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Study of a Health Information System
pilot project in Tanzania.

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Abstract

This thesis is based on an action research project in Tanzania where I, together with two other researchers have participated in the deployment of health information system. The project was initiated in Tanzania on an early stage at Bagamoyo and now we introduce it to Dar-Es-Salaam. The project group is part of HISP, an international effort to bring sustainable health information systems to third world countries. HISP is a global research and development network focusing on developing the network and the accompanying software DHIS. HISP/DHIS started in South Africa and has since been deployed both as a health sector approach and as software to a number of other developing countries.

My initial research goal included a participatory approach based on action-research, interviews and observations to gather data. The efforts to adapt HISP and DHIS to the Tanzanian environment have had a lot of different challenges which is to a large degree different to the ones I would meet in my known context. The adaptation of the HISP approach to the Tanzanian health service seemed less a problem than making people within the Tanzanian HISP network to move in the same direction.

I argue that information systems in developing countries as well as western must take into account its social context and the social implication an IS has on the environment in which it is present. I also do an attempt to put part of the empirical data into an actor-network theory story to better describe the notion of interacting of the actors in the HISP network in Tanzania.
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6.1 Introduction
Chapter 1 - Introduction

The background for my thesis is the introduction of the DHIS software into Tanzania. The software is a routine health data gathering and reporting tool. The overarching philosophy, HISP, is a bottom-up approach to health information focusing on “local information for local action” (Braa, 1997). The DHIS software initially saw daylight in South Africa and has been a success story from sub-Saharan Africa as far as health information systems go. The DHIS software reflects the bottom-up approach of the HISP philosophy, and is cornered on the fact that the data entry level is the district. Its introduction in Dar-Es-Salaam will possibly pave its way into larger parts of or the whole of Tanzania.

1.1 Motivation

My research started on a general approach towards social theory, more specifically towards Actor-Network Theory (ANT) as described by Bruno Latour (Latour, 1996/2003), Michel Callon (1986) John Law (Law, 2003). It continued with a stay in Tanzania introducing the DHIS software and the HISP philosophy (HISP, 2006) to the health districts in Dar-Es-Salaam, Tanzania. This was done in cooperation with the University of Dar-Es-Salaam. The introduction of the software to Tanzania had been struggling and with a new possibility to introduce it to Dar-Es-Salaam it needed some extra effort in the introduction and the deployment.

1.2 Research goals

My main research goal was to research the potentials for a district based health information system in Tanzania based on the initial introduction of DHIS at specific sites in Dar-Es-Salaam. The findings in Dar-Es-Salaam and Tanzania should in turn be possible to generalize to concern most Sub-Saharan countries.

Areas of interest during my stay in Tanzania and the post-research writing has been to identify key issues in the deployment and the use of a health information system based on experiences gathered in Tanzania and to discuss cultural theories as a means to understand working in a cross cultural context and further to use ANT in describing such work and the actor and networks involved.
1.3 Structure

Chapter 1 - Introduction
This chapter is intended as a guideline on which I base the other chapters defining the direction for the rest of the thesis.

Chapter 2 - Theoretical framework
Presenting a short introduction to social implications of ICT use with an introduction to two of the most relevant social theories mentioned in connection with the development of information systems (IS) namely Giddens structuration theory and information infrastructure. Presentation is given on IS's in general and more specifically on health information systems (HIS) with additional details on routine HIS and district HIS. The more general aspects of primary health care (PHC) are presented and some time is spent on presenting the DHIS software and its background with the corresponding HISP philosophy. The main sub-chapter is that of cultural context, in which I present issues from cultural studies in relation to cross cultural work. Finally I give a description of the theoretical framework from ANT.

Chapter 3- Methodology
Presenting the methodologies used in the thesis and in the research field. As such it gives a description of action-research as used in Tanzania, and a theoretical background for networks of action. Presentations are given of other research methods for comparison that was used as inkling for the research however more as practical methods rather than the general approach of action-research. I present what practical efforts were done, just to show the time-line of the introduction. Finally I give a presentation of the HISP team in Tanzania, stakeholders and what has been done earlier in conjunction to HISP in Tanzania.

