

Building collaborative networks in Africa on health information systems and open source software development – Experiences from the HISP/BEANISH network

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Abstract:

The development and running of efficient and appropriate Health Information Systems, while urgently needed, are difficult to achieve and depend heavily on skill and human resources, which tend to be in short supply African countries. One way to address the human resource problem in this area is to develop cross-country collaboration for sharing of resources, best practices, software and learning. The HISP/BEANISH network is made up of a number of African and Asian countries and is developed with such aims. The focus of this network is to develop cross-country collaboration on research and development in the area of Health Information Systems (HIS) and Free and Open Source Software as well as on the development of educational programs. This article will describe and discuss experiences from the HISP/BEANISH network and pinpoint some key challenges.

INTRODUCTION

Poor health status, rampant diseases such as HIV/AIDS and inadequate health services are seriously hampering human, social and economic development in Africa. Considerable efforts are currently being made by African governments as well as by international aid and United Nations agencies to address these problems. Appropriate Health Information Systems (HIS) are seen as crucial in this respect [1]. On the ground, however, HIS development in developing countries has proved to be difficult due to organizational complexity [2], fragmented and uncoordinated organizational structures all maintaining their own HIS [3], unrealistic ambitions [4], and more generally due to the problem of human resources and sustainability [5]. Each African country alone has tended to be too poorly equipped with human resources and knowledge about practical and appropriate HIS development to take full advantage of the potential given by modern ICT. One way of addressing the problem of the poor resource base in each individual African country would be to pool and share resources, best practices and knowledge across countries; by unifying resources and forces a sufficient critical mass of knowledge and solutions may be developed. This article describes and discusses the development of the HISP/BEANISH networks which represent one such effort to develop a South-South-North collaborative network of HIS development, research and capacity development in Africa.

The Health Information Systems Programme (HISP) started out as a pilot project in South Africa 1994, engaged in developing HIS to support the post-apartheid reconstruction of the health system. From 1999, best-practices, software and

approaches from South Africa were adapted and further developed in Mozambique and later in a range of countries such as India, Malawi, Tanzania, Botswana and Ethiopia, thus creating the HISP-network. BEANISH (Building Europe Africa Network for Applying ICT in Health), funded by EU, was established in 2005 in order to support this network further. The cross-country collaboration in the HISP/BEANISH network clusters around three areas:

1. Developing and strengthening national health information systems; developing data and indicator sets, analysis and use of information for health management and services provision and capacity development.
2. Development, application and use of the DHIS Open Source Software for health care.
3. Building educational research networks; the Masters and PhD programs in health informatics developed within the network have been crucial for the development of the HISP/BEANISH network as students are doing their empirical research in their own country and continue to work in national HIS projects when graduated.

In this article we will present and discuss the HISP/BEANISH network with an emphasis on the challenges related to establishing sustainable African networks within the domains of software and education.

RESEARCH APPROACH

Research presented in this article draws on case material from experiences in the development and assessment of health information systems in a number of countries in Africa and Asia carried out within the broader network of HISP/BEANISH [6]

(see www.hisp.info). The experience has been gained from action research in a large number of African country contexts such as South Africa, Mozambique, Malawi, Botswana, Tanzania and Ethiopia.

HISP/BEANISH draw on the Scandinavian action research tradition in IS development where user participation, evolutionary approaches and prototyping are emphasized [7]. These perspectives have strongly influenced the involvement and approaches followed in HIS development in the involved countries. Action research aims at generating new knowledge through taking part in the full cycle of planning, implementing and analyzing the results from concrete interventions [8]. The network of action research within HISP has made it possible to go beyond the learning in singular locations to the sharing of experience and knowledge between the various nodes and countries of the network [6]. Action research, such as implementing and testing data standards and a continuous cyclic prototyping of the DHIS software (still ongoing), has been carried out in close cooperation with users at multiple levels and has been important in generating mutual learning and understanding. The data analysis process can be seen as an integral component of the action research process of the HISP network. Within this network opportunities, both formal and informal, as part of a formal research process, or as an aspect of a project implementation process, arise for discussion of numerous aspects of information systems development, which resulted in the distilling of concepts that led to the development of this research paper.

THE HISP/BEANISH NETWORK

Background

The Health Information Systems Program (HISP) was initiated in South Africa in 1994 as part of the post-apartheid reconstruction and development program. The quest for equity and decentralised governance made the development of a new national health information system (HIS) to support the restructuring of the health sector a priority. In its first pilot phase (1995-98), HISP aimed at developing district health information systems including data and indicator sets (standards) and software to support the emerging decentralized administrative structures in four pilot districts in Cape Town. From 1999, based on achievements of the pilot phase, the Department of Health in South Africa adopted the strategies, processes, and software developed in the pilot districts as the national standards, which were then rolled out to all provinces and districts in the country.

