Developing District-based Health Care Information Systems: The South African Experience

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The work presented here is based on research carried out in the Health Information System Programme (HISP) in South Africa since the advent of democracy in 1994. HISP started out as a bottom-up process in three pilot districts and is today (2000) a driving force behind district-based health information systems development in South Africa. HISP is a collaborative research and development programme comprising the University of the Western Cape, the University of Cape Town (both South Africa), Universidad Eduardo Mondlane (Mozambique), the University of Oslo (Norway), and Departments of Health in South Africa and Mozambique.

In Phase I (1995-98), HISP aimed at developing district health information systems to support the emerging decentralised administrative structures in three pilot districts in Cape Town. The National Department of Health adopted strategies, processes, and software developed in the pilot districts in early 1999. These are currently being rolled out to all districts in the country (Phase II, 1999-2001). Similar processes have also started in Mozambique, and groups in other sub-Saharan countries are assessing whether HISP’s Open Source software can be adapted to their requirements.

1. Background

A decentralised health system based on districts is seen as the main vehicle for reconstructing the health sector in South Africa (ANC, 1994). Total national health expenditure per annum is around R 60 billion (USD 9 billion), but over half of this is spent by the world-class and technically advanced private sector serving the 20% of the population that has Medical Insurance Coverage (SAHR, 2000). This part of the population includes not only most of the white and coloured/Asian ethnic segments, but also practically all public health managers/staff, political/business leaders, and other influential groups. In other words, most decision-makers, influential stakeholders, and primary actors in the health sector are themselves insulated from the impact of their own actions or decisions. Decentralisation and empowerment of communities

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1 The term “District” is used throughout this paper to represent the lowest administrative level of health administration. The actual term used might vary over time and from country to country – SA’s current “Health Districts” will for instance from March-April 2000 change to “Health Sub-district”.
2 Similar situations are found in other sub-Saharan countries, where e.g. ministers, MPs, and senior civil servants are flown out to and treated in European private hospitals on government expense.
and patients are thus crucial factors in the struggle to improve public health services.

The primary health care approach is the underlying philosophy for the restructuring of the health system in South Africa, but its historic legacy of apartheid and a bloated, inefficient bureaucracy imposes many constraints:

- The SA health sector was and to some extent still is very hospital- and curative oriented.
- The health sector was and to some extent still is extremely fragmented by region and by type of service; i.e. different institutions are providing different – or similar - services in the same area without co-ordination.
- The development of a Health District system, aimed at reducing fragmentation, has had problems in many provinces. Power struggles between “old” and “new” institutional structures, sunset clauses in the constitution that make it difficult to remove redundant or non-performing managers, managers with a curative background and little or no understanding of public health issues, lack of financial resources, discord over the demarcation of new local government areas – the causes are many and often forms a highly complex web.
- There were no comprehensive national standards, like minimum data sets at various levels or Data Dictionaries for data elements and indicators, for collecting, analysing, and reporting health data/information. Each province and each vertical programme had their own standards with little or no co-ordination, a situation perpetuated today by many managers due to lack of experience/understanding or due to conflicts between different administrative levels or institutions.
- The economical and political focus on hospitals and hospital information systems, as opposed to primary health care, has made it difficult to (re)-direct funds and resources to district-based information system development. Tentatively, 90-95% of all development expenditure for new health care information systems today are spent on Hospital Information Systems (i.e. this excludes the cost of stationary, transport, and staff time used for existing data collection mechanisms).
- There are also persistent beliefs among some key decision-makers that it is possible for South Africa to “leap-frog” directly from poorly functioning paper-based health information systems to highly sophisticated and fully integrated country-wide network solutions based, for example on telemedicine, inter-sectoral smart cards\(^3\), unique patient-ID numbers, and similar. A majority of similar complex health care information systems have been failures in developed countries (Heeks, 1999), and pursuing them have drawn considerable resources and attention away from simpler, district-based solutions.

Given this historical and political context, this article will present and discuss experiences from HISP, with a focus on two main areas:

1. the process towards developing standards for primary health care data, and how this process was interrelated with
2. the development of a district based database application using a prototyping strategy.

In describing the story of HISP emphasis is on identifying the main actors that are driving the process. Such key actors are not limited to human beings, but are in the case of HISP ranging

\(^3\) Smart cards that carry information relating to a range of services, like your health record, your welfare benefit history, unemployment benefits, pensions, and so forth.
from people, documents and key events to software, courses, work-shops and standards. In pursuing this actor-oriented history writing, we find it useful to use some terms and general perspective from the Actor Network Theory. Here society is regarded as a socio-technic web where technical objects participate in building heterogeneous networks that bring together actors (nodes) of all types, whether human or non-human (Latour, 1987; Callon, 1991). According to Latour translation occurs as actors enrol allies in the actor-network and align their interests in a continuous process of re-negotiation where

‘... claims become well-established facts and prototypes are turned into routinely used pieces of equipment. Since the claim is believed by more than one person, the product bought by more than one customer, the argument incorporated in one more article or textbook, the black box encapsulated in one more engine, they spread in time and space.’

(page 132)

Experience from HISP clearly indicates the usefulness of identifying actors and actor-networks of all kinds when analysing the process of developing standards and large-scale complex information systems. By focusing on the various actors, the important driving forces behind aligning other actors in e.g. the process of standardisation may be identified. A typical example is how the software developed to capture and process a pilot site data set rapidly become a highly efficient actor in aligning minimum data sets and thus provide a real-world basis for a national Health Data Dictionary. Years of workshops and committee work had not able to produce similar results on the ground.

Section 2 of the article outlines briefly a theoretical framework for understanding information systems as social systems. Section 3 describes the development of Minimum Data Sets at the Provincial, National, Regional, and district levels as a cyclical and dialectic process involving both structure and process elements. Section 4 describes the development of the District Health Information Software (DHIS), using cyclical prototyping with guided user participation. Section 5 sums up and discusses some of the lessons from HISP so far, related to local level processes of system development and the global level processes of standardisation.

2. The problems of changing the South African health information infrastructure – a theoretical framework

As a legacy of apartheid the previous health system was fragmented and centralised along vertical command lines. Furthermore, there were no decentralised management structure and no culture of local decision making in South Africa (ANC, 1994; Pillay et al, 1999; Braa et al, 1997). The previous health information infrastructure\(^4\) was a mapping of this organisational structure. Regarding health information systems as information infrastructures imply that they develop and grow over a long time with layers upon and within one another. New features tend to get added as extensions of or changes to something already there – usually referred to as the installed base. As the installed base grows, it becomes more important and it becomes increasingly difficult to build new systems from scratch or to implement substantial changes (Hanseth, 1996).

