions speaking louder than words.

—Ken Banks, mobile technologist, anthropologist, conservationist.
*Tech Awards Laureate 2009. Founder: kiwanja.net; creator: FrontlineSMS*¹

Over the last several decades, there have been continuous efforts to promote and improve family planning and reproductive health, especially in the developing world. Despite these efforts, “unmet need”² is likely to grow by 40 percent in the next 15 years (United Nations Population Fund [UNFPA] 2011). In sub-Saharan Africa, where almost half the female population is of reproductive age, one in four married women still does not have her contraceptive needs met, and the total fertility rate of 5.2 is more than double the world average. The region also has the highest percent of adults ages 15-49 with HIV/AIDS. This has severely hampered economic and social progress; further impeding family planning/reproductive health efforts. As in many other parts of the world, significant gender barriers exist in Africa that contribute to unequal power relations, limiting the ability of women to gain economic freedom and improve their health status. Gender norms can present barriers to health services and contraceptive use when men control household finances, women’s mobility, and decisions on family health care (Foreman 2011).

Since 2001, USAID—through the Office of Population and Reproductive Health, the Africa Bureau, and local missions—as well as the World Health Organization (WHO), and other partners, have been working to reposition family planning in sub-Saharan Africa to ensure that it remains a priority in the face of competing global health demands. Activities include:

- Identifying targeted areas for increased investment and technical support in family planning at the country level;
- Providing leadership development training to ensure advocates and managers have the skills needed to work in this new environment;
- Developing methodologies for National Health Accounts sub-account analysis and other financial tools to support ministries of health in planning and budgeting for family planning services and commodities;
- Improving the policy environment for private sector involvement in family planning service delivery;
- Increasing health sector capacity by expanding the cadre of service providers, including community-based distributors through training, to administer injectable contraception;
- Working with international and national partners in identification and dissemination of best practices (USAID, 2006).

¹ **FrontlineSMS** is free, open source software that turns a laptop and a mobile phone into a central communications hub. Once installed, the program enables users to send and receive text messages through mobile phones with groups of people.

² “Unmet need” refers to women of reproductive age who are not practicing contraception but who do not want any more births (limiting their number of children) or who want to postpone the next birth for at least two years (spacing their children).

The Global Health Initiative (GHI) launched by the United States Government has an important focus on family planning/reproductive health outcomes that includes the prevention of 54 million unplanned pregnancies by reaching a modern contraceptive prevalence rate (CPR) of 35 percent across all GHI-assisted countries. Similarly, national governments and other international donors are working to revitalize the focus on family planning and reproductive health and, as a result of a range of combined efforts to do so, countries are in various stages of repositioning family planning/reproductive health (Judice, 2011; UNC, 2010).

Information and communication technology (ICT) can play an integral part in addressing family planning, reproductive health, HIV/AIDS, tuberculosis (TB), and many other health needs. ICT methods can be used to inform and educate family planning/reproductive health program planners, local clinic staff, community health workers, and other service providers, as well as clients. Appropriately applied, existing ICTs—particularly mobile technologies—have the capacity to improve access to family planning/reproductive health information and services for women, men, and youth, as well as to increase their opportunities to more effectively engage in the economy, with the ultimate potential to better both their health status and their quality of life. These technologies could also play a role in an overall approach to addressing gender inequities if care is taken to purposely support and encourage their use for and by women.

Objective of This Paper

Linking ICT and global health development is not a new concept, but the proliferation of ICT applications over the last decade is unprecedented. Key global health documents now mention ICTs as a means to support strategic development goals. The United Nations' Millennium Development Goal number 8 (MDG 8) calls specifically for increased access to new technologies,³ but ICTs also have the potential to advance results for the other seven MDGs. In particular, ICT applications used for family planning/reproductive health efforts are critical for moving ahead on MDG 3 (promote gender equality and empower women), MDG 4 (reduce child mortality), MDG 5 (improve maternal health), and MDG 6 (combat HIV/AIDS, malaria, and other diseases). Program strategies aligned to support the GHI's goal of a 35 percent CPR could benefit by including an ICT component across each phase of the family planning/reproductive health program cycle. There are also numerous opportunities to include ICT interventions in carrying out the seven core principles of the GHI.⁴ According to USAID's *High Impact Practices in Family Planning*, ICTs are recognized as *recommended* and *emerging* categories of high impact service delivery practices based on the strength and consistency of the family planning/reproductive health evidence-base (US Agency for International Development 2011).

Fostering innovation will require “expand[ing] access to existing technologies and practices,” as well as “expand[ing] global access to knowledge by harnessing modern information technology to narrow the “digital divide.”

U. S. Strategy for Meeting the MDGs, July 2010

³ MDG 8 reads: “Develop a global partnership for development,” and its sixth target is, “In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” Its specific indicators include: telephone lines per 100 population, cellular subscribers per 100 population, and internet users per 100 population.

⁴ The GHI's core principles include: implementing a woman- and girl-centered approach; increasing impact through strategic coordination and integration; strengthening and leveraging key multilateral organizations, global health partnerships, and private sector engagement; encouraging country ownership and investing in country-led plans; building sustainability through health systems strengthening; improving metrics, monitoring, and evaluation; and promoting research and innovation.

The purpose of this paper is to examine the current use of ICTs to advance family planning/reproductive health and other health programs, and to identify the enabling conditions for further ICT use and scale-up. The paper takes into account USAID's Repositioning Family Planning Initiative's three key intervention areas (advocating for policy change; strengthening leadership; and improving capacity to deliver services) for achieving its goals of increasing political and financial commitment to family planning, supporting expanded access, and helping meet women's stated desire for safe, effective modern contraception (USAID, 2009). This paper discusses how ICT can contribute to specific elements of family planning mentioned in *Elements of Success in Family Planning Programming* (Richey & Salem, 2008). The geographic focus of this paper is sub-Saharan Africa, where unmet need for contraception is the highest (PRB, 2011), there is an acute shortage of healthcare providers, and although eHealth initiatives are greatly increasing, they are doing so with uncoordinated systems that prevent cost efficiencies and scale-up.

In preparing this paper, the author reviewed more than 140 relevant documents through online literature searches and materials provided by interested parties. In addition, the author conducted key informant interviews to enhance understanding of this broad topic and obtain further information on the referenced ICT examples.

ICT for Health: Definition and Trends

There is confusing and sometimes conflicting information on what constitutes ICT. Terms such as *information and communication technologies* (ICTs), *information and communication technology for development* (ICT4D), *electronic health* (eHealth), and *mobile health* (mHealth) are often used interchangeably. Another new term has recently emerged—*mHealth education* or *mHealthEd*—to describe applications for mobile devices used primarily to support education and training for health care workers. This paper uses the definition of ICT stated below; related definitions are provided in Appendix A.

Information and communication technologies: Tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means. This encompasses the full range of electronic digital and analog ICTs, from radio and television to telephones (fixed and mobile), computers, and electronic-based media such as digital text, audio-video recording, and the Internet, including Web 2.0 and 3.0, social networking and web-based communities (GAID, 2010).

The use of ICT throughout the world has skyrocketed in the last two decades, albeit with a prevailing, significant difference in the use and scale of ICTs between the Global North and the Global South due to cost, availability, accessibility, and interoperability. The growing use of ICTs in the Global South—eHealth in particular—demonstrates how this region is adapting relevant ICT to local contexts and effectively changing standard public health practices.

Claudia Pagliari, a leading scholar in the ICT field, believes that eHealth is not only a worldwide technical advancement but something much larger: "In a broader sense, the term characterizes not only a technical development, but also a new way of working, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology" (Open Clinical, 2011). ICT is unquestionably revolutionizing the way we live and work, and touching health profoundly. In short, "used effectively, ICTs have enormous potential as tools to increase information flows and the dissemination of evidence-based knowledge, and to empower citizens" (InfoDev, 2006).

Most people are familiar with the use of more conventional ICTs in health interventions, including radio, television, computers, Internet, email, fixed land-line telephones, and fax. Some of these, such as radio and television, have been used for generations with differing results to support a multitude of family planning/reproductive health, HIV/AIDS, and other health programs. Health workers and health organizations are familiar with myriad examples: the driver who transports contraceptives from a warehouse to a clinic based on stock data emailed from a central office; the woman listening to a community radio serial or soap opera designed to increase modern contraceptive use or to encourage couples to openly discuss HIV/AIDS; the doctor who accesses the Internet to research family planning/reproductive health protocols or how to integrate services—all these are ICT in action.

ICT for Sustainable Development

The emergence of the ICT sector is the ideal vehicle for the dissemination of informational content. Currently, the community radio sector uses fax, telephone, e-mail, and cell phone to support the use of radio.

[The] information highway is understood to originate and flow from the developed countries to the developing world. But, in the past few years, information and communications technology has been a pouring wave into the developing countries.

The developing countries have no other choice but to adopt such technologies. Those who do not, risk being further marginalised. We need to jealously guard the role of broadcasting and local content development, as we face the challenges of information highway and convergence of technologies. Let's ensure that information and communication are respected as human rights, in the building of [the current] knowledge society.

“Community Radio, the Cradle of Information Technology”
Africa.oneworld.net

Of the more established ICT-based practices, radio and television use has been well tested and reported, and there are numerous websites and portals dedicated to documenting their results, for example Johns Hopkins University Center for Communication Programs (JHU CCP), Drumbeat, Soul Beat, infoDEV, K4H, C-Hub, and Communication Initiative. Current strategic social behavior change communication (SBCC) interventions use mass media in their structural-environmental models and radio and television have the greatest media reach to support these efforts.

Radio—often called “Africa’s medium”—has been a staple ICT used for information, education and communication (IEC) and SBCC efforts for decades. Successful radio programs have reported extensive audience reach—frequently in the millions—and production and distribution costs are relatively inexpensive. Radios create “listening communities that radically shift the nature of the public sphere” and radio broadcasts can “transcend the barriers of cost, geographical boundaries, the colonial linguistic heritage, and low literacy levels” (WITS, 2011).

There are countless examples of highly successful family planning/reproductive health-related radio shows, many of which incorporate multiple ICTs in their implementation, such as when a family planning/reproductive health serial program also holds call-in quizzes (by phone), and/or is recorded on audiocassettes to be rebroadcast, perhaps as a means for further community outreach by local NGOs or to broadcast in a local clinic. The SANYU FM radio station in Kampala, Uganda, recently adopted a

multiple ICT approach for their programming; they held a radio poll asking listeners what service delivery area (health, education, security, transport, or sanitation) should be the priority. Using a new tool called TRAC FM, the station solicited listener comments via short message service (SMS), discussed the comments on air, and then created and posted online visualizations of the results on Facebook. Of the listeners who voted, 65 percent said healthcare was the greatest concern.⁵ The station continues to solicit listener input on a wide variety of issues. In their use of radio, SMS, and Internet, Trac FM is mixing old and new technology to promote public debate and create a powerful feedback loop that allows Ugandan citizens to share their views and hold their leaders accountable.