The achievements in South Africa represented a

“best practice” case in Africa and from 2000 software and approaches have been customised and further developed in a number of other African and Asian countries, starting with Mozambique and India. From 2005 the EU has supported the network and further development of the HIS in Mozambique, Malawi, Botswana, Tanzania, Ethiopia and South Africa through BEANISH (Building Europe Africa Network for applying IST in Health).

The District Health Information Software (DHIS) developed by HISP has been an instrumental component of the process, and is now customized, applied and further developed in the various countries of the network. Since 2003/04 the development of a fully open source web-enabled and platform independent version 2 of DHIS has taken place.

Developing country HIS

Fragmentation and lack of data standards and coordination and integration among numerous sub-systems, together with poor use of information, represent the common HIS problems in most African countries. Typically each vertical health program is running their own system with little regard as to how this is integrated with or beneficial to the overall HIS. The approach developed in South Africa to overcome these problems was to focus on “need to know” rather than “nice to know” information and to link this essential information to the concrete targets of the health services by the use of indicators. Indicators (for example immunisation coverage) represent a concrete way to use information to measure achievements towards targets. Following this approach, the development of essential national indicator and data sets – or national standards – is now widely regarded as the key issue in country HIS reform. Most countries, however, fail in achieving this goal. The reasons are:

- 1) Conflicting interests between health programs; difficult to reach a “final” agreement.
- 2) Changes the only constant; new needs keep popping up (e.g. HIV/AIDS).
- 3) Multiple software and paper tools are difficult to coordinate and change; standards are “cast in stone”.

Despite these problems countries like South Africa has managed to develop national standards which are flexible enough to “absorb” changes over time – and local innovations. Why?

The application of the “hierarchy of standards” [9] has been a powerful tool to negotiate a balance between the national needs for “control”, with the local (e.g. province, health program) needs for

flexibility, or “more data”. While all health units are required to collect and report the “core” national data, they are at the same time allowed to pursue their own needs through additional data sets.

This flexible approach to standards makes it easy to absorb and implement changes over time; there is no “final” data set. For example: While extended ART services will require a specific ARV data set, the national core is only extended by the “essential” need to know data elements; Local innovations are allowed for and incorporated and may eventually be included in the national data set.

The flexibility of the DHIS database application is the key to manage the “ever changing” national and local data sets. Data elements, indicators and data sets are added, edited and managed by the health services themselves. The DHIS makes it possible to manage multiple data sets at district and provincial levels. This “data repository/warehouse” approach may be a key to how the lessons from South Africa may be applied in other countries.

This flexible strategy has been applied in many countries within the HISP/BEANISH network. One typical problem encountered is that in countries where there are national HIS databases and integrated reporting formats they tend to be “cast in stone” and unable to respond to changes, thus leading to fragmentation when individual programs pursue their needs through own data standards, software and paper tools. The well funded HIV/AIDS programs which are moving in with their own non-integrated HIS (and software, computers, staff logistic) are currently aggravating this situation.

So what can be done? Current efforts to establish integrated data sets in contexts as different as Addis Ababa, Botswana and Zanzibar may provide some answers. Here data sets from all programs are collated and streamlined and reduced by sorting out overlaps, gaps and inconsistencies. Using the DHIS database in a data warehouse approach the focus is on gradually improving and aligning the data sets. Where there are program specific software applications in use, these are being linked electronically to the DHIS, thus providing a shared data warehouse.

This strategy is emphasizing the role played by software and database technology, which brings in the challenge of developing capacity in this area.

Software & databases –importance of capacity

The development of the DHIS software has followed two trajectories;

1) Starting in 1997 a MS Office DHIS application (DHIS version 1.3 and 1.4) has been developed in South Africa through a participatory prototyping

approach

2) Starting 2003, using the functional specification of DHIS 1.4 as point of departure, a web enabled DHIS 2 has been developed using Java tools.

The major challenge has been to distribute the development of the DHIS between the countries in the HISP/BEANISH network. While the problems related to the MS Office version has been that the technology platform is not supporting modular development, the problems related to the Java version has been that the technologies, which are well suited for modular and distributed development, are complicated and difficult to learn. MS Office is however well known in Africa and a fair amount of innovations have been added to the DHIS in the different countries. When first customising the DHIS in Mozambique, the language translation problem had to be solved. A first version had the translation to Portuguese “hard coded”, but this resulted in a “fork” as new DHIS releases could not be used. As a result a multi-language module was constructed, where in principle all languages could be included (using the Unicode 16 bits standard). In Ethiopia, a module for registering ICD (International Classification of Diseases) codes was constructed. This however resulted in a fork preventing them from taking advantage of later releases of the DHIS MS Office version.

The DHIS 2, using Java tools, has been developed at the University of Oslo and is currently being implemented and used in Ethiopia, alongside India and Vietnam. Although the DHIS 2 has a modular design, lack of capacity has so far prevented African countries to take part in its development. This problem is now being addressed by planning courses in Java technologies at the Universities in Addis Ababa and Dar es Salaam.