Working with data and information within the health sector includes three different categories of activity – each of them can be done using paper- and/or computer-based tools:

\(^4\) Some authors refer to the same as “health infostructure”.
1. Collecting, collating, capturing, validating, and forwarding raw data – these tasks have traditionally been done by health workers at facility level (nurses, receptionists – usually eating up 20% of their work time) and data entry clerks at administrative levels;
2. Processing (analyses, extraction, format manipulation), production and dissemination of statistics, reports, graphs, maps, and similar health information – traditionally the domain of health information officers and/or interested health managers.
3. Utilisation of data/information for daily management, budget allocations and long-term planning – traditionally done to a very limited extent by most managers and decision-makers.

The data flows depicted in (1) directly re-enforce existing social contracts and administrative structures. It is common, for instance, to hear health workers on one hand complaining about the burden of filling in a multitude of forms and on the other hand demanding that the forms must “show the bosses everything we do” (i.e. provide proof of them fulfilling their duties). Data flows often deteriorate to exclusively confirming social contracts with no real use whatsoever.

The processing and dissemination of information also re-enforce existing structures and power relations: Firstly, the type and purpose of data processing reflect the dominating paradigms along several dimensions (e.g. information for local use versus information for upper management, descriptive statistics versus information for management, or curative information versus public health information). An example: The Cape Department of Health and Anderson Consulting produced in 1989 a comprehensive plan for health care information system development where the main “threats” to the health sector were identified as homeopaths, pharmacists and traditional healers and the main challenge to cut costs. The plan never mentions “violence”, “apartheid”, or even “race” – at a time when state-initiated terrorism and repression killed and maimed thousands of citizens, frequently with active support from doctors and nurses (Hedberg, 1997). Secondly, access to information reflect current power structures – with the bureaucracy or politicians often circumventing constitutional or legal rights to information by persons or groups regarded as potentially “hostile” to their own interests.

Utilisation of data/information for decision-making also reflect, re-enforce and/or reshape social contracts and structures, but in ways less transparent than for category 1 and 2. In particular, data/information is often either not used at all, it is used because information symbolises a commitment to rational choice, it is used as a weapon in dominiance games or is subject to ‘strategic misrepresentation’ (Feldman, March, 1981) as e.g. to support policies (e.g. macro-economic cost-cutting or privatisation) not directly linked to health policy targets.

All aspects of establishing, running or changing health care information systems also have a direct impact on the organisational structure through recruitment of “information” staff or through changing job descriptions for health workers and managers. Health care information systems are, in other words, deeply embedded in social work practices and are barely separable from the social context of which they are part.

In their web models, Kling and Scacchi give a theoretical framework for understanding why and how large information systems tend to be tied to the social context through a complex web of associations (Kling, et al. 1982). They propose the web models in opposition to what they describe as discrete-entity models that represent the commonly held view that information

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5 Anderson Consulting, a US-based consulting firm, is one of the world’s largest.
systems are basically socially neutral technical systems. Implications for system development are laid out as follows:

“When an analyst uses a discrete-entity model to understand the computing capabilities of an organisation he usually begin by asking, “What kind of equipment and facility do they have?”

In contrast, analysts using a web model begin by asking: “What kinds of things do people do here?” (Kling et al., 1982, page 9)

Building on the web models, Walsham et al. (1990) state that large information systems are best understood as social systems. This idea of being part of the social context, something much bigger and qualitatively different from the concept of a computer, technical artefact, or a technical system, explains the difficulties in changing the information systems - or the health system, or both.

When the bulk of health staff are engaged in collecting data for others, when they have no influence over what they collect, when they are barely involved in analysis of data, when computerised tools used are inflexible “black boxes” reducing their operators to mindless keyboard pushers, when they don’t get feedback and don’t use information for local management – then the structures thus constituted are those of disempowerment. Given this, it is obvious that such information systems and technologies are not neutral but have politics, meaning and behaviour inscribed into them (Akrich, 1992; Pfaffenberg, 1988; Winner, 1986).

Inscriptions range from conscious design, where the designers scripts and world-views are inscribed into the object as a scenario for action, to the more implicit translations being negotiated in the context of use (Akrich, 1992). Bowker and Star (1994) describes inscription in software as

‘.. values, opinions, and rhetoric are frozen into codes, electronic thresholds and computer applications. Extending Marx, then, we can say that in many ways, software is frozen organisational discourse.’ (page 187)

The notion of software as frozen discourse is very much in line with our experiences of the role of most information systems as obstacles to change in the current reform process in South Africa. We would, though, like to extend the notion to the wider information infrastructure and the social system. Walsham (1997) regards the notion of software as frozen discourse as an example of an inscription that resists change and thus demonstrate irreversibility.

3. Cyclical Development of a Hierarchy of Minimum Data Sets

During the start-up of the HISP pilot project in the Western Cape province in mid-96, it soon became obvious that development of a provincial minimum data set (MDS) for Primary Health Care had to get high priority. The old data sets were thoroughly discredited, not only because of their racial segregation and excessive bias towards workload-related elements (“finding out what the staff is up to”, “cutting cost”), but also because the data was of poor quality and seldom used for actual decisions.

In the following, we will describe and discuss the process of standardisation of the primary health care data set as it developed through three phases.
3.1. Stage 1: Prototype Minimum Data Set in one Province

It was decided to use the Cape Metropole Health Region, the largest in the province covering 11 out of 25 Health Districts, for developing and piloting a new minimum data set. The development, despite strong support in principle from almost all stakeholders, dragged on for 6-9 months. It was to some extent influenced by a similar effort that had taken place in the Drakensberg area of the Eastern Cape earlier. The most typical delaying factors were:

- Excessive demands for detailed data from a few vertical programme managers.
- Discussion on certain items refreshed long-standing discussions (or feuds) between different groups on how certain services should be provided, managed, or assessed through data collection. *This was not necessarily negative, but some of these “feuds” actually reflect contradictions between different professions or “schools of thought” that in the short term must be “resolved” through compromises. Some of the most common contradictions are outlined below (p 12).*
- Managers were reluctant to accept the new minimum data set due to fear that the switchover would create “gaps” in the collection of data.
- Provincial managers felt under pressure from various programmes and directorates at national level to continue supplying “old”, bloated data sets.

In the end, most stakeholders accepted a new PHC minimum data set for the Western Cape province, usually referred to as the Routine Monthly Report or RMR1. Most vertical programme managers at provincial level – traditionally a group of stakeholders with excessive data demands – had been recently appointed and did not put up much of a fight at that stage. The new MDS consisted therefore of only 47 data elements, a major reduction from the 300-400 collected previously. It was also decided to change the data collection frequency from weekly – previously used in most clinics run by Local Authorities – to monthly because (a) it reduced processing costs and (b) nobody were able to argue convincingly that weekly data capture provided any benefits for routine data.

In retrospective, it later became obvious that a major weakness in the whole process was the focus on data elements (i.e. numerator data) instead of indicators (e.g. coverage of immunised children). The causes are many and complex, but primarily related to the curative focus of the South African health sector. The sector is used to target patients coming in through the door, not the community outside its walls.