Chapter 4 Empirical study
Chapter 4 is the empirical evidence of the deployment, training and other tasks that were performed by myself and the other members of the HISP team during my stay in Tanzania. I present the experiences in Tanzania both from a research and a personal point of view. I describe not just the efforts made to introduce the system into Dar-Es-Salaam and subsequently when I worked towards Bagamoyo but also all the problems and the good things arising, both personally and generally for the project.
Chapter 5 - Discussion
Chapter 5 is a discussion based on the empirical work done in Tanzania viewed in light of the theoretical methods used. From the action research paradigm I describe the action taken as stories connected to the literature review dividing the discussion up as I did the review. The discussion is not meant to give any clear answers to the highly complex field of HIS, however the social contexts and approaches to understanding IS and different types of HIS are all discussed to maybe understand their position in the Tanzanian context better.

Chapter 6 - Conclusion
The conclusion is obviously based on the previous chapters 2, literature review, empirical study and finally discussion. It is however far smaller than the previously mentioned to just give a small summary of what I think could be interesting points to look further into or that I find particularly interesting.
Chapter 2 - Literature review and theoretical framework

2.1 Introduction
This chapter forms the theoretical basis for this thesis. The chapter is divided into a five part presentation of the areas in which this thesis sort under. First a presentation of social implications of Information Systems. Then I present some aspects on healthcare in general as the field of social health is important to the development and deployment of the DHIS. I then present the information systems and the different views on the IS's possibilities as health improving tool and on the district and routine based health information systems. I give a short presentation of the HISP project and the DHIS. Finally I give some references to literature on the social context and cross cultural studies done specifically in relations to IT. Last I give a presentation of ANT as a descriptive tool.

2.2 Studies of social implications for ICT
2.2.1 General
Within the context of ICT IS's has been understood largely as technological systems in which the computer is vital if not the only part of its success and implementation (Kling et al., 2000). Such a view can be defined as technological determinism (Chandler, 2004). Within IS research technological determinism has no valid place according to Kling et al. (2000, p.49- 50)

«Technological determinism cannot adequately account for the interactions between ICT, the people who design, implement and use them, and the social and organisational contexts in which the technologies and people are embedded»(ibid).

The computer system can hardly be separated from the context in which it appears (Walsham, 1993) and as such ways of describing technology, its context and its social implications has during later years brought the use of social theory to explain the ramifications and implications of the systems implemented. Web models as described by Walsham (1993) try too to explain this.

«Web models ... examine how [the computer systems] use depends upon a social context of complex social actions» (ibid).
As a respond to the increasing identification of IS as not solely technological bodies, but also social bodies there has been the development of a theory of social informatics (Kling, 1999). Social informatics is

«The interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts» (Kling, 1999).

The theory of social informatics seeks to unveil the implications of the technological system for the social system which it is a part of.

2.2.2 Structuration theory
Giddens structuration theories can explain the relationships between structure and practices. (Braa & Hedberg 2002). Giddens theory is recognition that no element within a structure is unrelated to either the action or the structure.

«This agency/structure debate is resolved by Giddens into a duality of structure, whereby agents and structures are not two independently given sets of phenomena, but represent a duality whereby structure is drawn on in human interactions but, in doing so, social structures are produced and reproduced. » (Walsham 1993)

The duality in Giddens theory is that social structures is both enabling and constraining. The actions that shape the structure will also be determined by that structure.

«While at the same time social action is constrained by structures (resistance to change), these structures enable social action which may (or, in fact will) eventually change those structures (opportunity for change) » (Braa & Hedberg, 2002).

Structuration theory can be seen as a basis for understanding the relationships between actions and structures. He also emphasised the unintentional implications a system can have on any unknown third party.

