e-Health Tools for the Asia-Pacific Region

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APDIP e-Notes present an analytical overview of specific issues related to information and communication technologies for sustainable human development in the Asia-Pacific region. APDIP e-Notes are developed by the United Nations Development Programme's Asia-Pacific Development Information Programme (UNDP-APDIP) based at the UNDP Regional Centre in Bangkok, Thailand. For more information, visit http://www.apdip.net or contact info@apdip.net

Summary

e-Health, defined as the use of information and communications technology (ICT) in health care, is emerging as a field of great potential when it comes to dealing with some of the critical problems the health sector in many Asia-Pacific countries are facing. e-Health can contribute to solutions in such different areas as lack of specialized staff, shortage of medical expertise in rural areas, limited access to medical education and scarce data on health-related issues. e-Health also has the potential of enabling women and men in communities to actively participate in and engage with their own health situation.

There is, however, a need to be cautious: e-Health may help to address significant health problems, but it does not solve them on its own. Furthermore, many e-Health tools can be very expensive to acquire, demand maintenance and adjustment, and require specific skills in using the tools, adding to their overall costs. This APDIP e-Note takes a look at the potentials, pitfalls and challenges of e-Health in the Asia-Pacific region, and identifies a number of different approaches policy makers and practitioners can take in order to enhance the effective use of appropriate e-Health tools for the best-suited health purposes.

This APDIP e-Note highlights important lessons learned in e-Health in the Asia-Pacific region are through three case studies from Indonesia, Philippines and Thailand. It also examines different approaches to e-Health, such as the use of free and open source software (FOSS) and the relationship between e-Health and the Millennium Development Goals (MDGs). Finally, considerations for policy makers are discussed.

It is critical to focus on the multi-disciplinary nature of e-Health bringing together researchers from both medicine and IT in a mutually beneficial relationship. Ensuring sustainability of e-Health projects by moving from proof of concept to country- or sector-wide implementation is an emerging challenge. Issues related to interoperability and security also need to be addressed.

What is e-Health?

e-Health is the use of ICT in health care. e-Health includes telemedicine, where medical advice or consultation is provided over long distances via Internet, radio, telephone or other communication technologies. e-Health also refers to the use of ICT for dissemination of health-related information, such as HIV/AIDS and vaccination hubs, using radio, television, Internet or short message service (SMS). Moreover, e-Health is used in hospitals for management, medical data collection or statistical purposes.

Other terms for e-Health include tele-health, telemedicine and health informatics, but instead of using them interchangeably, this *APDIP e-Note* uses e-Health as the umbrella term that includes all aspects of ICT use in health care.

It is significant that 'health' in relation to e-Health should be understood broadly as human well-being, and not only as the absence of disease. This understanding of health was officially recognized by the World Health Organization (WHO) Member States in the Alma-Ata Declaration in 1978.[1] The Declaration strongly emphasized the universal right of all people to primary health care and the role of all sectors in ensuring social development within this area. With its ability to facilitate and enhance the dissemination of health information, e-Health could in fact be the enabler of some of the Declaration's core ideas of empowering women and men to take control of their individual and community's health and well-being. The potential of mobile computing and other ICTs in e-Health is currently challenging information asymmetry and

[1] http://www.who.int/hpr/NPH/docs/declaration_almaata.pdf

ignorance in health; thereby taking important steps in realizing the Declaration of Alma-Ata.

What e-Health tools are available?

There is a wide range of available tools that can be used in e-Health. Some of the most utilized tools are:[2]

- **Hospital Information Systems**
  Computer-based information systems that support information processing within a hospital, in areas such as administration, appointments, billing, planning, budgeting and personnel.

- **General Practitioner Information Systems**
  ICT-based systems that support the work of a general practitioner or primary health care practitioner. The functions required by countries can be quite different due to variations in health care models.

