

The “e-well”

ICT-enabled integrated, multisectorial development of rural areas in the least developed countries

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Abstract: ICT has the potential to improve the quality and efficiency of cooperation and development efforts. However, there is a risk that ICT-enabled development projects will worsen the digital divide between urban and rural areas. It is therefore crucial to involve rural areas early in these development efforts, to make sure that their specific needs are addressed. Experiences in the field of health and healthcare have shown the potential of multilateral co-operation, the involvement of the periphery and the importance of supporting local contents development. Obviously, one of the challenges is to find sustainable ways to promote the ICT development of remote, rural communities. It is likely that specific solutions will be needed in different cultural and social contexts, but that replicable concepts will be identified. The proposed project, the “e-well”, based on a pilot implementation in rural Mali, will enable a reciprocal learning from parallel experiences of ICT-enabled multi-sectoral, integrated development plans, in several villages from different settings in Western Africa.

Key words: developing countries, Digital Divide, Internet access, rural areas, sustainable development, tele-medicine

DEVELOPMENT EFFORTS CAN WORSEN THE “DIGITAL DIVIDE”

Technological progress usually creates inequities, at least initially. This is notable in all societal aspects, at the global level, and in the information society in particular, where these inequities separate the information-rich from the information-poor populations, creating the so-called “digital divide”.

In most development efforts, there is a natural tendency to develop centrifugal projects, starting from the main cities where the wealth and the expertise is often concentrated, towards the periphery, following the deployment of infrastructures such as roads and telephones. When dealing with ICT, these development efforts carry the risk of inducing additional inequities. Such “induced digital divide” could probably be prevented by giving special attention to the needs of the remote, underserved areas, in order to have them connected early to the development efforts, and therefore in a position to influence the whole project.

Global connectivity enables new forms of deployment, which can be decentralized from the beginning. What is now relatively easy at the technological level, is somewhat more complicated at the contents level. Creating contents of quality requires skills that are more difficult to solve by technology, and more difficult to decentralize. This “contents gap” between the rich and poor countries, between the urban and rural areas, is therefore an other, non-technological, expression of the digital divide.

LESSONS LEARNED FROM THE TELEMEDICINE PROJECTS IN MALI

Telemedicine tools enable the communication and sharing of medical information in electronic form, and thus facilitate access to remote expertise. A physician located far from a reference centre can thus consult colleagues remotely in order to resolve a difficult case, follow a course over the Internet, or access medical information from digital libraries or knowledge bases. These same tools can also be used to facilitate exchanges between centres of medical expertise: health institutions of a same country as well as across borders. The potential of these tools is particularly evident in developing countries where specialists are few and generally concentrated in large cities, and where geographical distances and the quality of the infrastructure often hinder the movement of physicians or patients.

A project named « Keneya Blown » (the “health hallway” in Bambara language), was initiated in 2001 by the Mali University Medical School in Bamako, and financed by the Geneva government and the Geneva University Hospitals. Several goals were set: a) develop and use Internet-based connections between the national and regional healthcare institutions, b) implement basic services such as e-mail and a medical Web portal, c) implement a low-bandwidth, Internet-based distance learning system (<http://www.unige.ch/e-cours>), d) evaluate the feasibility of long distance collaborations for continuing medical education and tele-consultations.

Various types of collaboration have been enabled by the project:

- North-South tele-education: topics for post-graduate continuing medical education are requested by physicians in Bamako; courses are then prepared by experts in Switzerland and then broadcasted over the Internet from Geneva. New courses are produced and broadcasted on a bi-monthly basis, on a variety of topics. The material is also saved and can be replayed from the medical Web portal. Typically, these courses are followed by 50 to 100 physicians and students in a specially-equipped auditorium in the Bamako University Hospital, and also by smaller groups or individuals in the Segou and Tombouctou regional hospitals, and in other French-speaking countries in Africa: Senegal, Mauritania, Chad, Morocco, Tunisia.
- Webcasting of scientific conferences: several sessions of international conferences have been broadcasted, with simultaneous translation in French, in order to make the presentations accessible to colleagues in Mali, where the practice of the English language is still limited. Using the instant messaging feature of the system, remote participants can intervene and ask questions to the speakers.
- South-South tele-education: post-graduate and public health courses, developed by the various health institutions in Bamako, are webcasted to regional hospitals in Mali and to other partners in Western Africa. The contents produced are anchored in local, economical, epidemiological and cultural realities, and provides directly applicable information.
- South-North tele-education: medical students training in tropical medicine in Geneva follow courses and seminars organized by experts in Mali on topics such as leprosy or iodine deficiency. The exposure to real-world problems and field experts enables a better understanding of the challenges for developing and implementing healthcare and public health projects in unfamiliar settings.
- North-South tele-consultation: the same system can be used to send high-quality images enabling the remote examination of patients or the review of radiographic images. Tele-consultations are held regularly, in areas

where expertise is not available in Mali, such as neurosurgery or oncology.