Television is also frequently used for family planning/reproductive health and HIV/AIDS community mobilization efforts, although there are fewer televisions than radios throughout Africa. It is considered an effective tool for raising awareness and distance learning. Its moving images attract and hold viewers attention and “can bring abstract ideas like family planning to life and give them effective value” (Munyanziza 1993).

Lessons learned in the use of television in the health sector include:

- Programming should be adapted to local contexts and cultural realities and include careful preparation, pretesting, evaluation, and revision.
- In the case of family planning/reproductive health–related content, programs should clearly explain contraceptive choices and provide viewers with information on where to seek family planning/reproductive health services.
- The disadvantages of television include its high cost and limited access in rural and urban poor settings (those that need family planning/reproductive health information the most); a limited pool of knowledgeable broadcasters to support it; and its single direction communication, which does not allow audience interaction (Munyanziza 1993).

Both radio and television will remain viable ICT tools for family planning/reproductive health, HIV/AIDS, and other health issues for years to come. How they may be transformed by digital broadcasting technology in sub-Saharan Africa and elsewhere remains to be seen.

Computers, specifically personal computers, are an extremely important technology that can be used to strengthen health systems, advance health services, and widely share and exchange health information. However, there are significant areas of sub-Saharan Africa where computers are still not in use, and health clinics rarely have staff with the time or requisite skills to champion their use in a sustainable manner. Furthermore, there is little ongoing support from the health system to maintain and upgrade computer equipment or software. While the personal computer penetration rate in households in the industrialized world is over 70 percent, in the Global South, the rate is less than 25 percent (Ahonen & Moore, 2011). Although no concrete data is available on computer access in health service settings in sub-Saharan Africa, it is likely low. While computer use is frequently associated

Now, the computer has joined the aeroplane as the tool of choice to bring modern health care to remote rural hospitals. Using mobile phones and computer, AMREF consultants can advise doctors (often not specialists) in rural hospitals through audio and video links on how to handle difficult medical cases.

–African Medical and Research Foundation (AMREF)

⁵ TRAC FM is an open source platform partially built in RapidSMS and originally developed by UNICEF. Interested fans can view more data visualizations of TRAC FM polls on its Facebook page and Twitter. TRAC FM Facebook’s page is located at <http://www.facebook.com/#!/pages/TRAC-FM/123256091082072>. Their Twitter feed is at <http://twitter.com/#!/TracFM>.

with Internet use, not all computers are connected to the Internet. Handheld devices, including mobile phones, are now being used extensively for Internet access and are generally less expensive and more user-friendly than desk- or laptop computers, and they do not require a constant power source.

Internet penetration in Africa as of April 2011 was 11.4 percent, while the world average is 30.2 percent. Nigeria currently has the highest number of Internet users (44 million) across the continent (not unsurprising given its large population), but only a 28 percent Internet penetration rate. In the sub-Saharan region, the Seychelles has the highest penetration rate, at 37 percent, and Sierra Leone has the lowest at 0.2 percent, followed closely by the Central African Republic, Congo, and Niger—all at 0.3 percent (Miniwatts Marketing Group, 2011). Although large parts of Africa gained access to international fiber bandwidth for the first time in 2009 and 2010 through submarine cables, current broadband penetration in sub-Saharan Africa is less than 1 percent, making bandwidth expensive and connectivity very limited. Nonetheless, remarkable telecommunication advances are currently taking place throughout the region, which will have a great impact on Internet use and ICT applications.

New wireless ICTs are revolutionizing all aspects of life and development around the world. Previous generations of ICT are being upgraded to digital platforms and open-source software use is increasing transparency and operability.

People often associate wireless technology with mobile phones and personal digital (or data) assistants (PDAs), but the number and sophistication of wireless products and services is astounding, and many of these are being designed specifically to improve health information, diagnostics, and services. In 2009, the interest in mobile technology for health spurred the launch of the mHealth Alliance to “harness the power of wireless technologies to improve health outcomes in low- and middle-income countries.”⁶ The numbers are indisputable: there are now more than 5 billion wireless subscribers worldwide, and more than 70 percent of them live in low- and middle-income countries. Commercial wireless signals cover more than 85 percent of the global population, providing a much greater reach than the electrical grid (WHO 2011).

Wireless technology does not rely on fixed telephone landlines, which are uncommon in many places throughout Africa. In 2009, sub-Saharan Africa had more than 300 million wireless subscribers and the mobile phone coverage was at 60 percent (Aker & Mbiti 2010). Beyond what wireless technology can do for the end-user, it also provides significant revenue for governments; between 2000 and 2012, sub-Saharan governments will receive US\$71 billion in tax revenues from the wireless industry (Wireless ICT Task Force 2010).

mHealth, a more recent ICT that is based on digital and mobile capability, is now at the forefront of eHealth discourse because of its potential to transform information and knowledge exchange using wireless technology. There are multiple examples of mHealth initiatives worldwide, including data collection, supply chain management, health financing, treatment adherence support, health information messaging, diagnostic support services, and client helpline services. Certain applications can be integrated in a single program so a health worker can use the same mobile phone to do multiple tasks, such as accessing diagnostic support and training, collecting and sending data for epidemiological surveys, and updating patient records. Available evidence on the use of mHealth tends to be at the proof-of-concept stage only and very little formal evaluation has been conducted to date. With insufficient large-scale studies on eHealth and mHealth available to determine their relevance, applicability, and cost-effectiveness, it is difficult for sub-Saharan governments to determine related

⁶ The mHealth Alliance original founding partners include the UN Foundation, the Rockefeller Foundation, and the Vodafone Foundation. Additional partners include the GSMA, PEPFAR, and Hewlett Packard.

health investment priorities (infoDev 2006). Regardless, compelling work is being done and it is critical to evaluate these experiences to develop appropriate guidelines and inform next steps.

Elements for Success in Family Planning Programming: Summary of select ICT applications in family planning, reproductive health, and other programs

In theory, any available ICT could be used to directly or indirectly support family planning, reproductive health, and HIV/AIDS activities and help build the capacity of health providers and clients alike. An ICT that “improves the ability of a person or entity to carry out stated objectives” (LaFond 2002) can be viewed as an element of capacity-building and systems strengthening. The variety, availability, and the cost of ICTs directly affect usefulness and uptake. How well people can use them depends on ICT literacy and operability.

The use of ICTs in health is not merely about technology; ICTs are a way to achieve a series of desired outcomes, for example:

- Health workers making better treatment decisions;
- Hospitals providing higher quality and safer care;
- Governments becoming more responsive to health needs;
- National and local information systems supporting the development of effective, efficient, and equitable health systems;
- Policymakers and the public becoming more aware of health risks;
- People having better access to the information and knowledge they need to make informed choices for their own better health (infoDev, 2007).

In this section of the paper, examples of current ICT applications are presented based on the USAID-funded report *Elements of Success in Family Planning Programming* (Richey & Salem 2008):

1. Build a high-performing, well-trained staff.
2. Provide strong leadership.
3. Communicate effectively.
4. Work for supportive policies.
5. Make services affordable.
6. Base decisions on evidence (M&E).
7. Assure contraceptive security with a strong logistics system.
8. Offer client-centered care.
9. Integrate services.
10. Make services accessible through a mix of delivery sites.

For ease of reference, the following ICT examples are grouped under five of these 10 elements. The remaining categories (work for supportive policies, make services affordable; offer client-centered care; integrate services; and make services accessible through a mix of delivery sites) have been subsumed under the following five elements:

1. Build a high-performing, well-trained staff.
2. Provide strong leadership.
3. Communicate effectively.
4. Base decisions on evidence (M&E).
5. Assure contraceptive security with a strong logistics system.

Element #1: Build a high-performing, well-trained staff.

Programs can keep workers motivated and on the job by creating a good working environment, matching skills with tasks, and rewarding a job well done (Richey & Salem 2008).

ICT can play a vital role in training and updating the knowledge and practices of health care students and professionals—in nursing and medical schools, health facilities, urban settings, and particularly rural areas, where it is often needed the most. For example, ICT can support healthcare workers in remote hospitals, health centers and dispensaries, which are typically under-staffed and service hard-to-reach populations. Family planning services can use ICT to enhance provider skills and take health care worker productivity to the next level, helping them to update their knowledge and also maximize their direct interaction with patients. The technology already exists to deliver on-site, high-quality educational opportunities to health care workers in remote and rural areas through individual handheld devices and computers receiving relevant data directly from satellite feeds.

The following are examples of programs that use SMS, text messages, and web-based and wireless eLearning platforms to build a high-performing and well-trained health staff.

AMREF’s Distance Learning for Nurses in Kenya and Beyond: There are 20,000 nurses in Kenya—among them one registered nurse per 27,000 people. More than 85 percent of them do not have the requisite diploma to be “registered nurses,” leaving them inadequately qualified to treat major diseases. The number of nursing schools is insufficient for the number of applicants vying for the classroom-based training; only 100 of the 20,000 nurses can qualify each year.

Beginning in 2005, the African Medical and Research Foundation (AMREF) and the Nursing Council of Kenya (NCK) changed the traditional classroom-based teaching to a paper-based distance learning effort that eventually transitioned to an “eLearning” option. This provided greatly increased opportunities for nurses to get the training they needed for the registered nurses diploma online. Now, in partnership with the Kenyan Ministry of Health, Accenture, and the Kenya Medical Training Colleges, AMREF and NCK are using eLearning with the goal of registering 20,000 Kenyan nurses.

Four computer-based training modules are being delivered through more than 100 eLearning centers by 400 tutors, reaching nurses in even the remotest parts of Kenya. Twenty-five nursing schools are also engaged in the program. Although students must pay tuition to the nursing institutions where they are studying, some employers, such as Kenyatta National Hospital (KNH) are now supporting their employees’ participation in the program (ReliefWeb 2008).

eLearning is cheaper and faster than the traditional residential program. It offers an interactive mode of learning and allows students to gain IT skills. This mode of training harnesses technological advances to improve health and reduce poverty on a local level, and can easily be replicated across Africa.