The new data set was implemented from July 1997 in the clinics in the Cape Metropole. The Community Health Services Organisation (CHSO) running all the “Day Hospitals” in the region had not been sufficiently involved at top management level to implement the new data set. It must be emphasised that this development process brought managers from different parts of the fragmented health sector together in some cases for the first time. On-going turf wars combined with the impact of large-scale organisational changes in the local municipality structures, resulted in considerable suspicion and seemingly “illogical” behaviour from many stakeholders. These realities also affected HISP directly – it took 1-2 years before the large majority of stakeholders in the Cape Metropole region fully accepted HISP.

We are convinced that rapidly implementing the new data set, even in local clinics and mobile units only, was correct. The alternative – basically to continue discussions until everybody were on board – would entail a high risk of (a) progress being determined by the
most negative and/or backward stakeholders and (b) the driving forces (PHC managers and health workers, HISP consultants) running out of steam and abandoning the process.

Note here that the basic empowerment principle of expanding minimum data sets as one move down in the administrative structure was not emphasised during this initial stage, since reaching consensus or a compromise on the minimum data set itself had priority. Another barrier towards implementing a more flexible hierarchy of minimum data sets were the initial choice of a “black box” software tool that did not allow users the flexibility to add local data elements or indicators (see next chapter).

A consultative revision process went under way in early 1998, now with representatives from the Community Health Centres, additional vertical programme managers, and the three other health regions. The target this time was to develop a Provincial MDS for province-wide implementation: The Routine Monthly Report version 2 or RMR2. The revision process ended up discarding or significantly revising 37 out of the 47 data elements selected the year before. This was implemented in all PHC facilities in the Western Cape from July 1998, with hospitals providing extra data on reproductive health (family planning) services.

It must be emphasised, though, that these changes primarily were a result of additional or more assertive players entering the scene with their perceived needs and not a systematic assessment of which data elements were actually used and for what. Nevertheless, the increased experience with core data elements combined with the consensus decision to keep the number of data elements at approximately the same level as before increased data relevance significantly.

Another key development was the simultaneous development of indicators using the data elements, which indirectly also filtered out some data elements that could not be turned into indicators. A third revision, started in late 1999, will most likely introduce considerable fewer changes than the 1998 revision, thus indicating an increasingly mature provincial MDS.

3.2. Stage 2: Replication of MDS Development Processes

What was effectively the second stage of the Minimum Data Sets saga got under way in the middle of 1997: Key experiences and views extracted from the process in the Cape Metropole were fed into similar processes in other provinces (and vice versa, after a while). In most cases, the MDS development processes started in one or more districts and were then adapted and adopted more widely when proved successful. The acceptance of different minimum data sets at different levels was in all cases a major pre-requisite for success.

- An MDS for the Eastern Cape Province including indicators were defined in late 1997, and implemented from 1998. It could draw on both developments in the Drakensberg area of the province and from the Western Cape.
- An MDS for the Mpumalanga Province including indicators were also defined in late 1997, and implemented from 1998.

Dr. Arthur Heywood, a UWC public health and HISP manager, functioned during 1997-98 as the main communication channel between and moderator of these MDS processes. While not sufficient in the long run, his work provides an example of how important one or more respected, dedicated, and communicative professionals can be to kick-start such transformation processes. Another important aspect of these disparate processes is that they always produced
a group of local and/or provincial stakeholders that took ownership of the new MDS and campaigned for it among other stakeholders. A third aspect is the fact that the MDS development process in general runs faster every time because already established data sets developed by colleagues works as “guiding beacons” for people trying to decide their own information needs for the first time.

It also became increasingly clear that changes like introduction of new data sets must be carefully managed to avoid a backlash from grassroots staff wary of being at the bleeding edge of “continuous change”.

A national PHC Minimum Data Set were also developed in late 1997 by the National Health Information Systems / South Africa (NHISSA) committee. Participation in this development was, regrettably, in practice limited to NHISSA committee members and the provinces never paid much attention (i.e. hardly any data was submitted). It seems clear that this process was too exclusive to trigger the enthusiasm and loyalty necessary to actually implement it in the face of resistance or lethargy from many stakeholders. In the middle of 1998, it was obvious to all that a different approach was needed (see stage 3 below).

Three other conclusions can be drawn from the experiences gained in stage 2, the Western Cape revision process included:

1. Horizontal dissemination of experiences and replication of data sets have greater impact than data sets developed by higher levels. This is especially true in South Africa, where resentment against the centralised command structures inherited from the past runs high.
2. The use of moderators that are perceived as experienced and relatively neutral in relation to on-going power games can greatly speed up the MDS development process and reduce the number of less useful or useless data elements and/or indicators selected.
3. It is absolutely imperative that such moderators, and other “change agents”, get acceptance for (a) hierarchical minimum data sets, i.e. that each level concentrate on data they need and not on what all other levels need; and (b) that any minimum data set must be reviewed and if necessary revised at regular intervals.

A natural consequence of these different update intervals, combined with the fact that most of these MDS development processes partially are running in parallel, is that a certain amount of “misalignment” always will exist between the MDS at different levels. The misalignment should be reduced with time, but cannot be expected to disappear altogether if the MDS is kept abreast of actual developments in the health sector (new diseases, new priorities, changing organisations).

Finally, note that the RMR2 data set rapidly became a key actor in MDS developments in other provinces. By being established as a fact, and through the force of the good example other actors became convinced about both the feasibility and need of the process.

### 3.3. Stage 3: National Rollout and Standardisation

One of the authors, together with other researchers, conducted a national survey of Health Information Systems in the middle of 1998 (extracts were used in SAHR, 1998). It covered all nine provinces plus the National Department of Health. The overall aim of the survey was to do
a medium-level situational analysis of Health Care Information Systems in South Africa, with emphasis on Primary Health Care. A preliminary survey of available documents, including ‘grey’ literature, had shown that existing knowledge normally was superficial, fragmented, had significant gaps, and/or was out of date. Even basic information like what data the provinces were collecting or how many facilities they currently had were not available.

This article only presents one part of the survey, namely the Minimum Data Sets at provincial and national levels. The data set part of the survey ended up having a significant impact on later events both at national and provincial levels, triggering actions and developments that still are unfolding. By providing a comprehensive documentation of the extremely messy state of the fragmented health information infrastructure in South Africa, the need for coordination and standardisation became obvious for everybody. In Latour’s words, the survey became a well-established fact, an important actor in aligning the various interests of a multitude of actors in the actor-network. The results were rapidly fed back into the national and provincial decision-making processes (action research!). The net effect of the survey and subsequent processes was not only a new national MDS, but also significant streamlining of PHC minimum data sets at all administrative levels in South Africa.