«Repetitive activities, located in one context of time and space, have regularized consequences, unintended by those who engage in those activities, in more or less
A more general understanding of structuration theory and the implications for HIS is given by Mukama & Gregory (2005):

«Structuration theory provides an understanding of human work, which is social within a culture and is mediated by artefacts, such as tools, language, rules and procedures. Thus providing a wide understanding of the organizational culture in which the HIS development and implementation process is taking place». 

### 2.2.3 Information infrastructure

Hanseth & Monteiro's (1998) description of Information Infrastructure (II) focuses on one other aspect of the network that is not included in the web model, the «installed base». The term «installed base» defines as the network's initial state on which all additions need to comply with. The concept of «installed base» defines a network as seeking to be heterogeneous and resistant to change. The web-model and information infrastructure differs in the perceived possibilities of a system to evolve. While web-model describe a system that is inherently flexible and mostly dependent on its actors to change the network information infrastructure depend on the actors to change to be a part of the network. While there are actors that can change the system, no single actor can do so. The information infrastructures are socio-technical networks that can not be created but are long term networks that can surface within or be entangled into other structures (Hanseth, 2002). The interconnectivity of the networks is what describes the theory.

### 2.2.4 Conclusion

Structuration theory, web models and information infrastructure all suggest that the computer system is a part of a social system and is equally dependent on its social relations as its ability to do its job. Failing to see an IS as a social dependent system (technological determinism) will limit its potentials as the system is according to these theories dependent on a social system to work. The technological system is as such just one part of the social structure in which it is situated (Walsham, Symons & Waema, 1998).
2.3 Healthcare

2.3.1 Primary Healthcare (PHC)

The «treatment for all by the year 2000» statement in the Alma Ata declaration stated that «complete physical, mental and social wellbeing» (Titlestad & Sæbø, 2004 quoting WHO) is the target for the millennium and that this goal should be achieved through a primary health care approach.

Lippeveld (2001) identifies four areas influencing the quality of a person’s health:

1. Biological assets
2. Personal lifestyle
3. The environment
4. The healthcare system

As part of only one of four areas it might seem that HIS's has little impact on a person’s health situation. On the other hand a well designed, and appropriate HIS might aid decision makers in improving the environment and supply correct and appropriate information to the healthcare workers enabling them to inform healthcare users to alter lifestyle patterns to minimize health risks and thus addressing more than one side of the four identified as affecting general health quality.

Healthcare efforts can be divided into three categories:

1. Informational
2. Preventive
3. Curative

These categories are interdependent and often more than one will be addressed when in the meeting with a healthcare professional. In the case of a mother coming to a clinic to give her child an immunization shot the health staff can do all the three above:

1. Informational – on family planning and on sexual transferable disease (STD).
2. Preventive – give out condoms for both family planning purposes and to prevent STD's.
2.3.2 Evidence based medicine

At the Centre for Evidence Based Medicine (Sackett et. al, 2004) they advocate the use of evidence based medicine to the extent that it should be a part of all health workers job. They make the continuing development of medicine an evidence based health responsibility for all parts of the health sector. Some have argued that the workload is already so extensive that evidence based health approach will put an even larger workload on already overworked health personnel. The argument is that the extra workload will limit the numbers of health personnel available for patient relation, making the health service sparser. One other view is that the evidence captured from this approach is so valuable, and if performed as an integrated part of the practices, will benefit the health sector more than it is a burden (Sackett et al., 2004).

Both Sandiford, Annett & Cibulskis (1992) and Lippeveld (2001) adresse problems in evidence-based decision making, not because of an inferior theory but because a lot of deacons are not evidence based although the information is available. Gathering data is not in itself a sign of the decisions being made in accordance to the data.

2.3.4 Management Indicators

The different levels of management from district to national level need the same data elements. However the district needs more detailed level of indicators if they are supposed to manage the health care system as described later in chapter 2.4 the lower the level of management you are on the more data elements you need. The national trough to the district level will assign the data elements they need collected. The district collects the whole set of data to be used at all the levels of administration and the data elements can be used by either level as base for indicators and subsequently action. Indicators that are basis for this action can be called management indicators and I have divided them into three:

- Resource indicators
  - Human resource; Doctors, nurses, pharmacists
  - Infrastructure; number of health facilities or social services
  - Availability of services; Doctor/Patient ratio
  - Material supplies; drugs, vaccines.