Peter Ngatia
Director of Capacity Building, AMREF

Between 2005 and March 2011, more than 7,000 students have enrolled in the program, which is now being replicated by the ministries of health in Uganda and Tanzania with AMREF’s support. Program graduates working in Kenya’s Kangundo Hospital are reportedly more motivated, knowledgeable, and proactive. They also have enhanced computer literacy skills that directly build their general professional capacities. According to one graduate, “I [now] interact a lot with the patients and give them more attention than I used to. Even the doctors respect us. Before, we were just there to follow instructions, but after seeing what we’re able to do, they listen to us and even consult us” (iheed 2011).

SpacedEd Continuing Professional Development: Scaling up health workforce education to meet the overwhelming demand for more health workers generally involves tremendous resources, including investments in infrastructure and training facilities, as well as recurrent costs for trainer fees and program materials. Traditional classroom training often requires that participants be absent from their jobs, and does not usually take into account individual learning styles and/or scheduling conflicts. In response to these limitations, IntraHealth International’s *CapacityPlus* project is collaborating with SpacedEd.com on a unique approach to delivering knowledge and training through the Internet and mobile phones.

Spaced education is a cutting-edge learning method that combines two core psychology research findings—the spacing effect and the testing effect. The spacing effect refers to the research finding that information presented and repeated over spaced intervals is learned and retained more effectively. The testing effect refers to the finding that long-term information retention is greatly improved by testing learners on this information. Hence, “testing is not merely a means to measure a learner’s level of knowledge, but rather causes knowledge to be stored more effectively in long-term memory” (IntraHealth 2011). SpacedEd.com uses spaced education methodology to deliver learning content.

CapacityPlus will develop and test context-specific health courses, using Harvard University’s Space Education platform, to deliver individualized in-service training via SMS and interactive voice response on cell phones. Courses will focus on family planning/reproductive health, HIV/AIDS, maternal and child health, malaria, and gender. Though currently available only in English, the platform will expand to include four additional languages: French, Mandarin, Portuguese, and Spanish. Ethiopia’s Ministry of Health has asked *CapacityPlus* to develop a course on breastfeeding for HIV-positive mothers that community health workers could access by mobile phones. In Mali, *CapacityPlus* is developing an in-service course on postpartum family planning and a program monitoring family planning protocols.

Knowledge for Health (K4H): Eighty-three percent of Malawi’s population lives in rural areas, and thus family planning/reproductive health and HIV/AIDS services are largely delivered in community health centers and district hospitals located miles from rural villages. To increase access to these services, Malawi’s Ministry of Health (MOH) has been working with coordinating partners to revitalize a cadre of volunteer community health workers (CHWs) to bring contraceptives and family planning/reproductive health and HIV/AIDS education directly to the rural population. The USAID-funded K4H pilot project promotes family planning/reproductive health and HIV/AIDS information use and exchange, and aims to increase access to up-to-date information on these topics through the use of district health learning centers, electronic health information toolkits, and a SMS-based mobile telephone network to benefit managers and service providers at the national, district, and community levels to improve family planning/reproductive health and HIV/AIDS services.

To centralize and increase information access, District Learning Centers (DLCs) have been established in district hospitals in Nkhotakota and Salima; these offer a range of resources, including print materials and opportunities for face-to-face training and networking. The DLCs offer computers with free access to online and CD-ROM-based learning, including standardized Malawi-specific family planning/reproductive health and HIV/AIDS “toolkits.” Three Malawi-specific e-toolkits on family planning, neonatal and maternal health, and youth and reproductive health have been developed by technical working groups sponsored by the MOH; these include information to support the implementation of national policies and standards. The working groups are responsible for keeping the toolkits up-to-date.

In collaboration with Medic Mobile \+/, an SMS-based mobile telephone network was established that allows community health workers to send text messages between cell phones and other devices. Through the mobile network, the program alerts these health workers to new resources, training opportunities, changes in protocols, and other relevant knowledge exchange and public health activities in their district.

As a result of these efforts, 60 percent of health workers at the national level and 40 percent at the district level are accessing information through the toolkits. Two DLCs are open, and 91 health workers have received computer training. Seventy-seven percent of CHWs have received telephones and are using SMS to report emergencies, make diagnoses, and communicate with supervisors. Many have reported significant reductions in travel time and expenses due to the use of these ICTs (Management Sciences for Health 2011).

Global Health eLearning Center: USAID’s Population, Health, and Nutrition officers (PHNs) and Foreign Service Nationals (FSNs) demand current information on global health topics, but logistic and time constraints frequently make such knowledge exchange a challenge. In response to repeated requests from field staff for access to technical public health information, USAID’s Bureau of Global Health launched the Global Health eLearning Center, which offers Internet-based courses that:

- Provide useful and timely continuing education for health professionals;
- Offer state-of-the-art technical content on key public health topics;
- Serve as a practical resource for increasing public health knowledge (USAID 2011).

There are nine global health “certificate tracks” with dozens of online courses offered in each tract. More than two dozen courses relate to family planning/reproductive health, including “Family Planning 101,” “Family planning Programming—Elements of Success,” “Family Planning Legislation & Policy Requirements,” “Family Planning/Reproductive Health for People Living with HIV,” “Contraceptive Logistics,” and more. Subject matter experts design the courses, which can be completed by users in one to two hours online. Participants can also download and print the course materials for further study (USAID 2011).

Since its launch in 2005, participants from over 150 countries worldwide, representing USAID, its cooperating agencies, and other partners have accessed the eLearning Center. The program has awarded over 68,000 certificates to date for family planning/reproductive health-related courses.⁷

Element #2: Provide strong leadership.

Strong leadership helps programs navigate change. Good management solves operational problems (Richey & Salem 2008).

Virtual Leadership Development Program (VLDP): In response to demand from public and private health care organizations for cost-effective, practical, and accessible leadership and management development, Management Sciences for Health (MSH) designed the Virtual Leadership Development Program (VLDP) in 2002. As of September 2011, the VLDP—available in Arabic, English, French, Portuguese, Russian, and Spanish—had been delivered to more than 2,900 participants from 379 health teams in 63 countries around the world, with many managers and providers in family planning/ reproductive health, HIV/AIDs, and other health programs as participants.

⁷ Data provided by MSH IT and program staff in personal email communication. Sept. 2011.

The VLDP uses the Internet, a print workbook, and teamwork to strengthen the capacity of health workers to overcome workplace challenges. While traditional leadership programs might call for giving a few top level managers off-site training for one to two weeks or longer, the VLDP trains teams of from four to 10 people virtually over the course of 13 weeks. Each team develops an action plan to address a current work challenge they are facing and applies the knowledge and skills they learn throughout the VLDP to improve the situation.

The VLDP requires approximately four to six hours of individual commitment per week by participants who can work according to their own schedules. Team members work independently on the VLDP website with additional support from the workbook and a team of expert facilitators. They also participate in on-site team meetings within their organizations throughout the program.

The course cannot close before I can share how much the program changed me. You will never know your challenges until you are taught to analyze the root cause. It was not only about those I lead but also about me...

*VLDP Participant Remigio Kadzviti,
Botswana, 2011*

A virtual program such as the VLDP offers a learning opportunity at a fraction of the cost of comparable face-to-face training. The estimated cost per participant of implementing a 16-week VLDP is US\$78/week, while the estimated cost of sending one participant from an East African country to the United States for a three-week training course is approximately US\$1,433 per week (MSH 2010).

iHRIS Manage: The way health workers are managed and supported is central to the quality of the health services they deliver. According to human resources (HR) management expert, Ummuro Adano, “Adequate HR management capacity remains one of the critical missing factors in current efforts to meet the goals of national and global health system strengthening efforts including large global health initiatives” (McCaffery & Adano 2009). Recent efforts to support professionalizing HR personnel throughout sub-Saharan Africa can benefit from ICT applications and tools that can help HR personnel streamline management functions such as hiring, deployment, and training. The USAID-funded *CapacityPlus* project has designed and implemented one such tool, iHRIS Manage.

iHRIS Manage is a free tool based on open source technology that gives health managers timely information to assess HR issues and functions, and to plan and evaluate appropriate interventions. It is primarily intended to help manage health care workers employed within a national ministry of health, a hospital, or other large health care organization, but it can also be used by private service providers or adapted to other settings.

To ease the heavy HR administrative burden, iHRIS provides a Scanned Paper Records Module to “archive paper forms and letters generated and distributed when health workers are confirmed, promoted, or transferred” (IntraHealth 2011). In Kenya and Uganda, iHRIS Manage is showing results, helping the central ministry’s Human Resources Directorate to manage the workforce more efficiently while reducing costs and data errors. Using the system, HR professionals are able to standardize job titles and classifications, solicit job applications for open positions, assign employees to fill positions, and maintain a searchable database of all employees that includes their identifying information and qualifications. Managers can also track each employee's history with the organization, including their positions and salary histories, and record the reason for departure when the employee leaves.

We don't provide just software but offer a program of technical assistance and expertise to ensure that the technology is transferred effectively and serves the ability of decision-makers to use data to lead and manage.

CapacityPlus, 2011

The developers believe in a “release early, release often” philosophy that encourages user feedback. Within the last year, multiple new modules and software features for advanced HR management have been introduced. iHRIS software now integrates with other health information systems more easily, allowing health workforce data to be aggregated with health delivery information and disease statistics.

“One of the aspects that I’m excited about is the ability to build custom reports to facilitate health worker data analysis. Although the iHRIS software installation comes with a number of standard reports, the iHRIS team often receives requests for help creating custom reports. This new direction helps to meet the goals of the iHRIS team to build local capacity for the iHRIS software, as well as diversify and expand the iHRIS developer community,” says Kabelo Bitsang, iHRIS administrator for the Botswana Ministry of Health.

With the addition of Translatewiki, a site that provides a large community of volunteer translators, the program now also offers better support to users in the current available languages of Dutch, English, Estonian, French, German, Italian, Portuguese, Brazilian Portuguese, Spanish, Swahili, and Tagalog.

Element #3: Communicate effectively.

Communication grounded in behavior theory and sensitive to local norms motivates clients to seek services and helps them make good family planning choices (Richey & Salem 2008).

A woman’s well-being and that of her family and community depend on access to quality health information and education. There are many examples of ICT use for engaging, educating, and informing the community about family planning/reproductive health, HIV/AIDS, and other health issues, as well as the availability of related services. The programs described below use SMS and text messaging to effectively reach the community.

Mobile for Reproductive Health (m4RH): In 2010, FHI 360's Mobile for Reproductive Health (m4RH) project launched a set of SMS and text messages about eight family planning methods for mobile users in Kenya and Tanzania. The nine-month pilot project began in Nairobi in collaboration with nine of the city’s health clinics, including two private clinics operated by Marie Stopes International/Kenya and Family Health Options Kenya, the Kenyan Planned Parenthood affiliate. The messages were developed using information from evidence-based sources such as WHO’s family planning handbook for providers. They conform to the standard 160-character texting limit, and were rigorously tested for user comprehension. The m4RH system also provides service delivery information so users can locate clinics for the family planning method of their choice. The mobile access codes that clients need to get into the m4RH system are publicized on posters, palm cards, and flyers (see Figures 1 and 2).