Several methods and/or communication channels were utilised during the survey, feedback and dissemination of results, and the gradual implementation of new minimum data sets:

1. The minimum data sets used at national, provincial, local authority, and (occasionally) district levels were primarily identified through systematic collection of data collection forms, data tables, reports, articles, and other documents. Analysis and comparisons were done using an Access 97 database and Excel Pivot tables.
2. The survey results and recommendations were quickly presented, discussed, adapted, and adopted in workshops and meetings like the National Health Information Systems / South Africa (NHISSA) committee (the “official” channels).
3. The results and recommendations were incorporated into the national rollout framework for e.g. the Health Information Systems Programme (HISP) and various training courses at the University of the Western Cape, (the “unofficial” channels).
4. Intensive collation, analysis, and re-distribution of provincial data sets have been done as part of the development and distribution of the District Health Information System (DHIS) software from HISP, indirectly providing a solid and factual basis for all elements of minimum data sets under discussion or development (the “technical” channel – see the next chapter).

The primary method for collecting information about Minimum Data Sets used were through collating and comparing all available data collections forms, reports, articles, data tables, and other relevant documents. This was supplemented with information from semi-structured interviews when necessary, but written documents were usually available and sufficient for the type of overview needed.

The survey did not specifically look at the time management side of data collection, but previous estimates and interviews indicate that facility staff have been spending around 20% of

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*The term ‘medium-level’ is used to denote a compromise between the very high need for data/information and the limited amount of time and sufficiently experienced manpower*
their work time collecting data and filling in forms. The real cost of just data collection has thus nationally been in the order of R 2-3 billion per annum – a disastrous situation from a cost-benefit perspective given the low utilisation of this data. These real costs have regrettably been “hidden” in the general salary bill, paving the way for managers and vertical programmes to indiscriminately demand more and more data from facilities.

Just browsing through the collected material without further processing, it confirmed the tentative impressions from our preliminary review: The overall situation was one of fragmentation and widespread differentiation. Large amounts of data was being collected without being used or passed on to anybody that might use it, old data collection forms continued to be used despite having been scrapped, the same data was captured several times by different authorities, and so forth.

Another, but related, problem was the heavy bias towards numerator data. Considerably less attention is traditionally given to denominator data, and a large number of numerator data elements are often not converted into indicators at all (read: not used for any type of analysis or decision-making).

In the most extreme cases, Local Authorities were found to collect up to one thousand data elements every month or every week (sic!). There was also a multitude of definitions used:

- Age categories, like the cut-off rate for teenage pregnancies, fluctuated from case to case and from province to province.
- Key diseases or syndromes were defined differently. A typical example was diarrhoea, where some used a relatively stringent definition like “Three watery stools over 24 hours” whereas others used a relatively loose definition like “Every case where the parent say the child suffers from diarrhoea should be counted”.
- Definitions were commonly based on terminology not easily understood, resulting in a multitude of interpretations among staff. A typical example would be the interpretation of terms like “deliveries” versus “live births”.

The initial browsing of the data also made it obvious that the specific names used for data elements (and indicators) in general had been determined on an ad-hoc basis. This problem is primarily a technical one related to data processing using computers, and can in principle easily be handled using translation (lookup) tables. In practice, though, it becomes a major obstacle to smooth data flows when the computer literacy level among health personnel is limited.

On the other hand, there had been several positive developments during 1996-98. Five provinces had for instance developed minimum data sets for monthly routine data comprising less than 60 items. Health workers at facility level commonly greeted this with enthusiasm, since it reduced the burden of routine data collection. It should be noted, though, that the same staff also in many cases has resisted removal of data elements they consider important for “showing the work done”.

Finally, the negative experiences in the Free State Province with a more detailed, patient-based Minimum Data Set highlights several factors crucial to the relative success of the HISP bottom-up and minimalist approach (“crawl before you walk”). The Free State implemented in 1996/97 an MDS with around 200 elements, collected using individual patient tick-sheets that were collated and sent to the Provincial capital for scanning using a very expensive, sophisticated scanner. This initiative, despite huge efforts and major
investments, collapsed in September 1998, for several reasons: It was too fragile technically –
the scanner regularly broke down. The province could not afford to buy the necessary amount
of specially printed tick-sheets (R 0.50 or USD 0.10 each). The logistics of collating and
shipping it all to the capital were a nightmare. Most important of all, the majority of the health
workers hated to fill in hundred of forms every day to see them disappear into a black hole.
Many facility managers even ran their own local information systems in parallel.

The tick-sheet system was initially greeted with enthusiasm by many, including HISP
activists in the Western Cape, who believed it could provide any kind of data one would need.
Proposals to abandon on-going processes and just adopt the Free State system were rejected
by the two informatics specialists (the authors) within HISP, though, who were deeply critical of
the tick-sheet system for exactly those reasons that later resulted in its collapse. It was also
obvious to us as experienced system designers that a system collecting data on individual
patients purely for statistical purposes made little sense, since costs would be comparable to a
computerised registry & folder system whereas benefits would be comparatively limited. When
collecting patient-based data, it would be logical to go for a computerised registry, recall, and
folder system that would provide both patient services (e.g. printing labels) and statistical data
for management and planning.

The Free State adopted the HISP approach and software in mid-99, and will roll that
out to the whole province in the first half of 2000.

3.4. To sum up: Key Aspects of the MDS development Processes

The key results of the survey and these on-going MDS development processes are:

1. The survey documented both the variation and fragmentation of data sets collected at
   various levels and the core elements common to a large number of stakeholders.
2. The survey was turned into a key actor on the national scene through rapid feedback of
   results, quickly established as facts, to key decision-makers (NHISSA), and the core data
   elements identified were a few months later adopted as the nucleus of a new national MDS
   for Primary Health Care.
3. This new national MDS, combined with the minimum data sets from the Western Cape and
   the Eastern Cape, has in turn shaped the development or revision of provincial MDS, in
general based on a “pyramid” model for vertical data flows.
4. The processes have revealed a range of perspectives on utilisation of these data sets,
   partially linked to the roles played by each level in the hierarchy and partially linked to the
dichotomy between “action-led” and “data-led” information systems (Sandiford et al,
5. The clarification of these perspectives combined with the wide-spread acceptance of the
   “pyramid” model for Minimum Data Sets at various levels point towards a more
differentiated strategy for collection of health data, combining routine reporting, sentinel
sites, surveys, and ad-hoc updating of semi-permanent data.

The survey and the subsequent processes also clearly demonstrated that there is a range of
data/information dimensions that tentatively can be described through the following set of
contradictions. Most of these contradictions are deeply embedded in the material, societal and
cultural values pursued by different key stakeholders in the health sector, and any shift will take
considerable time.

- Data for the bosses vs Data for local use
- Semi-processed feedback vs Decision-based feedback
- Descriptive data (statistics) vs data for management
- Numerator-based data vs Targets/Indicator-based data
- Vertical programme data vs Integrated data
- Workload/expenditure data vs Public Health data
- Curative-oriented data vs Preventive Health data

A major challenge for HISP and all other stakeholders striving for an effective District Health System is to move the emphasis from left to right for each of these key dimensions. The national and provincial Minimum Data Sets can be seen as an actor in that regard.

### 4. Open Source Software developed through Cyclical Prototyping with Guided User Participation

HISP developed during 1998 and 1999 a free Open Source Software package based on Microsoft Office 97 that today is used throughout South Africa. The District Health Information Software (DHIS) is also being piloted in Mozambique and tested on other sub-Saharan countries.