- **National Registries**
  Electronic databases containing records on specific medical subjects or national pharmaceutical information. They can contain data on births, mortality, cancer, diabetes, risks of exposure to drugs during pregnancy, or potential drug interactions.

- **Electronic Health Records (eHR)**
  Also called Electronic Medical Records, eHRs of a patient's clinical history are used to support clinical actions by health professionals. Through ICT, eHR can be made rapidly available and information can potentially be shared among various instances of the health sector.

- **Decision Support Systems**
  Automated or semi-automated systems that support clinical staff, mainly doctors, in decision-making.

- **Surveillance and Monitoring of Diseases through Geographical Information Systems (GIS)**
  GIS are computer-based applications for capturing, integrating, analysing and displaying medical data related to geographical coordinates.

- **Telehealth**
  The use of ICT to either support the provision of health care or as an alternative to direct professional care. It encompasses telemedicine and the use of remote medical expertise.

One field - two logics

e-Health should fundamentally be a multi- or bi-disciplinary field, with the two most important disciplines involved being health care and IT. Professionals from these two fields have to collaborate when developing e-Health tools and solutions. The different nature of these two fields significantly influences the design of the e-Health solutions that are currently available. One issue that is raised especially within this meeting of professions is the overall suitability of medical work for computer support.

Medical work is characterized by a great deal of interruptions, a lot of walking and collaborative practices, such as discussions with many different colleagues throughout the hospital or clinic. It is as such not suited for sitting in front of a computer. Furthermore, medical work can be quite complex and encompass a high degree of unpredictability. It demands a high degree of flexibility of the health care practitioners and consequently of the tools that are designed to support medical work.

Many ICT tools, on the other hand, are designed to be used in an office environment, where individuals work on their own computers. Additionally, software development is characterized by a high degree of structure. Computer tools quite often do not provide a lot of flexibility, as they most likely will need unique identifiers in order to produce specific results. For instance, if one wish to build a statistical tool based on data from patient records it requires that all data is entered in the same way using the same codes and identifiers, if the system should be able to make comparisons.

In dealing with e-Health, it is important to not only deal with computer development but also be highly aware of the specific context and its characteristic in order to design tools that are useable. Health care practitioners, on the other hand, will need to pay attention to the precise demands of computer work.

Lessons learned from e-Health projects in the Asia-Pacific region

e-Health is becoming an integrated part of health care in the Asia-Pacific region where a great variety of e-Health projects are being developed. Although many of these projects tend to be pilot studies or research projects, the results are generally positive and encourage further studies and work in this area. They all provide important lessons learned for future e-Health projects. The following three examples of e-Health projects in Indonesia, Philippines and Thailand highlight a few of these lessons learned.

Dengue Surveillance, Indonesia
(http://www.apdip.net/resources/case/rnd50)
Dengue fever is the leading cause of hospitalization and death among children in Indonesia. The ability to prevent and manage dengue outbreaks is often limited by poor disease detection, surveillance and management systems, and a corresponding lack of coordination among community-based control efforts. This project aimed to involve the local government, community members and health care personnel in the development of an integrated, web-based GIS to monitor and detect outbreaks of dengue.

The system, piloted in Sleman district, is currently being tested in other districts and there are plans to expand it to map other diseases, such as tuberculosis. The

[2] Parts of the list are adopted from WHO eHealth, Tools and Services.
http://www.who.int/entity/kms/initiatives/tools_and_services_final.pdf

system uses FOSS applications due to their low acquiring costs.

Lessons learned: Technically, there have been no significant problems in setting the system up and training staff to use it, as their technical skills have been rather high. However, it has been more challenging to create a 'culture' around using the system, entering data, and reporting systematically and routinely through electronic means.

CHITS, Philippines
(http://chits.mudfish.info/HomePage)
The Community Health Information Tracking System (CHITS) is a computerized data collection system aimed at improving the reporting structure from rural health units to the public health system in the Philippines. It is an extensible, modular, open source information system that is used to collect existing routine health data using the Department of Health's Field Health Service Information System. CHITS aims to make community-based health information available not only to public health agencies requiring community-level information but also to the community who generates the information. The community can use this information for local decision-making and health planning. CHITS began in Pasay and has now been expanded to more than seven municipalities around the country.