Figures 1 and 2: Sample Information Cards for m4RH



Ongoing research on the SMS project revealed that more than 10 percent of clients accessed information on all contraceptive methods, but in both Kenya and Tanzania, the menu of natural family planning methods received the highest number of hits (9.1%). Kenya’s client user numbers were significantly higher than those of Tanzania (20,489 vs. 7,377), but uptake was more rapid in Tanzania, where the m4RH service is offered in Swahili, the country’s local language. Although the service has yet to be formally evaluated, anecdotal evidence suggests that it is quite popular with young couples and youth.

m4RH is one of the few text messaging services in Africa designed to provide family planning information and education to the general public, and anyone with a mobile phone in Kenya or Tanzania can access the free service. Partners see m4RH as a feasible and affordable means to deliver family planning/reproductive health information to large numbers of people, many of whom would not normally seek such information in clinics. The expectation is that access to this information will generate demand for related services. A separate FHI 360 project is now promoting m4RH among its HIV/AIDS peer educators and CHWs as a way to integrate family planning into their HIV/AIDS programs.

We’re always talking about not knowing how to reach youth—they are so tech-savvy now so this is a perfect way to reach them!

—Dr. Marsden Solomon
Regional family planning/reproductive health advisor, FHI 360 Kenya

m4RH is now “earmarked for expansion and replication to cover more geographic acreage” (Mwaila 2011). At a stakeholder dissemination meeting in March 2011, participants recommended that the platform be used to promote the services of youth-friendly centers, expand the support information for service providers to improve quality of care, and to strengthen Health Management Information Systems relative to commodity security. There was also a proposal to set the team up under the chairmanship of the Division of Reproductive Health “to support replication, further development, and institutionalization” (Mwaila 2011). With 25 million mobile phone subscribers in Kenya and more than 14 million in Tanzania, m4RH has significant potential for scale-up (International Telecommunications Union 2011; JamiiForums 2010).

CycleTel™: The Institute for Reproductive Health (IRH) at Georgetown University developed CycleTel as an educational and support mechanism for clients who prefer a nonhormonal modern contraceptive. CycleTel is a mobile phone-based version of the well-known fertility awareness product, Cycle Beads.® The developers considered the following trends to support the initiative:

- More than two-thirds of the world's 5 billion mobile phone subscribers live in developing countries.
- Over 3 billion (of 5 billion) are short message service (SMS) users.
- India topped 350 million cell phone users in 2008 (as of June 2011, India has 851.7 million mobile phone subscribers).
- The vast majority of subscribers are women and men of reproductive age.
- Mobile messaging services are extremely popular and growing, with mobile phone users sending over 2 trillion messages annually worldwide (Puleio 2011).

The proof-of-concept testing in India used Frontline SMS–based delivery of the Standard Days Method, where 500 women subscribed to the service with SMS on the first day of their menses and then received daily follow-up text messages indicating fertility status. The Standard Days Method has been found to be over 95 percent effective in avoiding unplanned pregnancy and is recognized as an “evidence-based practice” by WHO. An additional menu-based service allowed women to receive information via SMS on alternative family planning/reproductive health methods (with an emphasis on the importance of healthy timing and spacing of pregnancies), STI/HIV prevention, condom use, and counseling and testing information, as well as to connect to local health clinics. A helpline number for individual phone consultation was also available (Bhavsar for MobileActive.org 2010). As the project develops, women and men will be able to access answers to their questions about the Standard Days Method and other RH issues via SMS.

Voxiva, Inc. is the technology provider for CycleTel, whose application has significant potential to be scaled up across many countries and in different languages. The application is able to handle a high volume of users and messages—possibly reaching millions of people based on demand. According to the Institute for Reproductive Health, “Voxiva's system is able to send as many as 200 SMS messages per second and has proven ability to support expanding messaging and data needs as projects scale. Data collection occurs in real time and is stored in one central database, accessible to researchers and project managers at any time from any personal computer connected to the Internet” (Devries 2009).

“In light of the high unmet need for family planning and reproductive health information, there is the significant potential to help women avoid pregnancy and improve their reproductive health by providing them with timely, actionable, personalized information through SMS.”

–*Institute for Reproductive Health
Georgetown University*

Preliminary feasibility study results indicate that CycleTel would “fit well within typical mobile phone use and SMS habits in the study areas, and that women have significant interest in applying SMS to use the Standard Days Method and receiving related RH information” (Devries 2009). Other relevant findings included:

- Messages should be precise and non-technical.
- Participants definitely preferred text rather than voice messages.
- The phrase “fertile day” was perceived as degrading to women.
- Participants in the study showed a preference for phrasing “safe/unsafe day” rather than “you can/cannot get pregnant today” to protect privacy—confidentiality is an issue, even when cell phones are individually owned.
- There was a preference for messages only on unsafe days and for minimal information about length of fertile window (only when it begins/ends).

- Messages should be Hindi words spelled with Roman alphabet (“Hinglish”)—researchers suggest assessing the feasibility of sending messages in languages based on the non-Roman alphabet.
- Half of the male respondents thought both partners should receive messages.
- People are willing to pay for a monthly service.

These findings are being used to refine the CycleTel application and the service will be expanded in India and possibly adapted for other countries.

Element #4: Base decisions on evidence.

Research, monitoring, and evaluation yield important information to guide decision-making, and these activities need not be expensive (Richey & Salem 2008).

Monitoring and evaluation (M&E) is a core component of sound program design and management and is essential in advancing family planning/reproductive health, HIV/AIDS, and other health-related goals. Information acquired through appropriate research and M&E allows program staff to see how well a project is working, provides vital information to make well-informed decisions about performance, helps staff plan activities based on evidence, and helps determine whether projects are on track to meet desired goals. It also reveals if systems are in place and working effectively and, ultimately, whether a program is well established in the target community. Monitoring and evaluation can be used to help strengthen and institutionalize programs, shape funding decisions, and contribute to a global understanding of “what works” (Adamchak 2000).

The following two examples cite interventions using mobile collection tools to facilitate M&E and research efforts.

Last 10 Kilometer (L10K): John Snow International’s (JSI’s) Last 10 Kilometer (L10K) Project is using DataDyne’s EpiSurveyor⁸ (a free web-based mobile phone data collection software) in a program that allows field researchers in more than 115 communities in four regions of Ethiopia to collect critical data to help strengthen the bridge between households, communities, and the government’s flagship Health Extension program. The effort aims to “mobilize families and communities to more fully engage to improve household and community health practices and ultimately improve key reproductive, maternal, neonatal and child health outcomes.” L10K beneficiaries include approximately 14.5 million people, including 2.6 million children under five, and 3.5 million women of reproductive age (John Snow International 2011).

EpiSurveyor in Senegal: In 2008, the Senegal Ministry of Health, in partnership with WHO, improved M&E health data collection by using mobile ICT. They gave 20 CHWs in 10 districts PDAs loaded with EpiSurveyor and trained them on its use. During a six-month pilot project, with PDAs in hand, the CHWs visited 90 health posts each month. They carried out an 82-question survey on basic supervisory data and entered their responses in real time into EpiSurveyor. The data was then sent electronically to the district level,

⁸ EpiSurveyor is a web- and mobile phone-based tool that makes it simple to collect public health and other data on mobile phones. Usable on common mobile phones available in every country, as well as PDAs and a variety of smartphones, EpiSurveyor is a simple, no-cost tool that requires only basic word processing and cell phone skills to use. Survey forms can be downloaded and modified, and data entered and synchronized. Recent releases of EpiSurveyor include automated analysis in charts and graphs and reporting by email and upload of data via SMS. EpiSurveyor is now the most widely adopted open source mobile health software in the world and has been officially established as an electronic data collection standard by WHO.

where it was analyzed and then sent on to the MOH, where it was synthesized and included with reports from other districts. The pilot clinics using PDAs showed an improvement in 67 percent of health indicators. In one district, data that would previously take a full day to compile was gathered in one hour. The district saw a 500% increase in infant vaccinations, and an increase of 10,000 vitamin A tablets ordered after data gathered by the survey indicated a shortage. Timely data processing allowed health officials to reallocate their budgets to promptly respond to identified needs (Ranck 2011).

Relevant data from the pilot study indicated that health facilities in the pilot districts had a serious shortage of partograms, a basic birthing tool. The low-cost partogram is used by midwives to monitor labor to ensure safe deliveries. The EpiSurveyor-collected data allowed the MOH to identify that only 55 percent of the surveyed districts had partograms. Based on this information, the MOH increased distribution of partograms and asked field workers to encourage midwives to use the tool for every delivery. Follow-up surveys noted the midwives needed training to use the partograms effectively, so necessary guidance was initiated. Subsequent EpiSurveyor information showed that partogram use during labor increased on average by 28 percent in the 10 pilot regions compared to only a one percent increase in use in areas outside the study (WHO 2011).

Element #5: Assure contraceptive security with a strong logistics system.

A strong logistics system and a long-term plan for contraceptive security ensure that a variety of methods, and the supplies and equipment to provide them, are always available (Richey & Salem 2008).

Supply chain management systems in many countries throughout Africa are using eHealth and mHealth to transmit information “between medical dispensaries, logistics management units, local pharmacists, and patients to increase efficiency and fight against drug counterfeiting” (Vital Wave Consulting 2011). Required skills for any senior contraceptive supply chain advisor now include knowledge and experience with specific ICT for supply chain management and applications (e.g., software development and automation of logistics management information systems, use of mobile technologies for supply chain reporting, ordering, and monitoring), as well as capacity-building and organizational development for supply chain management (eTransformAfrica 2011).

The following interventions use ICT to facilitate contraceptive security through strong logistic systems.

Bangladesh Supply Chain Information Portal: USAID has been supporting efforts to strengthen the supply chain management system in Bangladesh to ensure family planning/reproductive health commodity security for many years. While advances have been made, problems still hinder the continuous availability of reproductive health commodities. Since the fall of 2009, the USAID-funded Strengthening Pharmaceutical Systems (SPS) Program has provided technical assistance to the country’s Directorate General of Family planning (DGFP) and other national stakeholders to improve procurement management for reproductive health commodities, build up the existing distribution and management information systems, and increase local capacity to strengthen health systems overall. This support has resulted in the Government of Bangladesh streamlining procurement, which led to the World Bank’s approval of commodities amounting to US\$63 million.