- Health status indicators
  - Hospital Attendance; A high attendance may imply high morbidity in the population. This could be a result of poor quality of service.
- Social economic status. E.g. Poor sanitation will increase the amount of people getting sick or the frequency. Inadequate safe drinking water may lead to dehydration and death from diarrhoea.
- Low birth weight
- Morbidity and mortality rates. The morbidity rate should compare the standardized rates and not the actual numbers so as to avoid the e.g. age specific disease risk. (Waller and Gotway, 2004). Same too for mortality rate, it’s the mortality rate compared to age which is most interesting.

- Quality indicators
  - Ante-Natal Care (ANC) coverage rates
  - Drop out rates from treatments from disease like malaria.
  - Hospital death rates

Other data that can seriously affect the attendance in health facilities, the effect of treatment or the accuracy of the data gathered:

- Health strategy
  - A large portion of the Tanzanian health sector is private. The private sector is not demanded to deliver routine data.
  - Part of the Tanzanian health sector constitutes of traditional medicine. Instead of abolishing the sometimes discredited alternative medicine, the Tanzanians acknowledge its use and abilities as positive. It appears sometimes difficult to gather data from the many practitioners.

- Religion
  - Religious beliefs and the superstition aversion to go might prevent equivalent health service to all regardless of religious believe. The use and incorporation of traditional medicine as a part of the health sector as Tanzania has done might remedy this to some extent.

- Laws and regulations

- Economy
  - There is a danger of drop out of treatment due to expensive medication. In the case of free medicine it is a known fact that people sell the medicine to finance other primary needs.

- Aid
  - There are a lot of foreign countries and NGO's that give support in form of money or projects that has as goal to increase the quality of life for the general Tanzanian.

- Data
  - What data should be included?
Health indicators can give a good indication on the general health situation of the target population but it can also when condensing too many values into one indicator be disruptive and give little constructive feedback (Sapirie, 2001).

2.4 Information Systems (IS)

2.4.1 General

Information Systems consists of information organized in a specific way dependent on the context in which it appears. Information systems in general are not identified by being a computer based system (Kling et al., 2000) however you could argue that the amount of data in most modern information systems would indicate the need for and benefit from being managed by computers. The nature of the information or data is the descriptive term of the system. Such an example is Health Information Systems (HIS) where the health aspect is the descriptive term of the system. Technology is added when appropriate.

A major problem in developing information systems for a given target group is that the developer has rarely been a part of the users group (Sapirie, 2001). Relation to the given IS or information and communication technology (ICT) system is always a problem. Creating a familiarity with the ICT will affect your ability to learn, and a positive relationship to the ICT will increase your ability to learn (Titlestad, 1994).

Feldman and March (1981) find that information itself has additional information attached to it by being present in certain situations and the ones that gather information is often the ones that find information gathering important (Sandiford, 1992).

"We might expect investment in information to be particularly sensitive to variations in the symbolic requirements and signalling opportunities of the organization" (Feldman & March, 1981).

One might believe that it is in the mind of the decision makers to retrieve information that is in the best interest of the organizations, and that the "need for information will be determined prior to requesting the information" (Feldman & March, 1981). However this does not reflect the actual real
life cases as decisions are often not taken in accordance to the information gathered underlining that basis for decision is not always facts or information. Feldman & March (1981) as well as Sandiford (1992), Sandiford, Annett & Cibulskis (1992) and Lippeveld (2001) points out that decision and data does not follow each other and that a lot of decisions are made on weak or non existing data.

Information system, which is usually made for recording historical data or for being the basis for action has strong limits and expectations to its ability to provide beneficial information.

«Information about the possible consequences of alternative actions will be sought and used only if the precision, relevance and reliability of the information are compatible with its cost. » (Feldman & March, 1981)

Feldman & March (1981) identifies a main problem being that most information seekers collect too much information and are not satisfied with the information available when taking the decision.