The flexible prototyping capability of the DHIS software, which is adaptable to most developing country health system contexts is a crucial tool in use for participatory HIS design and development in cooperation with health professionals in all HISP/BEANISH countries. The DHIS thereby represents a key component in the action research carried out within the network. However, it is not only in relation to the development of the DHIS software that capacity is needed. The customisation, application and maintenance of a “professional” database system to support the HIS in a country also require substantial amounts of capacity at national and sub-national levels.

When a country develop their first integrated HIS database encompassing the various information needs and current data sets across health programs, the problem of standards immediately becomes an issue. When populating the DHIS database (or any

other database system) with data elements and data currently being collected as part of the HIS, inconsistencies and lack of standards are instantly being made transparent. This will then typically spark a process of standardisation of data and indicator sets and data collection tools. The capacity required for managing such standardisation processes and the information flows in a national HIS, and for the development and maintenance of a database system is substantial and will in most (if not all) cases exceed the capacity in the Ministry of Health in an African country. The challenge is therefore both to develop the needed capacity and for the Ministry of Health to link up with appropriate national capacity found in other institutions such as in the universities.

National HIS capacity & sustainability

Capacity development is urgently required in Public Health in Africa – in both training and service institutions. The HISP/BEANISH experience may provide a useful model for “best practice” replication, combining as it does, service-based learning accompanied by mentoring and support, software tools and manuals development, continuing education, Masters and PhD Programs, and dissemination of both the process and its products through conference presentations and scientific publications.

Capacity development within HISP takes various forms according to the needs identified and the context of delivery. These forms are: a) local development of tailored courses for health professionals, these are often a challenging mix of categories with different life and IT experiences; b) cross-border support for the development of courses and DHIS- related IT capacity, e.g., Mozambican HISP/BEANISH members going to Botswana to support curriculum development on HIS and to Malawi to run courses; South Africa HISP/BEANISH members teaching modules on HIS development in Tanzania and Norway; India and Norway HIS experts supporting the Master of Public Health and Informatics in Mozambique; c) participation in classroom and field activities related to MPH and MSc Informatics; HISP members have been actively involved in teaching Masters modules, from basics of information systems to software development to use of evidence for decision-making; d) running of integrated Masters Programs in Health Informatics in Mozambique which are planned expanded to Malawi, Ethiopia and Tanzania; e) running of the PhD Programme including students from all the participating countries; all dissertations and related publications are developed with the goal of documenting and disseminating the various aspects of HISP/BEANISH initiatives, using action research as the common methodology vehicle and

having strong theory-building as a common output.

Using adult learning principles, capacity development within HISP/BEANISH strives to ensure that both the theoretical content and the computer practices take into account previous exposure and are meaningful and applicable to the daily professional experience of the learner. For example, use of local data and addressing concrete HIS constraints is a point of departure in the training efforts –contextualised learning.

Products resulting from and refined during the capacity development initiatives include software (often with the aim of “localizing” DHIS potential), short courses, manuals, conference presentations, masters modules, theses and scientific articles.

Key success factors in this model have been:

- the mutual support being developed within Africa;
- the complementarity between interventions and capacity development: training and education need to be “localized”, i.e., made appropriate to the context;
- the mutual dependency between lower and higher levels of training and education, that is basic/elementary with medium/higher levels;
- the institutionalization of capacity development within both educational institutions and service organisations.

CONCLUSIONS

The cross-country collaboration in the HISP/BEANISH network clusters around three areas:

1. Developing and strengthening national health information systems; developing data and indicator sets, analysis and use of information for health management and services provision and capacity development.

Key challenges are: to develop standardized data and indicator sets across the fragmented health services and programs and to integrate the data flows following a district based data warehouse approach.

2. Development, application and use of the DHIS Open Source Software for health care.

Key challenges are:

- a) to develop capacity in Africa on modern Open Source technologies such as Java based frameworks and to make African partners fully collaborate in the globally distributed DHIS software development, and

- b) develop national capacity in managing the standardisation processes and data flows within the

country HIS and to develop and maintain the database system at national and sub-national levels.

3. Building educational research networks; the Masters and PhD programs in health informatics developed within the network have been crucial for the development of the HISP/BEANISH network as students are doing their empirical research in their own country and continue to work in national HIS projects when graduated.

Key challenges are: to develop sufficient national capacity in HIS and Open Source Software development so as to ensure sustainability and to develop educational schemes in each country; ranging from training of health workers and continuous education to Masters and PhD programs.

An overall experience in the HISP/BEANISH network is that “best practices” and appropriate ICT solutions are better spread and adopted in a South-South way than in a North-South fashion. If something is working well in one African country it is likely that it might work well in another African country as well. ICT solutions in the North are developed to serve need in a very different context and it is therefore not given that solutions developed in the North will work in Africa. South-South learning and sharing may therefore be mutually beneficial for the countries involved.

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