- South-South tele-consultation: physicians in regional hospitals can request second opinions or expert advice from their colleagues in the university hospitals, via e-mail, including the exchange of images obtained using digital still cameras.
- South-North tele-consultation: the case of a leprosy patient, followed in Geneva, has been discussed using the tele-consultation system, and enabled the expert in Bamako to adjust the treatment strategy.

This three-year experience in deploying a telemedicine network in Mali has led to several useful observations:

- a) ICT may increase the digital divide;
- b) ICT can reduce some of the health system's fractures;
- c) local contents development is a major challenge, and
- d) South-South networks are most relevant.

ICT may increase the digital divide

It is obvious that ICT serve first those who have access to it, and therefore tend to put at higher priority exchanges between technologically equipped partners. In our experience, initial telemedicine activities were oriented towards leading-edge medical practices, and the exchange of expert advice between teaching centres. Primary care or public health topics were not seen as priorities. This can be explained by the type of partners involved initially, representing mostly tertiary care, teaching medical centres.

Paradoxically, the main benefit of telemedicine should be seen in remote areas, where expertise is lacking and where the main problems are likely to be at the primary care and public health. Medical infrastructure available in such remote areas also prevents the application of leading-edge, often technologically advanced, practices.

ICT can reduce the health system's divides

At the same time, the deployment of telemedicine tools in regional hospitals greatly improved continuing medical education opportunities and enabled some forms of teleconsultations, in particular for second opinions on radiological images.

Further to the periphery of the network, the implementation of a satellite-based internet connection in a rural hospital was a strong enough incentive

that motivated a physician to accept the job in the remote village, provided he could stay in contact with his colleagues and follow training courses via the e-learning environment.

Local contents development is a major challenge

Local medical content is a key for the acceptance and diffusion of health information, and is also essential for productive exchanges in a network of partners. It enables the translation of global medical knowledge to the local realities, including the integration of traditional knowledge. Medical content-management requires several levels of skills: technical skills for the creation and management of on-line material, medical librarian skills for appropriate contents organisation and validation, and specific skills related to the assessment of the quality and trustworthiness of the published information, including the adherence to codes of conducts such as the HONcode.

South-south networks are most relevant

At the content level, there is a steady demand for North-South distance learning. However, several topics for seminars, requested by physicians in Mali, could not be satisfactorily addressed by experts in Switzerland, due to major differences in diagnostic and therapeutic resources, and to discrepancies in the cultural or social contexts. For instance, there is no magnetic resonance imaging capability in Mali and the only CT-scanner has been unavailable for months. Chemotherapeutic agents are too expensive and their manipulation requires unavailable expertise. Even though diagnostic and therapeutic strategies could be adapted, practical experience is lacking, and other axes for collaboration must be found. A promising perspective is the fostering, through decentralized collaborative networks, of South-South exchanges of expertise. For example, there is neurosurgical expertise in Dakar, Senegal, which is a neighbouring country to Mali. A tele-consultation between these two countries would make sense for two reasons: a) physicians in Senegal understand the context of Mali much better than those from northern countries, and b) a patient requiring neurosurgical treatment would most likely be treated in Dakar rather than in Europe.

Based on the lessons learned during the pilot project, a larger, four-year project involving six countries of Western and Northern Africa has been launched in 2003: the RAFT project (Telemedicine Network in French-speaking Africa). The following aspects are emphasized:

- The development of a telemedicine infrastructure in teaching medical centres, and their connection to national and international computer networks, in order to foster multi-lateral medical expertise exchanges, with a predominant South-South orientation.
- The use of asynchronous, collaborative environments that enable the creation of virtual communities and the control of workflow for getting expert advice or second opinions, in a way that is compatible with the local care processes.
- The deployment of internet access points in rural areas, with the use of satellite technology, enabling not only telemedicine applications but also other tools for assisting integrated, multi-sectoral development, and, in particular, education, culture and the local economy. The mini-VSAT technology, recently deployed over Western Africa, offers an affordable, ADSL-like connectivity. Sustainable economical models, based on the successful experiences with cybercafés in Africa, are being developed to foster the appropriation of this infrastructure by rural communities.
- The development and maintenance of locally- and culturally-adapted medical contents, in order to best serve the local needs that are rarely covered by medical resources available on the internet. New tools are being developed: regionalized search engines, open source approaches, and adapted ethical codes of conduct. The Cybertheses project (<http://www.cybertheses.org>) and the resources from the Health On the Net Foundation (<http://www.hon.ch>) are used to train physicians, medical documentalists and librarians.