The software design process started out with a set of objectives and scenarios, which, to borrow Akrich’ terms, the design team wanted to inscribe in the software:

- Shift of control of software and information system from the central to the local levels
- Local utilisation of information infrastructures
- Local flexibility and user orientation. It should be easy to adapt the software to the local conditions
- Support the health sector reform towards decentralisation and the development of health districts
- Empower local management, health workers and community
- Horizontal flow of information and knowledge

How these inscriptions ‘survived’, or changed, through the first rounds of translations in the context of use is discussed in 5.1. It is, though, at this early stage, too early to analyse the process of local translation of the ‘software in use’, but the designers’ intended inscriptions are clearly stated here so as to facilitate later research.

This development process has gone through several phases, though, and it has never fully followed any established prototyping strategy. A predominantly chronological overview of events can be used to highlight the paths followed.

It should be noted that the choice of Office 97 was almost exclusively done on the basis of the fact that Office 95 or 97 already were in widespread use among users in the Cape Metropole (i.e. the installed base). We wanted to capitalise on the knowledge many users already had from working with Office at work or at home. It seemed clear that Office 97 could
provide the functionality initially required. *No systematic assessment of other options, neither with regard to Operative Systems nor with regard to development/programming tools, were done at the time.* Such options, e.g. related to Linux or other Database Management Systems, have been and are today under continuous assessment with regard to future versions of the DHIS.

It must also be emphasised that most final decisions related to software development issues during the 1997-99 in practice were taken by one of the informatics professionals on the HISP team, who up to now continue to be in charge of software development. User requests and suggestions have been, though, a major determinant factor in all decisions.

### 4.1. The Amateur Option – a Dead End

The first approach tried in early-mid 1997 was to empower the health professionals working in or with the HISP team to develop the DHIS application by themselves. A range of people were sent to standard Office 97 courses, including “advanced” Access 97 courses, offered by the private sector in Cape Town. The assumption was that this would enable them to develop relatively simple application for capturing and processing RMR data. The HISP informatics professionals were also in mid-97 involved with other activities abroad.

That approach was an abysmal failure, and no applications were developed beyond some very simple “flat-file” databases and/or “flat-file” spreadsheet solutions. This become painfully obvious during a rather confrontational meeting in late October 1997, convened to examine the two software alternatives propagated by different groups: Office 97 versus DataEase, a DOS-based database management system previously used by the Cape Metropolitan Council. A typical “black-box” application in DataEase – developed by one programmer and with no flexibility for the end user – ended up being selected simply because no useable alternative existed. The users needed something now, and were not willing to rely on promises of better software to come.

Our clear conclusion from this was that development of software flexible enough to support the bottom-up, flexible, and user-oriented strategies pursued by HISP had to be done by professionals.

### 4.2. A Nucleus Development Team is formed

Two important events changed the situation during the next couple of months. Firstly, a very skilled and efficient Access (VBA) programmer from a local private company (Soft Craft Systems) was identified and hired on an hourly basis. Secondly, one of the informatics specialists on the HISP team started working fully with HISP as part of his doctoral research. The VBA programming knowledge of the latter were limited, but the two together formed an effective team – one taking strategic decisions and guiding/filtering user requests, the other providing nifty programming solutions.

Given the overall design goals of local control and flexibility, a number of key principles were laid down during the development of the first prototype (Dec-97 to March-98):

1. The application must support the ‘pyramid’ model for Minimum Data Sets through allowing users to add, modify, or delete local data elements, indicators, and so forth.
2. The application should be designed in such a way as to support the drive towards decentralised capture, analysis and use of data – in particular, support the push towards having the facility staff responsible for data collection also doing data capture, initial processing and output of locally needed information. One result of this was the introduction of validation rules, aimed at identifying as many potential data errors as possible during/after data capture.

3. The application should be easy to use for new areas (provinces, districts), and should allow users to tailor the geographic scope of their data sets to their needs. This resulted in the use of a front-/back-end solution in Access, where the back-end data files would cover different areas and the user could switch between them at will.

4. The application should as much as possible rely on the flexible and powerful analytical and display tools already available within Office 97, even if this increased the learning curve considerably. This formed the basis for the decision to primarily rely on pivot-tables in Excel for analysis. Automation, Object Linking and Embedding were other key technologies regarded as supporting this empowerment principle.

5. The application should be free Open Source Software\(^7\), meaning e.g. free distribution and re-distribution of the source code and, as is the case with Linux, widespread collaborative software development / bug fixing using the Internet. \textit{Note: the latter objective is much more difficult to achieve within application software (HISP) than within operation system software (Linux).}

The first prototype, a software module aimed at capturing and analysing routine monthly data (“the MD module”), was released for pilot testing in the HISP pilot districts in March 1998, and went through a series of very rapid prototype cycles during the next 4-6 months. New “builds” were sometimes released on a weekly or even daily basis. Its popularity grew rapidly, though, in particular because it facilitated the implementation of the new Minimum dataset and so clearly supported the principles and strategies already pursued for developing district-based health care information systems. Adherence to basic principles for good relational database design, e.g. referential integrity rules, update/delete cascading, and normalisation, also set the application apart from most other applications (e.g. spreadsheets, EpiInfo 6) users were familiar with.

\(^{7}\) See e.g. http://www.opensource.org/ and http://www.gnu.org/philosophy/free-software-for-freedom.html for an update on the discussions on free and open source software
Figure 1: A small part of the relationship diagram in a DHIS data file:

The application was in mid-98 adopted throughout the Western Cape province in order to capture and process RMR2 data. RMR1 data was also extracted from DataEase and/or various spreadsheets and incorporated.

A second “TB” module for handling quarterly tuberculosis data, largely a modified version of the MD module, was developed in the 3rd quarter of 1998. This triggered considerable criticism from some of the HISP partners, who felt it had been done without sufficient consultation, and this module was only gradually implemented in the Western Cape. This controversy had its roots in conflicts between different levels of the administration, and it clearly demonstrates to what extent health care information systems must be seen as social systems:

(a) HISP continuously had to adjust its strategy and work-plans to remain with one leg on the ‘inside’ of the public health sector, and

(b) The financial (donor-funded) and organisational (primarily academic) independence of HISP allowed the programme to also have one leg on the outside of the public health sector, i.e. to undertake developments and provide solutions that would be difficult or impossible from the inside due to e.g. conflicts or financial/political constraints.

We believe it is largely correct to say that the HISP team in 1997-98 was viewed with mixed feelings by many key decision-makers at provincial and national level. On one hand HISP was seen as relatively successful in its pilot districts. On the other hand the team – and in particular some of its more outspoken members – were seen as too provocative and not sufficiently
supportive of national and/or provincial visions, policies, and management. These relations are far better today, but with occasional flashbacks when latent contradictions and conflicts erupt. The team regards this as parts of a normal dialectic process, but it does increase brain temperatures somewhat from time to time...