Sandiford, Annett & Cibulskis (1992) and Feldman & March (1981) divide the need for a IS into two categories, either as a decision making tool, or as a monitoring tool. The decision on gathering information is also often not taken in the same place as the information is intended used. Gathering large amounts of data come from the belief that it is better to have too much information rather than have too little.

2.4.2 Health Information Systems (HIS)

HIS's can be defined by what questions it needs to answer. In WHO (2000) the main questions a HIS should answer is divided by the type of HIS it is. Whether it is a patient record system for use at the patient level or a statistical tool for use on district or facility level should alter the system to answer the different questions arising from the needs of the user.

HIS in general are plagued by low grade of usability and the need for reviewing (Skobba, 2003. WHO, 2000. Lippeveld, 2001). The reviewing process can be accommodated like WHO (2000) described with a HIS assessment, with objectives as follows:

- «Determining the adequacy and relevance of the HIS»
- «Evaluate the extent HIS supports the management of services»
- «Identify the weaknesses of the IS»
What defines a health information system is not only its ability to maintained large quantities of data but also that it «fit[s] into the organization of the health system for which it generates information» (Lippeveld, 2001). As Sandiford ask in the title of his article (1992) «Does data mean decision?» In this article Sandiford argues that decisions are often made without the regard of the data gathered. This is even happening when the data is readily available as it is in his example from Tanzania. Sandiford, Annett & Cibulskis (1992 p.6) says it well: «If action is the aim, then it is just as important to know how a discoing could be made, as to know what decision should be made».

Needs assessment in HIS should try to limit the scope of the software to include only vital information that in turn can be used as basis for indicators (Lippeveld, 2001) and ultimately decisions. According to WHO (2000) areas that might need these data are:

- Health planners and managers.
- Health care personnel.
- Socio-economic planners.
- National policy makers.

A HIS has as target to improve the quality of life and life expectancy of the population the HIS covers. Experiences from a health care effort in India concerning computer based information systems show that there are possibly large benefits from the use of such systems (Chandrasekhar & Gosh, 2001). Although this is the case in this Indian context and has also been the case for the HISP effort in South-Africa we need to be aware of the fact that in many cases the use of a HIS from the international community with its funding can also be «disruptive and counterproductive» (Sapirie, 2001).

The Health Information Systems in most developing countries are still at the lower levels of administration a paper based system. However a larger number of countries are interested in or doing efforts to start gathering the data unto computers at the district level.

A HIS can facilitate the planning and policy making in the district as well as on national level (WHO, 2000). It does so by addressing key elements like defining indicators and their related data values. Routine data gathering will be affected by the issues to be addressed defined by the data collected and the reported findings. The areas of interest will be defined by the DMO/RMO/DoH defining the data to be collected.
Gathering data in information systems allows the data to be seen as useful management information (Jakobsen & Johannesen) and it provides the user of the system and of the information with a concrete view of the efforts put into the health service.

IT people defining categories of health, setting up minimum datasets have less credibility than done by public health professionals.

«Defining essential information requires clear definition of tasks and procedures for performing these functions. Unfortunately, it is often information systems designers who propose the data required for the new functions to be carried effectively without the clarity of defined administrative tasks and procedures. » (Sapirie, 2001)

2.4.3 Routine health information systems (RHIS)

A RHIS is a health information system based on registering treatment, illnesses and a number of different variables in relation to the public health care on a regular basis. Normal interval for this is from a year and shorter (Titlestad & Sæbø, 2004. Quoting RHINO p.38). The registration of routine data from the healthcare service forms a vital part of a modern dynamic HIS. In terms of health information systems the need for a routine health information system is apparent as data gathered need to be fetched on a routinely basis to reflect the changing health situation and to improve the health data as information basis for action.

The data is collected for three reasons.

- Basis for decisions
- Monitoring
- Evaluation

The catchment area can be erroneous due to the likely difference in theoretical catchment area and the actual population seeking the facility as an option in their health care.