Lessons learned: The system has made data collection and consolidation easier for the local health workers, as it has eliminated bottlenecks in the system and improved the preciseness of the data. Social aspects played a more important role than technical aspects in the implementation of the project, as the community health care workers first had to familiarize themselves with computers to use the program. Using games as an alternative approach to ICT training has proven successful in assimilating health care workers to computers, and has reduced their reluctance towards using technology.

Hospital OS, Thailand
(http://www.hospital-os.com/en)
The project team developed a low-cost hospital information system, which is affordable to smaller and rural hospitals that often lack not only medical capacities but also IT capacities. The functionalities of the system include workflow management, appointment making, billing and patient registration. Costs are kept low by developing the system using FOSS applications. Hospitals that are using Hospital OS are linked together in a virtual community in order to facilitate knowledge sharing among smaller hospitals. Currently, 50 hospitals in Thailand are using the Hospital OS software.

Lessons learned: The virtual community model has made it possible to deliver IT solutions to hospitals that otherwise might not have had access to it or only would have waited with using IT. The model has also shown to be effective in maintaining and developing the system after installation, which is significant in terms of ensuring sustainability. There has been a high level of interest among hospital staff to learn to use and implement the software and, surprisingly, it has not been difficult teaching hospital staff to customize the software. Even staff, such as hospital drivers, with no prior training in software development, has learned to do so.

Overall experience
Many e-Health projects in the Asia-Pacific region are pilot projects, donor-supported research and development projects, or projects affiliated with research institution such as universities or major hospitals in the larger cities. This is also the case in the African region. However, in Europe and the United States, e-Health projects have generally passed the stage of piloting and have moved towards large-scale implementation on a country-wide basis. Efforts are also emerging in scaling up the research approach in larger e-Health initiatives in the Asia-Pacific Region. The Aga Khan University in Pakistan has for example, in 2007, received a large grant from the International Development Research Centre of Canada to manage a comprehensive study of capacity development in e-Health in 18 developing countries in Asia.[3]

What are the potentials of e-Health?

e-Health applications are showing an increasing potential around the world. In developing regions, the potential is especially focused on the use of e-Health to solve some critical problems of the health sector, such as a need for more specialized staff, improve management of hospitals, react quickly in disaster situations, address after-effects of disasters, and deal with and inform citizens of endemics and epidemics.

One promising area is the ability to reach remote citizens and communities through Internet, phones and satellite technology (or telemedicine). This is particularly useful for small islands states or countries where citizens live in remote areas. This approach provides the possibility to consult an expert, get a second opinion, and seek validation from another practitioner. It can also be instrumental in providing continuous education to practitioners working in remote and rural areas, thereby reducing the rate of rural depopulation. Furthermore, there are some indication that telemedicine may reduce costs in terms of travel expenses.[4]

Popular technologies that have already proven useful in developing regions also carry a significant potential in enabling and facilitating e-Health. Mobile phones and personal digital assistants, for example, capable of sending data through voice, SMS or the Internet, can be an efficient substitute for computers, which are more costly. Currently, large companies such as IBM, Microsoft, Motorola, Nokia and Sony Ericsson are engaging in research activity on mobile e-Health. The most prominent example is the public-private

[3] http://www.aku.edu/CHS/chs-grants1.shtml
[4] This has been seen especially in the Scandinavian region where telemedicine is an area undergoing much research. See: Bergmo, Trine S. (2000) 'A cost-minimization analysis of a realtime teledermatology service in northern Norway', *Journal of Telemedicine and Telecare*, Vol. 6, No.5, pp. 273-277; and Danish Centre for Health Telematics (2006) 'Telemedicine in practical application'. http://www.medcom.dk/dwn1177

partnership 'Phones for Health', a US$10 million initiative to combat HIV/AIDS in 10 countries in Africa.[5]

Other potentials include:

- Improving medical data collection through the use of GIS and other surveillance systems. Medical reporting to government or other authorities can also be significantly improved using ICT.
- Increasing efficiency in hospital management and administration.[6]
- Disseminating health information more effectively. ICT makes it possible to reach a large audience through many channels, such as radio, television and the Internet. This can be useful in disaster situations but also for public health information on how to handle specific diseases or outbreaks.