4.3. The DHIS Application as an Actor

In 1998 NORAD pulled out after having funded HISP Phase I. Indications in the 3rd quarter of 1998 were thus that HISP would not be able to continue after 1998, primarily due to lack of funds. Several key events worked together to change this:

- The HISP Open Day in October 1998 brought home to visiting decision-makers from both provincial and national levels how popular HISP had become at the grassroots level in the Cape Metropole.
- The collapse of the Free State tick-sheet system in September 1998 left HISP as the only relatively successful initiative working on information systems for primary health care.
- EQUITY, a USAID-funded project in the Eastern Cape, had been working for several months trying to debug and implement a local software package (written in Delphi) for capturing and analysing routine data. This software had been developed by an EQUITY staff member with no formal education in informatics, system design, or programming. Despite his highly motivated and dedicated efforts, he had run into serious trouble – which we see as corroborating evidence for our conclusion that professional and flexible software needs a highly skilled development team (see 4.1 above). When HISP imported all available data, established an Eastern Cape data file, and produced analysed output within 2-3 days, the province and EQUITY decided to switch to using the DHIS software.

These events, together with the major progress done on the National MDS for Primary Health Care, resulted in the DHIS being endorsed for national rollout in February 1999 – first at a national conference and later formally through the National Health Information Systems / South Africa (NHISSA) committee.

These positive events triggered new funding for HISP, with the Norwegian University Council (NUFU), the EQUITY project, and various provinces/councils providing funds for the national rollout, research & development, capacity and institution building, training, and so forth. These funds will carry the process well into 2001, at least.

Chapter 3 outlines how the various Minimum Data Sets developed became key actors in the processes. We could now see the software – which HISP always stressed should be viewed as a tool only – become an even more crucial actor in the development and rollout of HISP. Despite verbal assurances from most people that “process is more important than products”, we see again and again that the software is a powerful and often decisive force attracting e.g. new provinces to adopt the HISP approach. The success with which the software enhanced the implementation and application was among the most important actors in aligning the other provinces and the national level in the process towards national and provincial standards, i.e. Minimum Datasets.

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8 To quote a national manager: “HISP is the most cynical and provocative bunch of workaholics I’ve ever met!”
The informal mechanisms for reporting bugs, requesting new functionality, and so forth—
all tightly integrated with user support—proved popular and encouraged user to provide
feedback to the development team. This combined with the rapid deployment of new or
corrected versions astounded many users, who previously had experienced mainly drawn-out
tender processes, fully pre-specified development projects (usually ending in fiascos or
frustrating delays) and egocentric, self-serving “I know what’s best for you” developers.
Requests for new functionality and/or new modules had to be filtered or moderated by the
HISP development team depending on the number of users requesting it and team capacity, but
all relevant requests were logged and prioritised if they could not be implemented rapidly.

4.4. The DHIS Application as a Vehicle for Standardisation,
Integration, and Dissemination of Health Data/Information

As mentioned above, some work was done in the Western Cape to extract existing data from
DataEase and spreadsheets, break it up and insert it into the DHIS data file. The same was later
done with available quarterly TB data for the Western Cape.

With the Eastern Cape coming on board, the amount of HISP time spent on data
extraction, validation, and error correction escalated rapidly. Between 5,000 and 10,000 errors
were for instance corrected in the Eastern Cape data set for 1998—originally captured in a
Clipper application that had no validation controls—and the improved data sets fed back to all
users. Another example, clearly showing the extreme fragmentation and compartmentalisation of
previous systems, were the data sets received from Mpumalanga Province: There was only
40% match between the facility names used for immunisation data and the names used for
tuberculosis (TB) data (both captured in different EpiInfo files). When comparing the two data
sets to their official list of facilities, the match dropped to 20%—clearly demonstrating that these
data sets had never before been integrated and/or analysed together.

During 1999-2000, the HISP development team took on the role as a temporary
national/provincial clearinghouse for PHC data. It has been made crystal clear that this role is
temporary. HISP will assist the provinces in importing all relevant existing data into their DHIS
data file and assist in establishing and streamlining their data flows. When the target—95% of all
expected data available at provincial level within 30-45 days—is reached, HISP will gradually
remove itself from the data flow and concentrate on assisting in analysis, dissemination, and
development of a local “information culture”. Advanced users within the provinces have also
increasingly received training in importing and validating data from disparate sources themselves.

This work on importing and/or integrating data sets has been crucial for the rapid
acceptance of HISP, and it has had several vital spin-off effects:

1. For the first time, all nine provinces have lists of their Organisational Units (facilities, health
districts, etc) that are based on a standard naming convention, comprehensive, and up-to-
date. The HISP experience is that it takes approximately six months with data flowing in
before nearly all duplicates, old names, missing facilities and so forth have been cleaned up.
The recent introduction of a two-character provincial prefix for all names has resulted in a
nationally unique set of OrgUnit names without centralising further the responsibility for
ensuring unique names in each province.

2. The HISP team has systematically used its position as a clearinghouse to encourage
standardisation of data elements, indicators, and their definition and use. This has been met with little resistance compared to similar initiatives from national level mainly because it has been so tightly linked to the assistance given in importing and integrating existing data. It was also more palatable because it was presented as a positive bottom-up initiative instead of a “dictatorial” directive from up high – many national initiatives flounder because they get entangled in latent conflicts and contradictions between groups and administrative/political levels.

3. With the recent development of an XML-based Data Dictionary tool, HISP has also provided a constructive basis for close collaboration with the National Department of Health and its Data Dictionary development efforts.

4. The re-distribution of all data acquired out to all users as sample data on the HISP CDs did not only make implementation much easier, it has also been the first major horizontal distribution of raw data in South Africa. Whereas many managers and decision-makers previously supported such free distribution of anonymous health data (and many didn’t), there were no mechanisms to do so effectively. Comparative analyses of data and indicators from different areas, which are closely linked to the government policy of transformation and equitable allocation of resources, are also increasingly emphasised in HISP training courses and sessions.

5. The direct assistance given various provinces in setting up their data files provided considerable extra leverage with regard to weeding out useless or wishy-washy data elements and/or indicators from their new or revised Minimum Data Sets.

6. Since most of this standardisation and integration work was done by the person also in charge of software development, a number of prototype cycles benefited directly from the work done, in particular with regard to data validation functionality.

The considerable experience with a variety of data sets gained through this work has also made it easier to plan for the integration of new types of data, or even integrate such data into existing DHIS modules or data files. **SA is thus getting closer to its long-term target: A truly integrated district-based Health Information System.**

Finally, the temporary function as a clearinghouse contributed significantly to the overall, gradual alignment between all key stakeholders with regard to Minimum Data Sets, indicators, targets, data flows, analytical methods, and dissemination routines.

### 4.5. From Rapid Prototyping to Stable Versions for Production

As the DHIS installed base grows, it has become necessary to gradually shift from rapid prototyping and centralised production/distribution of CDs to a more flexible approach. This has several elements.