Figure 3: Screenshot of Bangladesh SCIP's Procurement Tracker



The DGFP Supply Chain Information Portal helps ensure contraceptive availability in Upazila and at the field level, which eventually will help reduce unwanted pregnancies and population growth—steps toward reaching the relevant MDGs.

The DGFP's new Supply Chain Information Portal (SCIP) is key to the improved procurement management system, offering relevant and timely information for informed decision-making.⁹

The Procurement Tracker (seen in Figure 3) allows government officials to track the status of the procurement process every step of the way, which helps prevent delays while also promoting transparency. The SCIP also provides information on current DGFP tenders and procurement opportunities, tender documentation, results of past tenders, a news page, and a photo gallery (<http://dgfplmis.org/>). The portal is unique in the government sector for its ability to allow users to manage data and create presentations using web-based dashboards.

⁹ The SCIP received two prestigious awards at Bangladesh's Digital Innovation Fair in July 2011. The secretary of Bangladesh's Ministry of Health and Family Welfare accepted the SCIP's award for the best e-governance initiative; in addition, the portal won the runner-up award for national digital innovation in the e-health category, making it eligible for the 2011 World Summit Award—the global initiative to promote the world's most innovative information technology applications.

The ILSGateway (Tanzania): Health system performance and related family planning/reproductive health outcomes are severely affected when essential supplies and contraceptives are not available on demand at service facilities. Poor supply chain management causing stock-outs or surpluses produce cost inefficiencies and result in poor quality of care for clients. Over the last two decades, the DELIVER Project, funded by USAID, has gathered experience and expertise in contraceptive security logistics and, more recently, in antiretrovirals and anti-malarial drugs. DELIVER staff have done so with a core focus on using appropriate ICTs.

A large volume of data gets generated in logistics systems, and having a means to organize the data in a visual dashboard makes it much easier for decision-makers to translate the information effectively. Vast amounts of information are also produced by routine reports that are frequently difficult to summarize or analyze at the central level. To respond to this “information overload” challenge, the DELIVER Project in Tanzania worked with a local software developer to create a database application that allows systematic data capturing and analysis at the central level. The database facilitates order processing at the Medical Stores Department (MSD) and data collection on commodity use at the facility level, which the MSD had not regularly collected in the past. The system is “built with remote access capacity and has features that will also enable online order submission by Web-enabled facilities through the Internet and provide access to data on product usage to MOH program managers” (JSI 2007).

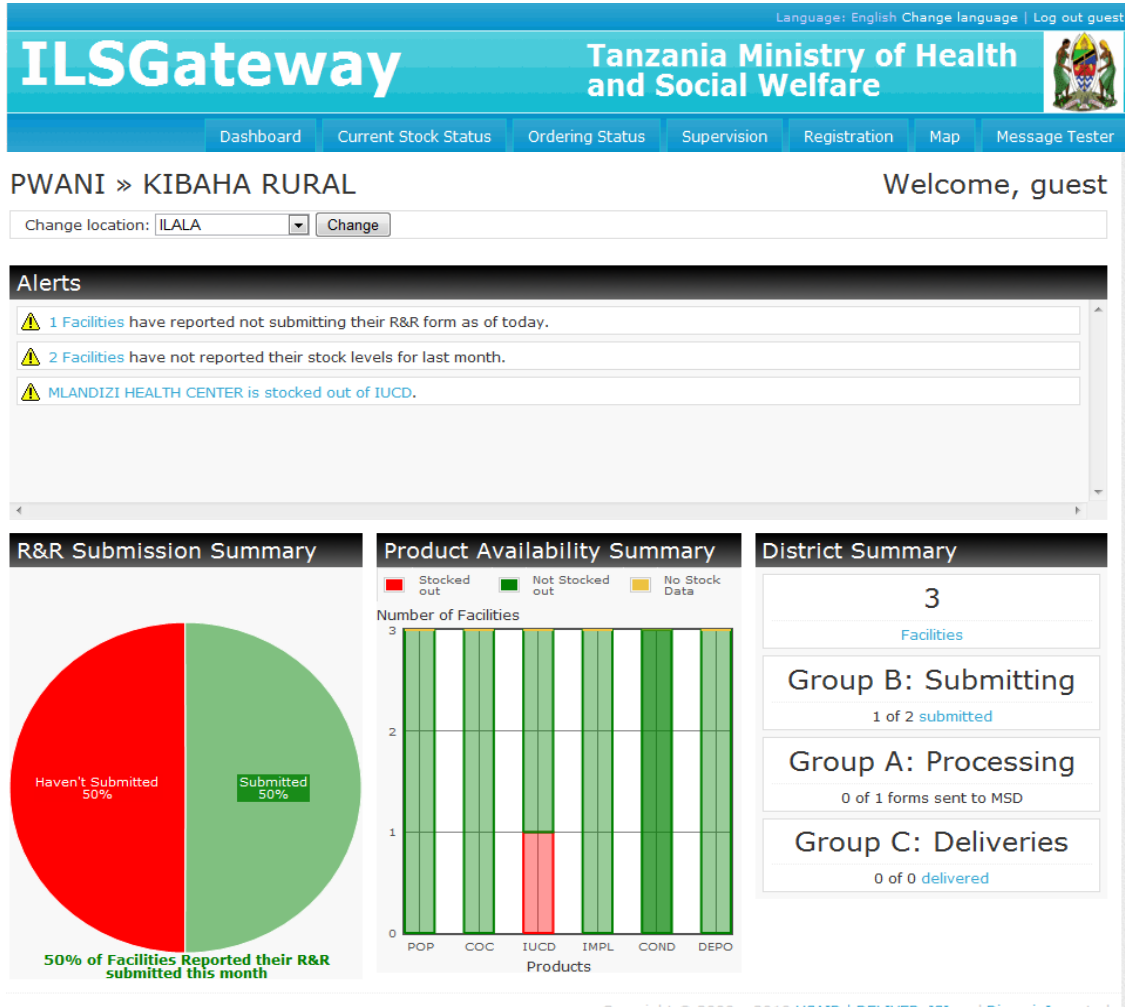
In 2010, the project began working with Tanzania’s Ministry of Health and Social Welfare to develop a series of technological innovations to address weaknesses in the country’s newest supply chain system, the Integrated Logistics System (ILS). The ILSGateway is designed as a routine reporting system using SMS text messages and USB-powered bar scanners to scan order forms.

Both the SMS messages and scanned report and request forms feed into a website with a user-friendly dashboard interface, which provides a reporting system with greater visibility of stock levels at service delivery points. This visual graphic information is intended to improve ordering and reporting rates and adherence to ILS procedures. It will also empower district logistics managers to diagnose and prevent chronic stock outs of contraceptive and other health commodities. ILSGateway began its pilot phase in several districts in November 2010 with the following objectives:

1. Provide real-time stock status information on RH commodities.
2. Improve the timeliness and accuracy of paper-based ordering and reporting from service delivery posts (SDPs).
3. Improve the accuracy and timeliness of deliveries to SDPs by confirming delivery arrival in real time.
4. Allow decision-makers at all levels to monitor the regularity and spread of facility-level supervision by managers at district and other levels.
5. Prevent widespread emergency ordering that has resulted from other reporting systems by aiding districts and facilities in regular and routine ordering (JSI 2011).

Figure 4 presents a view of the ILSGateway website.

Figure 4: Screenshot from the ILSGateway



Using ICTs for Health Systems Strengthening

We've realized that it's how you use this new set of tools to enact system change that makes the difference. It's about the people in the system and their roles and how they relate to each other that's most important. For ICT, mobile has the most impact because it's people-centered. It allows patients and community health workers to all of a sudden be INTEGRAL to the system. This changes expectations and roles for patients and community health workers in a very positive way. When someone walks 40 miles to get trained, it means they want to play a particular role in the health system. Mobile tech can make that happen.

*–Josh Nesbitt
CEO, Medic Mobile \+/*

Health systems are complex and the people working within these systems require dedicated attention, skills, and support in order to sustain positive health results. ICTs are currently being applied to strengthen all six of the WHO health system building blocks—information, health service delivery, human resources, financing, governance and leadership, and drugs/vaccines. Information systems in particular involve sophisticated applications to help gather, send, analyze, store, and disseminate tremendous amounts of data from multiple sources. ICTs are used in many ways, including electronic patient records, monitoring drug supplies, ordering systems, budget management, and tracking disease prevalence.

The following are examples of digital platforms and mobile technology being used to strengthen national health systems.

Uganda Health Information Network (UHIN): Uganda has one of the highest burdens of disease in the world but also some of the best cellular telephone coverage in Africa. UHIN, launched in 2003, is a wireless network built around the country's cell phone network, handheld computers, and wireless servers to enable CHWs to access vital information. It makes data collection and reporting easier, disseminates health information, provides learning materials, and facilitates email exchange for health workers. At its start, the project equipped 700 health care providers in five districts of Uganda with PDAs loaded with a mobile clinical library, including MOH documents such as the Uganda Clinical Guidelines and other resources on HIV/AIDS treatment and care, malaria, and maternal and child health.

According to UHIN program staff, health workers use the PDAs to collect public health data at the community level and then upload it along with emails they need to send to wireless access points via infrared, Bluetooth, or Wi-Fi at a rural health facility.¹⁰ These points transmit the data and messages over the network to a Kampala-based server, which routes them to the correct recipients and sends back the messages, data, and health information that clinicians need. Because the technology is solar powered, health care workers are able to access and exchange information in remote areas without fixed telephone lines or regular access to electricity.

We received accurate HMIS data in a timely manner, empowering us to make evidence-based decisions regarding resource allocation and response to outbreak prone diseases quickly.

*–Dr. Robert Mayanja
Rakai District Health Officer,
Uganda*

Among the information exchanged: monthly Health Management Information System reports; disease surveillance data; reports related to HIV/AIDS, tuberculosis, and malaria; and data for monitoring drug

¹⁰ Bluetooth, Wi-Fi, and infrared wireless technologies are commonly used for short-range wireless communication between electronic devices.

usage and stocks. Additional tools for electronic data collection of non-routine sources of information—especially in relation to community-based health care, nutrition, and environmental sanitation programs—have also been developed, and rural health facilities are using the network to capture data and report to district health offices and the MOH.