By examining the potentials of e-Health, it becomes quite clear that it contributes positively to solving some of the problems that are challenging the health sector in many developing countries. However, it is also clear that e-Health alone cannot achieve better health for people living in poor areas.

What are the challenges of e-Health?

Utilizing e-Health tools in the health sectors in developing countries pose a number of challenges. Costs and scaling up are two well-known and broadly discussed challenges. Investing in and implementing ICT is not cheap in itself, and maintenance and customizing the equipment following implementation can be a big amount in health budgets that may reach up to US$70 per citizen per year.[7] The problem of up scaling is reflected in the many pilots where the new focus will have to be on how to move from a proof of concept approach to large-scale country- or sector-wide implementation.

A less tangible, but yet critical, challenge is to develop capacity in all aspects of the e-Health field. As illustrated by the three Asia-Pacific examples of e-Health projects, it is not always enough to invest solely in the hardware and software. Human capacity is especially critical in order to achieve successful project implementation. There is a need for human capacity both in terms of general ICT skills, but also more specifically in understanding the interplay between medical and computer work that provide the common ground for developing appropriate e-Health tools.

Furthermore, capacities are needed at both organizational and structural levels, in terms of strategic implementation of e-Health in the health care sectors. It is important to note that the health care sector, traditionally, lags far behind other industries (such as finance, education, and government) in the adoption of technology. The cost attendant to e-Health is usually behavioural, rather than strictly technological or financial. e-Health tools may be technically feasible and can be cost-effective, but health care workers may not use these tools because they find it too time consuming to adapt their work routines to the tools. For example, as of 2005, the adoption rate of electronic medical records by US physicians was only 23.9 percent.[8]

e-Health technologies need to be developed to interact as seamlessly as possible to the workflow of health care workers. Securing interoperability is a significant challenge that requires attention as e-Health projects start to grow in size and numbers. An interoperability framework[9] is required, both nationally and internationally, to ensure that systems developed at one hospital are compatible with the ICT standards of another hospital. An interoperability framework can also help promote the exchange of e-Health applications between countries. Equally important, the role of a number of legal issues in e-Health, such as protection of patient data, needs further examination.

What about FOSS and e-Health?

The use of FOSS applications can help deal with some of the challenges in e-Health, and it has been widely utilized in e-Health projects in the Asia-Pacific region. FOSS is especially popular because it is a relatively cheap solution due to its low acquiring costs. But there are also other reasons for using FOSS in health care. FOSS may, for instance, make it easier to achieve interoperability as the accessibility to the program's source code allows any user to modify the code to ensure compliance with open standards for interoperability. Experiences from a variety of projects show that for first-time users, learning to use a FOSS-based application is not more complicated than learning any other software application.

Specific challenges entailing use of FOSS are scalability of the applications and legal issues in terms liability for errors caused by the software. This is relevant because many developers usually work on the same piece of FOSS application without being affiliated with the same company or organization. It is also evident to note that even though using FOSS brings down the acquiring costs to the individual hospital or health system, it cannot bring down the costs of implementation and training with the same significance. There are emerging joint efforts in expanding the use and understanding of the potential of FOSS in health. For example, the Open Source Health Care Alliance is working internationally to exchange knowledge and lessons learned in the areas of FOSS and e-Health.

What role can e-Health play in relation to the MDGs?