THE DIMMBAL.CH PROJECT: MULTI-SECTORAL INTEGRATED DEVELOPMENT IN RURAL MALI

Sustainability

One of the key challenges of development projects is their economic sustainability. Sustainability can be improved by enabling simultaneous development activities in multiple sectors (education, health, economy, culture). This requires a significant effort, geographically-focused, involving most of the stakeholders of the community, in order to reach a significant increase in development, compatible with long-term sustainability of the process and results.

Reciprocal enabling

Collaboration between a scientific research team and the local authorities of the commune of Dimmbal, in Dogon country, Mali has led to the elaboration of a four-year multi-sectoral integrated development plan (<http://www.dimmbal.ch>). The strategy is to obtain a critical mass of cross-enabling activities so that their appropriation by the population and long-term sustainability are improved.

For example, it is accepted that young adults leave the village during the dry season in search for employment, usually in the large cities, where they are more likely to catch sexually-transmitted diseases, and bring these back to the village. Developing local industries could therefore, by occupying these young adults, reduce potentially dangerous behaviours.

Many of these activities can be enabled by a satellite-based internet connection: the telecentre. Main sectors and activities of the projects include:

- Infrastructure: construction of a telecentre and media library, training of local coordinators to the techniques of management and ICT.
- Education: extension of the primary school buildings, reading and writing classes for adults, continuing training for teachers via the internet.
- Economy: support to the development of local enterprises and industry, valorisation of local, traditional knowledge, reforestation and plantation of medicinal herbs.
- Health: additional wells and forages, extension of the local dispensary, creation of a laboratory for medical analyses, integration of traditional medicine in the practice of the dispensary.
- Culture: valorisation of history and traditions by ethno-historical and archaeological research, support of the local theatre team, publication of paper-based and electronic documents.

The project also develops evaluation tools, in particular to measure the hypothesized enabling of the various activities and to validate the economical sustainability of the approach.

THE “E-WELL” PROJECT: LEARNING FROM PARALLEL DEVELOPMENT EFFORTS

The “e-well” symbolizes the central, multi-functional role of ICT, as an enabler of development efforts. It is likely that success factors and obstacles in such projects will be educative to similar projects in other settings. The goal of the « e-well » project is to run several development projects in different rural settings in developing countries, and to evaluate, compare and

share results in order to learn collectively from the various experiments. This would enable a south-south learning network focusing on knowledge about the technical, social and economical engineering of rural development projects. The expected outcome is a better understanding of the potential, success factors, impact and sustainability, of integrated, multi-sectoral approaches to the development of rural areas in different settings.

The “e-well” project plans to include 6 different sites with four-year development plans, and various coordination, evaluation and sharing activities between the local coordinators of each site. The project is designed to run over 7 years (2004-2010), for a total budget of €6'500'000, under the coordination of the AGENTIS, a UNITAR project, part of the decentralized cooperation programme, dedicated to exploit the potential of information and communication technologies for development and social initiatives.

BIOGRAPHY

Antoine Geissbuhler is a Professor of Medical Informatics at Geneva University School of Medicine, and Director of the Division of the Medical Informatics at Geneva University Hospitals.

A Philips European Young Scientist first award laureate, he graduated from Geneva University School of Medicine in 1991 and received his doctorate for work on tri-dimensional reconstruction of positron emission tomography images. He then trained in internal medicine at Geneva University Hospitals under the direction of Prof. Francis Waldvogel. After a post-doctoral fellowship in medical informatics at the University of Pittsburgh and Vanderbilt University, he became associate professor of biomedical informatics and vice-chairman of the Division of Biomedical Informatics at Vanderbilt University Medical Center, under the mentorship of Prof. Randolph Miller and Prof. William Stead, working primarily on the development of clinical information systems and knowledge-management tools. In 1999, he returned to Geneva to head the Division of Medical Informatics in Geneva University Hospitals and School of Medicine, following in the steps of Prof. Jean-Raoul Scherrer who founded this world-renowned group.

His current research focuses on the development of innovative computer-based tools for improving the quality and efficiency of care processes, at the local level of the hospital, the regional level of a community healthcare informatics network, and at the global level with the development of a south-south telemedicine network in Western Africa.

Ousmane Ly is the Executive Coordinator of "Keneya Blown", the technical structure of Mali Network of Information and Medical Telecommunication (REIMICOM). Dr. Ly has a PhD in Medicine and a BSc in Biological Sciences. Currently, he is preparing his Post Medical Computing University Certificate in the University of Geneva. Mr Ly is also a member of the ATAC (African Technical Advisory Committee / United Nations Economic Commission for Africa, ECA).

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