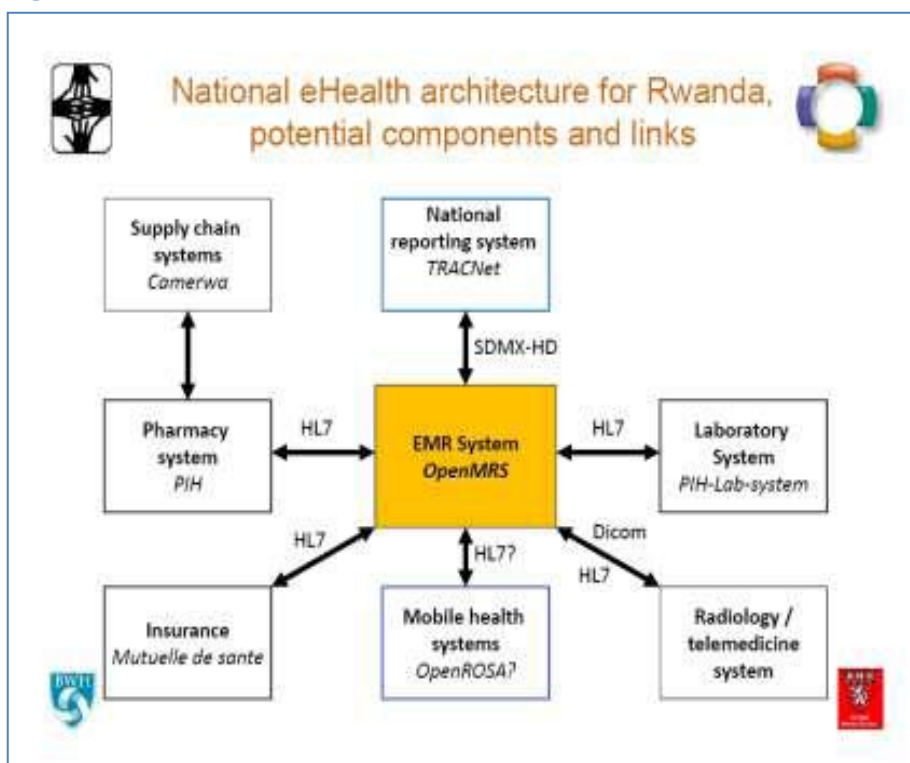
In addition, continuing medical education for all health workers is regularly broadcast through the UHIN. Three times a week, health workers receive eLearning content pertaining to diagnosis, treatment, and prevention of major health problems on their PDAs. They also receive news from mainstream media on a daily basis through the network.

A 2010 study showed that UHIN reduced the cost of managing health information by 25 percent compared to the “cumbersome paper-based manual systems that are delay-prone, less reliable, and in some cases incomplete” (NSJ 2010). Following the end of the initial project, the MOH of Uganda incorporated UHIN into its comprehensive strategy for a National Health Information System, and the districts continue to use the system to gather, report, and deliver vital health information and data.

National Medical Record System in Rwanda: A key element for improving health service quality is the consistent use of appropriate medical records aligned with a strategic health information system. Though multiple electronic medical record systems exist in the private sector, there is a trend supporting national electronic records taking place throughout Africa.

As part of the country’s Vision 2020 effort, the Rwandan government implemented a comprehensive national medical record system for use in all their health facilities using TraCNet, Open MRS (medical record system), and the National Health Information System. The system consists of programs for tracking patient records, monitoring infectious diseases, managing drug and supply chains, telemedicine communications with health professionals in remote areas, and eLearning and training for health care workers (Fasier, May & Wanchoo 2008). The system will need to address patient record security and privacy as part of its quality control mechanism, an area of particular sensitivity for family planning/reproductive health and HIV/AIDS clients.

Figure 5: Rwanda's eHealth Architecture



This national initiative requires substantial technical expertise by local technicians, data managers, and programmers to implement, manage, and further develop software according to Rwanda’s clinical needs. To that end, the International Development Research Centre funded a technical mentorship program to train Rwandan programmers as local software developers for OpenMRS.

The E-Health Software Development and Implementation (EHSDI) training course is operated primarily by U.S.-based Partners In Health and the Rwandan Information Technology Authority.¹¹ At the outset, 10 recent graduates of top Rwandan universities were selected after a rigorous written exam and interview. The three EHSDI mentors supporting the graduates are experienced computer programmers, and the program also includes guest lecturers from Rwanda and other countries. In keeping with the trend to share learning experiences openly, the EHSDI team also created a blog to document their process (Partners in Health 2011).

M-Pesa: In 2005, Nick Hughes, managing director at Signal Point Partners and Susie Lonie, executive head of Mobile Payments with Vodacom in South Africa, started a mobile money initiative in Kenya called M-Pesa (*M* for mobile, *Pesa* for “money” in Swahili). This joint venture between Safaricom, the leading mobile telecommunications company in Kenya, and Vodafone allows people to transfer money, pay bills, and save money by using a mobile phone, all without a bank account. M-Pesa’s mobile phone application also allows users to purchase airtime. Since its launch in late 2007, M-Pesa has attracted more than 13.8 million subscribers and has a network of 24,000 outlets. By 2009, 40 percent of Kenyans had used the service to send and receive money. The cumulative value of the money transferred via M-Pesa since its inception is over US\$3.7 billion—almost 10 percent of Kenya’s annual GDP (Safaricom 2009). M-Pesa has inspired other mobile money services around the globe, and these “m-money” systems have recently transitioned from a pure money transfer system into a payment platform that allows NGOs, schools, hospitals, and firms to send and receive payments.

In Kenya, Tanzania, and Afghanistan, M-Pesa directly helps improve health care by providing families “quick cash” necessary to pay for transportation to clinics or hospitals. In Tanzania, M-Pesa works with the Comprehensive Community Based Rehabilitation Center to transfer money quickly and directly to transportation companies and allows families to pay back the small transportation loan at a later date. In Kenya, it supports the Changamka Medical Smartcard, allowing women with limited access to money to pay for maternity care (Kim 2011).

Center for Health Market Innovations (CHMI): The Center for Health Market Innovations (CHMI) is a global network of partners that collects, analyzes, and disseminates information about Health Market Innovations in developing countries with the goal of accelerating the diffusion of successful models. The research team consists of eight partner organizations in 16 countries that look for relevant and innovative health programs to document and include in an innovators’ database available on an open Internet platform at <http://healthmarketinnovations.org>. Highlighted activities can be implemented by governments, NGOs, social entrepreneurs, or private companies—as long as they have the potential to improve the way health markets operate.

Beyond the core team, CHMI relies on the website’s users (which include program implementers and social entrepreneurs in the for-profit and nonprofit private sectors, donors and investors, government policy makers and practitioners, and researchers from academic institutions) to contribute possible market innovation program information and to update the status of existing entries. The site has detailed information on more than 1,000 programs in more than 100 countries and an interactive database that can present comparable, visual information about the expanding number of programs. Users and contributors can “map” global innovations by program type, health focus, legal status, and target population. Registered users can also directly connect with people running the programs featured

¹¹ The EHSDI course is now in its second year of implementation in Rwanda, where it is run in partnership with the Rwanda Development Board. The goal of the course is to produce local software developers with the necessary knowledge and skills to develop electronic medical record software, specifically to create modules for OpenMRS. The course is nine months long (the first year it was 11 months).

in the database to learn more and to find implementing partners in their own countries. They can dialogue with the extended community on CHMI's blog and download the whole database to use—with appropriate attribution, of course. CHMI's database is a significant tool for researchers studying the private sector's role in the health marketplace and for donors and investors looking to identify potential programs to fund.

“CHMI uses its rich information on programs around the world to identify and analyze emerging innovative models that could be scaled-up or adapted in other countries. CHMI works to better understand which emerging program models truly have the potential to improve health and financial protection in health markets” (Center for Health Market Innovations 2011). CHMI is coordinated by the Results for Development Institute with funding from the Bill & Melinda Gates Foundation and the Rockefeller Foundation.

Enabling Conditions for ICT Use and Scale-up

As stated previously, many conventional ICTs (radio, television, fixed phones, and fax) have been used for generations and are fully integrated into family planning/reproductive health, HIV/AIDS, and other health interventions. Their use depends on the reliability of an electrical power supply, fixed telephone lines, the necessary resources to pay electric bills, and a comfort level for routine use. Personal computers, with Internet access and email, also rely on a stable power supply and are currently less available in remote areas for several reasons, including lack of appropriate infrastructure, cost, and limited computer literacy.

These barriers to use also apply to the more current mobile and digital ICTs and are key areas that need to be addressed in order to accelerate ICT development in sub-Saharan Africa.

Leading global health transformation expert David Aylward sums up the current state of ICTs and what must happen to further advance the field of mHealth:

What has not happened in either the developed or developing market is taking mHealth to scale or even to really big trials. Most of what is out there are small, non-sustainable proofs of concept addressing specific problems, rather than large health systems. We are really looking for how to support and facilitate the integration of services so that rather than having a series of point solution services, like SMS to people about behavior change, we get everything connected in an integrated, transformed system. This surely means empowering health workers in communities with new mHealth information and devices, but they need to be connected to clinics; they and the clinics (and the public) need to be connected to information centers; and then all that needs to be connected into the traditional health system. And we need to integrate across primary care; we cannot have disease-specific silos any more.

So integrating those primary care services is one mission. Then integrating those kinds of services into underlying healthcare systems, e-health to use the short language, is a second. This means connections to labs, pharmacies, hospitals, doctors, insurance and payments generally. In other words, mHealth is not going to stand by itself. It is an extension of a transformed health system.

Getting sustainable economics under both of the above is a third challenge. Who are the organizations and what are their costs and benefits? Researching and showing the health

and economic effects of these transformed approaches is a fourth. Research in a data rich environment is a very different animal from the data poor situation we have today.