A close link between health and human development was established in the Alma-Ata Declaration in 1978. This relationship is also present in the MDGs where health holds a significant position. Out of the eight

[5] http://www.pepfar.gov/c21414.htm
[6] *Info*Dev. Improving Health, Connecting People. http://infodev.org/en/Publication.84.html
[7] http://hdr.undp.org/hdr2006/statistics/indicators/52.html
[8] http://www.cdc.gov/nchs/products/pubs/pubd/hestats/electronic/electronic.htm
[9] See UNDP-APDIP's Government Interoperability Framework Project Website. http://www.apdip.net/projects/gif

goals, four are related to health: (1) Eradicate extreme poverty and hunger, (4) reduce child mortality, (5) improve maternal health, and (6) combat HIV/AIDS, malaria and other diseases.[10]

As e-Health is not a solution in itself, but rather a selection of tools that can be used in health care, it alone cannot deliver on these goals. But it is highly instrumental in the work towards achieving these goals and the specific targets and indicators within them. Through ICT, information on preventive behaviour in relation to child mortality or HIV/AIDS has been effectively disseminated to targeted audiences. Satellite-based surveillance of weather and epidemiological variables has assisted in eradicating and controlling river blindness (onchocerciasis) in West Africa.[11] These two examples as well as the previous examples of e-Health examined in this *APDIP e-Note* all constitute part of the efforts in reaching the health-related MDGs.

Considerations for policy makers

e-Health is a rather new field where much research and implementation has been done in pilot projects and research projects to define and shape the potential and relevance of e-Health tools. It is critical to focus on the multi-disciplinary nature of e-Health bringing together researchers from both medicine and computer science in a mutually beneficial relationship. Ensuring sustainability of e-Health projects by moving from proof of concept to country- or sector-wide implementation is an emerging challenge that needs attention within the field of e-Health.

Attention is especially needed in the following four areas:

1. Large-scale implementation

- Research in building models for long-term projects within the various fields of e-Health.
- Integration of other sectors in the framework for e-Health support, for example the telesector or the Internet providers.

2. Ensuring sustainability

- Although this may already be a component of large-scale implementation, many e-Health projects suffer from 'pilotitis' and are not sustainable beyond the pilot stage.
- Business management expertise may be required to determine the financial and operational viability of an e-Health initiative.

3. Supportive legal and political environments

- Creation of a supportive political environment where issues such as legal support and securing funding are dealt with.
- Development of interoperability frameworks directly targeted at e-Health.

4. Development of cross-disciplinary competences

- Integrated education in e-Health – for example, medical education and education in computer science.
- Enhanced general IT education in primary schools to build further competencies in this area.

As exemplified by the amount of tools and areas within health care work where ICT can be applied, e-Health is a very broad field. This *APDIP e-Note* provides an overview of the field. However, it is critical to note that a solution/recommendation for one aspect of the field might not be relevant or suited for another aspect of the field.

In e-Health it is necessary to recognize the potential offered by each individual tool and to use each tool in an appropriate way that, above all, aims at improving health and enhance the individual's capability of leading a healthy life.

~Stine Loft Rasmussen

Additional Reading

Dougherty, M. (2006) *Exploring New Modalities: Experiences with Information and Communications Technology Interventions in the Asia-Pacific Region – A Review and Analysis of the Pan-Asia ICT R&D Grants Programme*, UNDP-APDIP ICT4D Series (see case studies on Health and Medicine). http://www.apdip.net/publications/ict4d/ExploringNewModalities.pdf

Chetley, A. (2006) *Improving Health, Connecting People: The role of ICT in the health sector in developing countries – A framework paper*, *info*Dev. http://infodev.org/en/Publication.84.html

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[10] For a detailed list of Health in the Millennium Development Goals see: http://www.who.int/mdg/goals/en/index.html

[11] Merrel, R.C., et al.: 'Satellite applications for telehealth in the developing world', Journal of Telemedicine and Telecare, 2006.