Firstly, HISP encourages the provinces (including National Department of Health) to take primary responsibility for replicating and distributing new versions of the DHIS software in their domain. Each province – or District/Municipality if the provinces decentralise the distribution further – can then also modify the software to fit themselves (e.g. using their own background map illustrations or logos, to mention a simple example) and they can include the latest and most complete versions of their data sets. HISP is therefore recommending that all provinces acquire CD-writers or establish software servers (for all their networked users) to
replicate the software. Acquiring software to rebuild their modified versions would be the next step⁹.

Secondly, HISP has deliberately slowed down the release of new versions as more and more users are coming on board, in order to make implementation and training easier. Future developments will follow the same path as all other professional software: The big majority of users will use a stable “production” version of the software. A smaller group of dedicated users and developers will voluntarily test out new Beta versions (or participate in developing it). Ideally, HISP would like to have Beta testers in all provinces / directorates to ensure the widest possible test environment before releasing new stable versions. With future releases supporting multiple languages and localisation, developers and Beta testers in non-English environments (e.g. Mozambique) will be necessary.

Thirdly, each organisation (province, District, Municipality or whoever is deciding on Health Information Systems for an administrative area) must obviously decide whether they need or can implement a new version. In practice, though, other changes in the user’s hardware/software often force us to provide upgrades or revised versions – one example is the differences between Office 97 and Office 2000 that necessitated a number of changes to the software.

Finally, the provinces should adopt common positions where suitable (e.g. for data interchange standards, systems interfaces, data flow regulations, a national Data Dictionary, network protocols, or any similar strategic issues where standardisation provide clear benefits). This could be done through any relevant co-ordinating body. Here HISP will advocate a balance between innovation and standardisation – with innovation normally preceding standardisation to ensure that standardisation decisions are based on factual experience and not visions only.

4.6. User-driven versus Expert-driven – the Quest for Balance

Participative prototyping as the “Scandinavian School of Informatics” has described it is usually quite formal and structured, with well-established user groups, channels of communication and conflict resolution. This is only possible, though, when the participating users have a relatively clear picture of both their own requirements and the options provided by the selected institutional structure and technology.

In the case of South Africa and within the institutional framework HISP operates, such user participation would be impossible or at least counter-productive. There are several reasons for this:

1. Formal user groups would easily become battlegrounds due to the current large-scale transformation of South Africa’s administrative structure.
2. Most users had in the beginning only vague ideas about their future needs, and usually an incomplete understanding of current or perceived needs. Other researchers have reached similar conclusions (Hedberg, 1990; Heeks, 1999).
3. Very few users have technical skills beyond rudimentary computer literacy (word processing, spreadsheets, punching data into “black box” applications)

⁹ HISP uses “Installshield 2000” for software packaging, and provides the set-up script to any interested user.
The methodology that gradually developed was thus more informal, where any interested or innovative user had full access to the development team (a meritocratic approach). This access was either direct or indirect via the other DHIS trainers/facilitators – users have been encouraged to use whatever channels they preferred. Access has not been regulated in any way, but the development team normally has to guide users to a significant degree in understanding their own requests and how it can be implemented in practice. Such guided user participation is obviously time-consuming and only possible with a limited number of users.

It should also be noted that the development team constantly has been looking for existing solutions to perceived or expressed needs. One source of solutions has been the sub-contractor Soft Craft Systems, whose work for other customers occasionally provides solutions relevant for HISP (and vice versa). Another source is existing or expected Open Source software from other organisations – one example is the upcoming EpiInfo 2000, which uses compatible technology (e.g. the Jet engine) and complements the DHIS application.

The balance between a user-driven and expert-driven approach shifted considerably towards the experts in the last half of 1999. As the installed base grew, more and more users requested highly sophisticated solutions, preferably tailored or customisable towards systems or networks already in place. Typical examples were increased demands for web-based technologies, demands for the ability to run the DHIS through ODBC/OLE DB on different database management system platforms (e.g. Access, SQL Server, Oracle, DB2), ability to look up data (e.g. street names in addresses) from existing data warehouses, and ability to display and analyse data spatially (i.e. interfacing the DHIS to Geographical Information System software). Hardly any user is currently capable of assessing the pros and cons of utilising/adapting such technologies, and it will be a major challenge during 2000 to bring a sufficient number of super-users (i.e. beta-testers) up to speed on these technologies.

5. Discussion – some lessons from HISP

5.1. **Cultivation** of local level processes

While a consequence of the previous (and still existing) information systems is the structuration of a disempowered local level, the HISP strategy for developing district health information systems aims at promoting empowerment at local level. The design and development strategy used in HISP is based on a social system model and involves the behaviour and performance of the wider health system as it is interacting with the information system. Given this, the term *cultivation* (Dahlbom, et al., 1996), as a contrast to construction, is used to denote the slow incremental process of transforming social structures where the resources already available forms the base. The outcome of the design process is not given. Cultivation as a design strategy, may thus be linked directly to the notion of information system being social systems. In the case of HISP, the aim is thus to establish and sustain processes that gradually cultivate local empowerment and increased primary health care awareness within a constantly changing context.

The DHIS software development process follows such a cultivation strategy: evolving groups of activists and interested users have been involved in the design and development in a
bottom-up fashion. Within the overall design objectives of e.g. local / end-user control, empowerment and flexibility, the actual specification of the software was developed through incremental implementation and guided user participation. To use the terms of inscription and translation (Akrich, 1992): the designers ideas (or scripts) of wanted user-behaviour were inscribed in the software, but during the cyclic user-interaction the initial designer control drifted away and new translations not planned for emerged. An example is presented below.

The design prescribed decentralised capture, local analysis and local use of data – preferably to be done by the person(s) at facility level responsible for data collation in the first place. One result of this was the introduction of data validation rules and functionality (and control thereof) at the point of data capturing. When implementing the system, the first translation of this democratic ideal of end-user control into the software resulted from the fact that (a) facility staff were computer illiterate and had no easy access to computers, and (b) the existing class of staff (data entry clerks) historically responsible for data capture. The data entry clerks were firmly embedded in the organisation and physically located close to their managers, so they were initially seen as representing the “grassroots” to be empowered.

The second translation related to the fact that the emphasis on data entry clerks to some extent clashed with the hierarchy of the work organisation. In Eastern Cape the information handling at district level is divided between the data-entry clerk (low level/skill) and the information officer (high level/skill). During a training session, the following question quickly came from an information officer: ‘If the data entry clerk is validating the data, doing initial analysis and printing reports, what am I supposed to do?’ Whereas a data entry clerk responded: ‘Ha! We are empowered! But now we need training!’ This contradiction between the way work is prescribed by the software and the actual hierarchy and organisation of work is not yet solved. One actual (and ongoing) translation is, on the one hand, to train the data-entry clerk more and increase her responsibility, and, on the other hand, to involve the information officer much more in health management, i.e. upgrade and empower both positions.