There are significant problems in designing and developing appropriate tools for information gathering.

«The international development community seems unable to learn what works and what doesn’t for facilitating effective technical cooperation in support of sustainable..."
While we want to make HIS contributions as directly improving the life and health of the patient connected to the HIS, there are great limitations to that possibility. Lifestyle, environment and biological assets play in general a much more important role in the daily lives of the patients covered by the given HIS (Lippeveld, 2001).

Lippeveld divides management issues into three categories which addresses the constraints of the marginal health influence. The main one is the individual care which can affect the preventive and promotional sides of health services. He also instructs on the relevance of the system to the specific health unit which is often not affected by information gathering because the information is focused on collecting rather than managing.

The accuracy of the data is the most important aspect of information gathering. The reporting requirements should be held at a minimum. This is to avoid bad data (ibid).

Lippeveld, on the basis of HIS research has seen that “decentralization of information management toward the district level is an effective strategy to improve RIS”. However when there are questions which the RHIS can not answer, then a non-routine approach is valid.

Lippeveld (2001) binds the RHIS together with the district/community based HIS, and has as goal to glue the individual and community health interventions together. Elements in future work according to Lippeveld is involving key information users, qualitative information tracking and strategy and testing for appropriate computer support.

Lippeveld does not only promote the use of a RHIS but a district based RHIS because it holds more potential to «integrate ... individual health and public health interventions» (Lippeveld, 2001) Main reasons for promoting this kind of system is that centralized information can often not be acted upon in time. This is also supported by other authors like Sandiford, Annett & Cibulskis (1992) and WHO (2000).
2.4.4 District based health information systems

The district is identified as the lowest level of administration and described as the key area in which the health care is applied. The district provides the basic elements for information and treatment like schools, hospitals and primary health care units (PHC) (Skobba, 2003. WHO, 2000).

A district based health information system for recording statistical data should be used to answer questions of «coverage, achievement, quality of care, workload, satisfaction, resource availability, community participation and health situation and trends» (WHO, 2000)

Braa (1997) emphasizes the concept “local information for local action”. The principle is that to be able to work properly and appropriately we need to define the acquisition of data to be of relevance towards the local community/district. When this goal is reached, the thought is that the action will be more appropriate than imposing a more general national approach on the districts.

“The increased tendency to decentralize health services management demands that we develop methodologies to facilitate the definition of processes and tasks that are being decentralized to district and facility levels.” (Sapirie, 2001).

Standardizing the district as the basis for information and decision will introduce some shifts in the structure of the health departments. Developing methodologies to facilitate this transfer so as the processes and tasks will not differ from province to province but be consistent within a national context is important to improve the quality of data and the appropriateness of that data. Keeping in mind that the data is not to be used only at district level in a district based health information system but on all levels of administration.
2.5 Health Information Systems Programme (HISP)

2.5.1 The HISP philosophy and network

The HISP philosophy was developed in conjunction with the development of the DHIS software. The philosophy was developed by Braa and Hedberg (Braa & Hedberg, 2002). HISP is generally a district based HIS where the main philosophy is to give the district as the area of administration closest to the data more information for its action and better possibility for acting (Braa, 1997). The consequence is that the district needs more power and funding to be able to act on its increased amount of data. A number of authors support the benefits of having a district based information system (Sandiford, 1992. WHO, 2000. Sapirie, 2001). In addition to being a District based HIS it is also a Routine HIS as it gathers routine data from all appropriate nodes in the districts for later comparison and analysis at any level of administration.

One of the main reasons for changing the focus from the region or national level and unto the district is the improved possibility of gathering and acting on data that is closer both in time and physically. The ability to act upon correct, appropriate and timely data is seen as a vital ingredient to improving the use, quality of data and the data gathering process.

Literature on HISP describes six steps to develop a DHIS (Williamson & Stoops, 2001 citing Braa, Heywood & Mohamed and Heywood).