So, fundamentally, it's those four goals that we are after.¹²

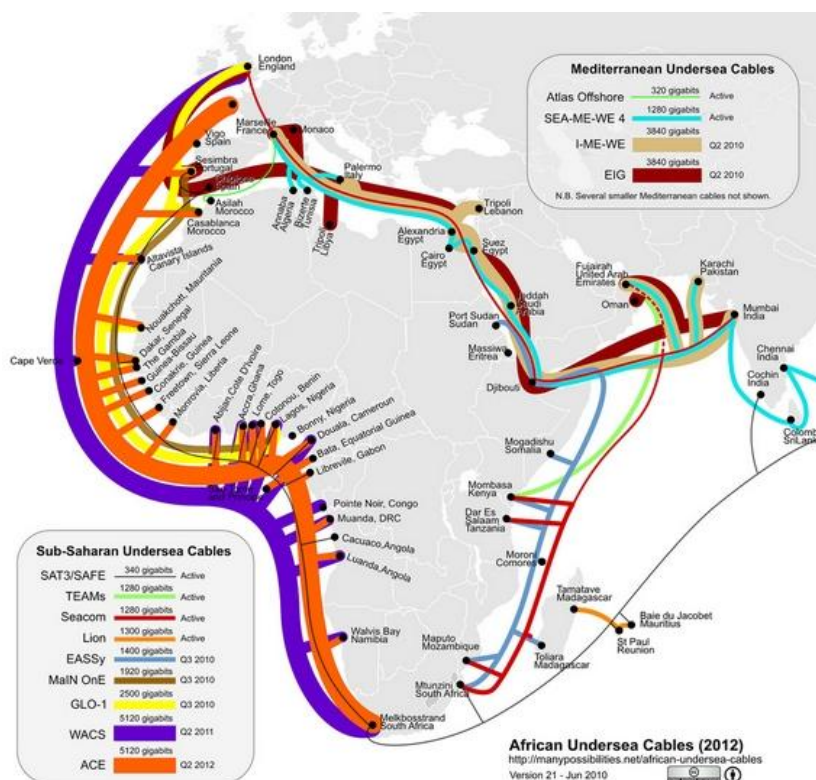
This penultimate section of this paper discusses nine overall enabling conditions for ICT use and scale-up: appropriate infrastructure, cost, ICT literacy, standards and operability, policies and regulations, contextual understanding, sound management, appropriate language, and evaluation.

1. Appropriate Infrastructure: In general, the ICT infrastructure in sub-Saharan Africa has dramatically improved over the last decade, however, there is still only a minimum of fixed telephone lines, which offer poor service, and subscription rates to these services are stagnant.¹³ The primary ICT focus now is broadband Internet, which requires fiber optic cables and satellites, and whose use has become central to developed countries long-term economic strategies. In sub-Saharan Africa, the Internet is said to still be in its infancy and efforts to advance broadband capacity are just beginning. Nonetheless, much progress is being made, as illustrated in Figure 6. In 2009, undersea fiber-optic cables began connecting Africa to the global communications network. The work is ongoing, and an US\$1.7 billion investment for fiber-optic cables brings with it radically higher volumes of potential Internet traffic. A recent report on ICTs indicates that the next major challenge on the horizon for policy makers in this region is “[e]nsuring that networks are capable of delivering broadband Internet access at affordable prices” (World Bank 2011).

¹² Personal communication. September/October 2011.

¹³ According to the World Bank, in 2005 almost 70 percent of fixed lines were out of service at some point in the year, and the number of subscribers in 2008 was the same as it was in 2000, 1.4 subscribers per 100 people.

Figure 6: Africa's Undersea Cable Coverage



“The map paints a different-from-the-usual picture of Africa. It’s not a picture of a dark continent but rather a brightly lit one, lit by terabits of light capacity brought by a dozen cables landing on sub-Saharan African shores either now or in the near future. Africa, the brilliant continent. This also happens to be the Africa I believe in.” Steve Song
[\(http://manypossibilities.net/\)](http://manypossibilities.net/)

2. Cost: Health systems have competing priorities and some people within the system may consider ICT a luxury, particularly the current mobile and digital versions. “The cost of hardware, software, telephone connections, and Internet service providers (ISPs) is high in low- and middle-income countries, both in absolute terms and relative to the income people have available” (K4H 2009). In addition, hardware and software quickly become obsolete, necessitating additional investments in technology and adding further financial burdens to limited health budgets. Using open source software can help contain costs and also supports transparent efficiencies.

The hub for global knowledge exchange is the Internet, and access to it is very expensive throughout sub-Saharan Africa compared to the Global North, a factor inhibiting broader use. High-end volumes of information now require a broadband connection to be effective, and in 2008 the median cost of a broadband connection in Africa was US\$92 per month, far beyond the reach for many individuals and institutions. Wireless broadband technologies are causing access prices to fall, and as more operators enter the market, costs should continue to decrease (World Bank 2011). Civil society organizations, NGOs, the public sector, and other organized stakeholders should join forces to leverage their power in numbers to negotiate lower rates from private sector telecom providers.

3. ICT Literacy: There is a severe health workforce shortage across sub-Saharan Africa. Already overburdened health workers may view learning about and using ICTs as just another work requirement for which they must struggle to make time. Many health workers may not have received basic computer training and some from rural areas may never have used a computer.

Lack of experience with eHealth can sometimes result in decision makers and frontline users feeling uncomfortable with its use or intimidated by ICTs that require solid computer literacy. Even in countries with far more exposure and access to modern ICTs, there are still reluctant adopters. Those who did not grow up in the information or digital age may not embrace the technology for a variety of reasons, including a preference for face-to-face exchanges or traditional learning methods. In addition, “information technology professionals who can maintain computer systems and trouble shoot problems are [also] in short supply in some countries outside of capital cities,” (K4H 2009) leaving those willing to try the new technologies with apprehension over how to move forward if they run into problems.

Because of the severe personnel shortages, health systems throughout Africa often rely on community health workers to carry out basic health services and, in some cases, functions such as providing injectable contraceptives. Some of these CHWs may not have more than an elementary education or may have low literacy levels, which may present a challenge for adopting ICTs with mHealth or mHealthEd functions or diagnosis-assistance menus that support advanced services. Programs need to plan accordingly and have staff on hand at central or regional locations to answer calls directly rather than offering text message instructions for CHWs in that category.

On the other hand, it is striking how many health workers at all levels have adopted ICT use—computers, Internet, SMS messaging, and eLearning/mHealthEd. mHealth remains in a category all its own because it combines the capacity of higher-end text exchange (the written word) with direct verbal exchange. Successful engagement with health workers is crucial to the integration and scale-up of ICTs in family planning/reproductive health, and that engagement is much easier when there is a clearly perceived value as well as sufficient training and support. ICT can fundamentally change the way care is delivered, including changing working practices, empowering clinicians to make decisions about patient care, providing further education and information to CHWs and reducing their paper-only reporting load, and empowering patients to assume more responsibility for their reproductive health. Most would find this an extraordinary advancement, though some professionals may feel that the old ways they know best are being challenged. This is where Pagliari’s previously mentioned remarks about a new way of working and attitudinal shifts must come in to play (Open Clinical 2011) and where ICT capacity-building is crucial.

4. Standards and Interoperability: The proliferation of digital and mobile ICTs has created systems that, though well intentioned, are frequently incapable of sharing information. To remedy this, ICT health programmers are encouraging the use of free and open-source software (FOOS). Research throughout the Global South indicates the need for interoperability standards in health information systems that allow different health ICT applications to be shared, replicated, and scaled up. Health applications based on open source, as well as open standards, ensure that they can be broadly shared and more effectively evaluated; FOSS is particularly helpful in the context of cost containment for resource-poor countries.

Interoperability is also crucial to transparent and inclusive processes—which can be enhanced by allowing the free flow of health-related information when ICT systems can be linked and are able to exchange data according to an agreed set of protocols and standards. However, developing countries have limited access to such standards. One of the solutions could be “open standards” that nonprofit organizations make publicly available, either free or at a nominal charge.

Recognizing the need for interoperability and attaining it are two different things. As one consortium of technology experts has noted, “Interoperability standards, guidelines and best practices can help overcome the problem, but achieving interoperability for products and services requires a change in mind set among key decision makers, product manufacturers, and service providers. Standardization is an important instrument in transparent processes, and should be promoted by innovative companies. The better that industry applies the processes of interoperability and standardization, the less will governments need to intervene” (The World Standards Cooperation 2011).

5. National Policies and Regulations: In the past, health officials did not need to put much focus on telecommunications in crafting national health policies and regulations. Now, with the exponential growth in eHealth, officials must distinctly consider ICTs in their official approaches. There are few eHealth policies in place in Africa, and those that do exist are not always aligned with national health strategies. Only three countries in sub-Saharan Africa currently have eHealth as part of their national health strategies. According to Brahim Sanu, regional international telecommunications union representative for Africa, the new knowledge-based economy is forcing a paradigm shift for policy makers in Africa who must include streamlining ICT as a key factor in regional and national health policies.

“The telecommunications regulatory environment can play a key role in fostering increased mobile phone adoption. State ownership of telecommunications operators distorts markets and adversely affects competition. Realizing this, governments across the region have privatized their state-owned telecommunications operators. By 2010, 28 African countries had gone through this process.”

(The World Bank, 2011)

Many countries in sub-Saharan Africa still have restrictive telecom regulations and national policies that hinder ICT progress. These can also impede important “cross-border harmonization of licensing rules, thereby frustrating the economies of scale that are needed to make large [ICT] projects affordable” (IDRC & CRDI 2010). In late 2007, the Connect Africa Summit helped to “kick-start Africa’s push for broadband and eLearning.” Participants developed five goals but few, if any, can be realized in the short time frame that they proposed. Of particular note is Goal 3, which focuses on easing regulation to expand ICT opportunities. It reads:

Adopt key regulatory measures that promote affordable, widespread access to a full range of broadband ICT services, including technology and service neutral licensing/ authorization practices, allocating spectrum for multiple, competitive broadband wireless service providers, creating national Internet Exchange Points (IXPs) and implementing competition in the provision of international Internet connectivity.

According to GSMA, an association representing the interests of the worldwide mobile communications industry, market liberalization results in increased volume and quality of mobile service (in both domestic and international traffic). Prices also decrease following market liberalization; with partial liberalization, prices fell by a minimum of 31 percent in Africa and up to 90 percent following full liberalization (World Bank 2011).

An important question to consider in this area is how are the health sector structure and the national regulatory framework encouraging problem-oriented, interdisciplinary, rapid-response technical collaboration. Furthermore, what are the political, regulatory, and managerial tasks needed for taking on the current complex multifaceted technical challenges that come along with the progressive ICT landscape as it continues to rapidly evolve? (infoDev 2006)

Context and Content in ICT Use and Scale-Up in Family Planning

Uptake of family planning methods is influenced not only by poor knowledge of modern contraceptive methods, but also importantly by cultural beliefs and community opinions. In such a situation, there may be significant benefit in having the counselling offered from someone who lives within the community he/she serves, and who therefore will be fully cognizant of the nature of local concerns.

Community health workers may visit their clients on a regular basis and so be able to address, in a way in which clinics are not, important issues relating to method compliance and continuation. Family planning counselling is, however, relatively complex and there may be a mismatch between this complexity and the resources available to the community health worker, who typically receives relatively little training.

Our project is developing mobile-phone based software to support community health workers in providing high quality family planning counseling to their clients. Our objective is to take a best-practice family planning counseling method and encode the provider-client dialogue it prescribes in an interactive application. The community health worker can then use this application in guiding each counseling session along this best-practice path. We believe that this model will prove to be an important addition to the resources available to support efforts in promoting the broadest provision of community based family planning counseling.