A third translation in software and training schedules resulted from the realisation that two groups were to some extent sidelined by the empowerment of data entry clerks and information officers (none of them normally health professionals): The district health managers (usually doctors or nurses) and the facility supervisors (usually chief professional nurses). These groups are crucial for the third category of activity outlined in section 2: Utilisation of data/information for local decision-making.

This example represents only one of several areas within which the software prescribes – or allows for – practices which are clashing with current work organisation, culture and practices. More complex and substantial areas of this contradiction are linked to the ways with which local analysis, dissemination and use of data are prescribed by the new system, but due to organisational structure, culture and politics, are not being implemented in practice. The above example illustrate two points:

1. When using a cultivation strategy, there is no clear-cut division between design decisions ‘inscribed’ by the designers and later translations by the users. Rather, the design, implementation and use tend to drift through a cycle of translations in a process not fully controlled by anybody.
2. The software and wider information system developed through such a cultivation process is not necessarily a passive reflection of the organisational structures. In the case of HISP, the opposite is in fact the situation: a ‘radical’ software prescribing ‘new’ bottom-up work-
practices emerges within the ‘old’ top-down hierarchical bureaucratic structure and clashes with it.

The HISP strategy has been shown to be viable despite the discrepancy in (2), because it is aligned with official ANC public health policy (ANC, 1994; Pillay et al, 1999), which aims at a radical transformation of the organisational structure, culture and practices within the health system. Thus, the HISP cultivation strategy could not easily have been formalised within the present organisational structures. It had to be partly out of control by the bureaucracy and driven by activists representing the policies of the new South Africa.

While the notion of ‘software as frozen organisational discourse’ (Bowker and Star, 1994) illustrates well the problems experienced when trying to change the health system in South Africa, the HISP cultivation strategy represents an opposite perspective. Here the software development process contributes towards cultivating a new ‘transformed’ organisational discourse. Though, gradually, the software may again be part of the locking and freezing of the new decentralised organisational discourse. The dialectics of social processes implied here, as both containing process and structures, is captured in Giddens’ notion of structuration (Giddens, 1984, p. 25): ‘.. the structural properties of social systems are both medium and outcome of the practices they recursively organise ..’. By including the notion of information systems as being social systems, it follows that they may contribute towards both process and structure in the dialectics of social systems.

Figure 2: The task is to move from the previous fragmented and disempowering local level structure (A) towards the new unified and ‘empowering’ district structure (B). This is figure is from Atlantis, part of Blaauwberg Health District.

A main feature in the proposed health district model is to redirect the flow of information, which previously was flowing from each of the health related services to their ‘head-office’ outside the district, to the district information centre. Redirecting the routine reporting of hundreds of health workers from the head office to the district office is aimed at strengthening the trust in, and authority of, the district. Through routinising the reporting to, and the receiving of feedback from the district office, the strategy is to gradually cultivate the new district system. Given that the health information system is instrumental in the reproduction of the previous (and to some extent present) fragmented and locally disempowered health system structure, following the discussion above, this strategy aims at intentionally cultivating empowerment at local level. The aim is to gradually transform and cultivate the social structures at district level to promote – or
Empowered and unified districts - shift of control from the centre to the district (see figure 2).

Cultures of local use of information for decision making and PHC awareness. By routinising analysis and use of information to support local action and decision-making, the strategy is to gradually transform the social structure of meaning towards a primary health care ethos.

5.2. National standards – an incremental process of aligning actors

HISP started out as a pilot project in three districts. The aim was through a prototyping approach to involve all local actors in a process to define, design and test the district health and management information system. As the momentum increased, more actors were enrolled and aligned and eventually the HISP software and processes became the national standards. This process of developing a framework of national standards within which to integrate all district information systems, has been the main feature of HISP at the global level.

The development of a standard data set to be collected by all facilities and health services within a province was identified as a main objective at the very start of the HISP process. Without standards the goal of an unified and integrated district information system could not be achieved neither within, nor across districts. Information systems at a certain level in a hierarchy of standards (i.e. data sets) need to adhere to a set of standards in order to communicate with other information systems at the same level, and at the levels above. Since the levels ‘below’ adhere to the same rule, communication in the network regarding the standards defined at each level is ensured. The ‘pyramid’ model gives each level the opportunity to define or modify their own data sets and indicators, while at the same time requiring them to adhere to minimum standards along the vertical axis.

The cumbersome process of developing such standards has been one of the main features of the HISP process. The lessons clearly show that the development of standards is an incremental process of implementation, use and further development, implementation and use. Only through practical use and some success was it possible to convince the various actors within the health services to join forces and align their interests in the standardisation process. Two events were crucial in the process of progressively convincing and aligning all major actors on the South African health scene:

1. The development and implementation of provincial minimum data sets for data collection in the two provinces of Western and Eastern Cape in 1998. The two set of standards were only partly compatible, but they demonstrated (a) that it was possible to agree upon standards across health programs within one province, and (b) that there are advantages to collecting standard data in terms of e.g. comparing health service performance and health status between areas and sectors.

2. The development and implementation of the DHIS database application to support the standard data sets in first Western and then Eastern Cape. The database made it possible to store, manipulate, check quality and analyse the data and thus added considerable value to the newly implemented data sets.
The database together with the standard data sets became the main actor in the process that followed, which resulted in all provinces and the National level agreeing upon standards and a way forward. These experiences are in line with current research on how standards are to a large extent being developed through incremental implementation and progressive alignment of actors through negotiations and the creation of momentum (Hanseth, 1996).

5.3. The challenge: the spread of the process from the few to all districts

The application of local scale solutions at a global scale represents a fundamental problem of scope: how to spread bottom-up processes and the information system from a few pilot districts to all districts and provinces. As outlined earlier, a district information system is a complex ‘organism’ and consist of a number of human and technical components; e.g. knowledge, people, routines, paper based tools, software. Technical components may be ‘physically’ diffused horizontally to all districts, but the local adaptation and translation, e.g. knowledge and human capacity need to be developed and cultivated locally. This multitude of vertical processes needs to be supported at each level (national, province, region, district). The obvious problem is that the network of capacity to support such large-scale processes is not present at the outset and will thus have to be developed as part of the process. Given this, the large-scale diffusion of the district information system needs to be carried out through a network of ‘clusters’ of capacity (i.e. ‘smaller’ actor-networks) that needs to be built in each province.

Given the previous discussion, we can say that the aim is to cultivate a process whereby the various actors at all levels are both enabled and given ‘space’ to translate their own interests in alignment with the other actors. The national health information system needs thus to allow for flexibility and local variations at district and province levels as long as they adhere to the standards of the next level.

The cultivation of the information system in each individual district is a long-term process and the development between districts will be uneven. Through establishing networks of support and capacity building at the various levels, the aim is to enable the strong districts, regions and provinces to lead the way, support the weaker ones, and ‘drag’ them along. Through this learning process, capacity to carry on the process at provincial, regional and district levels is being developed, and a network of support will gradually have to encompass all regions and districts in the province.

6. References