—T. Routen et al.
Using Mobile Technology to Support Family Planning Counseling in the Community

6. Contextual Understanding: Deciding which technologies to use should be determined mainly by specific local contexts and demand (Weigel & Waldburger 2004). Context and content factors are critically important in considering ICT use and scale-up, including local content creation, the language used, and the relevance of content to the local situation. Information on sociocultural contexts that shape behavior and attitudes, patterns of population movement, cultural attitudes, and ICT readiness define the ability of users to engage in developing innovative approaches in using ICTs and taking them to scale. Appropriate ICT enhancements depend on knowledge of the context, as Routen et al. indicate in the box at left.

7. Sound Management: As stated earlier, the six building blocks of the health system can each benefit from ICTs that provide strategic ways to collect, organize, manage, and share information and educate and inform staff and the community. The influx of huge volumes of information created by current ICTs presents a challenge for managers who need to decide which technologies are most appropriate for their staffs, are most cost effective, and will increase productivity. Building the capacity of health workers and other intermediaries to be able to effectively use, work with, manage, adapt, and develop appropriate ICTs is an ongoing task. Many may feel overwhelmed by the abundance of information available through rapidly increasing means (e.g., streaming content; digital archives; and the vast number of websites, listservs, blogs, etc.). Hence, knowledge management depends heavily on whether ICTs are considered a help or a hindrance. The ICT field itself is grappling with exponential growth, and those looking in from the outside view the rapid fire of ever-changing technology and applications with awe and frequent anxiety.

8. Language: With the exception of radio and television programming, the issue of language is frequently ignored in ICT programs, most of which offer very little content in local languages. There are a huge number of languages in sub-Saharan Africa, and almost two dozen of them are considered “official.” In South Africa alone, there are 11 official languages. Very few health information resources available on the web are written in any of those official languages, with the exception of English, French, Portuguese, and Spanish. Most current ICT applications designed to facilitate learning and knowledge exchange are not in local languages either. Improving health workers’ capacity to deliver effective family planning or other health services involves providing these workers with updated information and guidance in a language they can easily understand—preferably their own.

9. Evaluation

Evaluation is critically important in determining whether the investment in ICT use is worthwhile, particularly in gauging the benefits to the health initiative the ICT is supporting. Evaluation can measure impact and allows corrective measures to be taken where necessary and provides opportunities to share lessons learned for new or ongoing efforts. However, organizations frequently do not formally evaluate their ICT systems and may not fully understand how best to negotiate or address limitations in existing evaluation techniques that are still grappling with knowledge management evaluation models.

As Charles Kenny of the Center for Global Development notes,

Technology is at the center of global improvements in the quality of life. At the same time, the relationship between technology and development is a complex one, and many technologies that look wonderful on paper fail miserably in the field. So the three cheers for USAID's new engagement have to be accompanied by a thousand cautions. Perhaps most importantly, any technology initiative needs to be intimately tied in with USAID's revived focus on monitoring and evaluation (2011).

Conclusion

As public health folks we need to be IN the technology and influencing how it gets developed and created and become very literate so that our concerns are in the development of it further upstream rather than us being just passive recipients of it. I think that's what the next generation of movements in public health will be. We don't just have to passively accept things; we need to be there at the creation . . . We should be at the leading edge of innovating with these tools.

*–Jody Ranck, DrPH
Global eHealth and Innovation Expert*

ICT solutions are facilitating access to information and education for patients, health workers and policy makers. As illustrated in this paper, ICT applications in family planning and reproductive health range from using SMS and text messages to give information on family planning methods to women mobile users; to wireless solutions that update and connect rural health workers to web-based distance learning programs; to mobile phones and PC solutions that help to manage health data, drug supplies, patient's electronic medical records, and the health workforce. The use of ICT is breaking down barriers, enabling health service providers to work together more closely and reach out to local clients as well as communities far beyond their geographic borders.

At the same time, governments and donor agencies worldwide are trying to come to terms with the complexity of current ICT opportunities, the multitude of new ICTs coming online, and the realities of the global digital divide. They are doing so at the same time that they are attempting to harness the power of cutting-edge digital technology within their own organizations. In some cases, already overburdened health workers and program managers are being asked to embrace new technologies even while standards and policies for their use are not yet in place.

ICT costs are still prohibitive for many African countries and few have necessary eHealth policies in place to govern this exponentially growing field. A focus on the local context for capacity-building in the information and digital age is extremely important, as is collaboration and transparency among government ministries that each have a role in advancing eHealth; it is no longer just a matter for the

ministries of health, but also for ministries and leaders who manage education, economics, environment, energy, gender, and even trade.

Donors, researchers, and public health practitioners agree that ICT will continue to play a significant role in the delivery of evidence-based interventions for greater health impact. This requires continued investment not only in hardware, software, and other technologies, but also in people, who are key to the success of any health system and in capacity building.

It is important to move forward and act on some of the recommendations and lessons that have been generated by previous research studies. For example, in *Improving Health, Connecting People: The Role of ICTs in the Health Sector of Development Countries, Working Paper No. 1, 2007*, the authors present the following lessons learned on using ICTs to help strengthen health systems:

- Pay attention to past experience.
- Involve users in the planning and design of the system.
- Build information cultures.
- Strengthen the capacity of users.
- Set realistic goals.
- Focus on the benefits of the system, rather than the technology.

In the face of rapid change, many health care needs as well as health system needs remain constant: the need for reliable, accessible family planning methods and family planning/reproductive health services; the demand for continuing education for health workers at all levels of the health system; the need for reliable health information as well as a regular supply of vaccines and medicines; and the need to overcome gender inequities so women are able to take control of their own health. Young people, with their open embrace of technology and their seemingly natural aptitude for mastering it quickly, can be a critical resource as ICT addresses these needs.

While it seems that technology is changing every nanosecond, the astounding pace has led to many advances in the global health community, as the examples in this paper have shown. ICT can play an important role in addressing all these needs and in the delivery of quality, efficient health care services and the overall support of the health system, especially if the scale-up of ICT interventions takes into account the conditions for success outlined in this paper.

APPENDIX A: ICT-Related Definitions

Information communication technologies (ICTs): tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means. This encompasses the full range of electronic digital and analog ICTs, from radio and television to telephones (fixed and mobile), computers, and electronic-based media such as digital text, audio-video recording, and the Internet, including Web 2.0 and 3.0, social networking, and web-based communities (GAID 2010).

Information and Communication Technology for Development (ICT4D): a relatively new and highly dynamic field of development interventions that use ICT to help poor and marginalized communities across the world benefit from modern technology that improves the quality of their lives. ICT4D is by nature multidisciplinary, and its interventions require a multi-stakeholder approach, not least to keep abreast with and take full advantage of rapid technological developments (SPIDER 2011).

Electronic Health (eHealth): the combined use of electronic communication and information technology in the health sector for “cost-effective and secure use of ICT in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge, and research” [WHO]. Key eHealth applications include, but are not limited to, electronic medical records, telemedicine, health information networks, decision-support tools, Internet-based technologies and services, digital imaging, computer-assisted surgery, wearable and portable monitoring systems, and health portals (Open Clinical 2011).

Mobile Health (mHealth): a new field of eHealth that supports health service provision and information via mobile and wireless technologies. According to the WHO’s Global Observatory for eHealth (GOe), mHealth is “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices. mHealth involves the use and capitalization on a mobile phone’s core utility of voice and short messaging service (SMS) as well as more complex functionalities and applications including general packet radio service, third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system (GPS), and Bluetooth technology” (WHO 2011).

mHealth Education (mHealthEd): an emerging new set of applications designed for mobile devices and used for training, testing, supporting, and supervising health care workers, as well as applications that provide health information to individuals (iheed 2011).

APPENDIX B: Matrix on ICTs and Family Planning/Reproductive Health

What issues currently dominate ICT use in FP/RH (principally with regards to e-Health)?			What emerging technologies are likely to impact health care?	How does research inform e-health?	How do developments in e-health inform research?
Professional Clinical Informatics	Electronic Patient/Health Records (EPR, EHR)	Consumer Health Informatics	New Technologies	Research Input	Research Outcomes
<ul style="list-style-type: none"> - Decision aids for practitioners (prompts, reminders, care pathways, guidelines) - Clinical management tools (electronic health records, audit tools) - Educational aids (guidelines, medical teaching) - Electronic clinical communications tools (referral, booking, discharge; correspondence, clinical email/second opinion, laboratory test requesting and results reporting) - Electronic networks (clinical networking systems) - Condition-specific tools and information (diabetes informatics; hypertension informatics; etc.) - Telemedicine applications (for interprofessional communication, patient communication and remote consultation) - Subfields (nursing & primary care informatics) 	<ul style="list-style-type: none"> - Electronic medical records. Record linkage. Databases and Population registers - Achieving multiprofessional access. Technical and ethical issues. - Data protection/ security issues - Patient access and control - Integration with other services (social work, police in case of rape) - Clinical coding issues (terminologies) - Organizational Management <ol style="list-style-type: none"> 1. Billing and tracking systems 2. Audit & quality assessment systems 3. HRH 	<ul style="list-style-type: none"> - Decision aids for patients facing difficult choices (genetic screening) - Information on the Web and/or digital TV (public information and educational tools for specific clinical groups) - Clinician-patient communication tools: <ol style="list-style-type: none"> 1. Remote: Clinical e-mail and Web-based messaging systems for consultation, disease monitoring, service-oriented tasks (appointment booking, prescription reordering). 2. Proximal: Shared decision-making tools, informed consent aids 3. Mixed: Online screening tools (for depression) and therapeutic interventions (cognitive behavior therapy) - Access and equity issues (data protection issues, the Digital Divide) - Quality issues for health information on the net <ul style="list-style-type: none"> - "virtual" health communities 	<ul style="list-style-type: none"> - Satellite communications (for remote medicine) - Wireless networks (within hospitals, across geographical areas) - Palmtop technologies (for information, for records) - New mobile telephones - Digital TV (for disseminating health information & communicating with patients) - The WWW and its applications for health (issues: quality control, confidentiality, access) - Virtual reality 	<ul style="list-style-type: none"> - Development - Need for user involvement in product conception, design and testing. Iterative development. Needs assessment, accessibility and usability research. Multifaceted expertise required. - Implementation Understanding people and organizational factors, system acceptability, resistance to change. Use of tailored implementation. 	<ul style="list-style-type: none"> - Potential of electronic databases such as population registers for epidemiological research. - Research into the impact or use of informatics tools suggests appropriate and cost-effective priorities for policy makers. - Areas of crossover (bioinformatics)

Source: Vital Wave Consulting, 2011

APPENDIX C: References and Resources

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