1. Establish district information teams.
2. Information audit of existing data handling processes.
3. Formulations of goals, indicators and targets.
4. System and structure development for support of data handling.
5. Capacity building of health care providers.
6. Development of an information culture.

Especially the last point of developing an information culture is important to ease the introduction of the new information system.

«Success include the creation of district level data based information systems and structures, development of practical training courses that focused on skills and understanding of information management and, less tangibly a sense of ownership and a culture of information» (Williamson & Stoops, 2001).
One of the key elements in the HISP approach is the ability to connect similar sites together in a HISP network, relying on different contexts to aid each other both in practical issues such as being part of mailing lists and training programmes conducted in other countries (Lungo, 2003). The view on the HISP network has not just been considered as a means to interact, but has been viewed as a part of a research method «networks of action» (Braa, Monteiro & Sahay, 2004). The network of HISP is a network of actions as part of the action-research theory.

2.5.2 The DHIS software

2.5.2.a Current status

The DHIS software was developed in an effort to bring a district based health information system to South-Africa. The effort includes not only the software but a whole mindset previously described as the Health Information Systems Programme (HISP).

In the implementation and deployment of the software into a number of test sites in South-Africa efforts where done to introduce the HISP philosophy as well as the software. Since that time of early implementation and deployment the software has proved to be a sustainable HIS in the South-African context. From the success story in SA the software has been implemented in a number of other countries and tested for use on sites in a number of third-world countries. Among these are Mozambique (Skobba, 2004) Tanzania (Lungo, 2004) Cuba (Titlestad & Sæbø, 2004), India, Malawi, Mongolia, Ethiopia and Vietnam. In sites such as Mongolia and Cuba the effort to introduce the software has been unsuccessful proving that the more centralized type of government the less likely it is to succeed in the transition unto HISP and DHIS (Braa, Titlestad, Sæbø, 2003).

In a multiple of sites such as Vietnam, India, Ethiopia and Tanzania the efforts to introduce the DHIS and HISP is still ongoing. The decisions to use the DHIS as recording tool for statistical health data in these sites is not yet decided but have support from the governments at least to some extent. In other sites such as Mozambique, Malawi and on Zanzibar the DHIS has succeeded in becoming the standard ICT HIS. In Mozambique the introduction took quite some time while in Malawi the introduction to the DHIS was implemented very fast. In Zanzibar there are currently students from the HISP network that are working on the introduction of the software.
2.5.2.b The software layout

Within the DHIS software there are five tools for entering, accessing and analysing the district health data. The major component is the Monthly Data (MD) tool. This is based on Microsoft (MS) Access. The MD tool allows the health officials to register routine health data for later statistical analysis. Secondly there is a report tool, which is also based on the MS Access platform. This tool is available through the MD application in the main part of the DHIS releases. The third, and final tool based on MS Access, is the customer satisfaction tool. It is not available through the MD tool, but must be accessed through another shortcut found on the desktop of the computer.

There are two applications meant for visualization of the monthly data, the Excel pivot table tool which is a chart tool based on MS Excels pivot tables. The second application is a Geographical Information System (GIS) tool, which is based on a scaled down GIS solution, the Arc View from ESRI.

The DHIS tools mentioned must largely be opened as separate tools, and the user must select the area, or data he wants to view in each of the separate programs. He can not access the different tools through the other software. For instance if the user is working on inserting data into the MD unit, for a specific unit, he can not easily see how that data compares to the data of the surrounding facilities, or to other data elements in either the pivot tables or in the GIS solution.

Using DHIS, health officials have access to a large community of developers and students throughout the world for support and customization. Within HISP developers and designers are in the field identifying the needs of the health officers and most of them also get a short training in community medicine. However there is no direct help function through the DHIS which allows the user to interact directly with a super-user or developer.

2.5.2.c DHIS2

There is currently being tested out a new version of the DHIS, DHIS2. The new DHIS design will be based on separation of layers, possibility for networking and flexibility in user interface and database selection.

DHIS2 is a new development of the existing DHIS program. DHIS2 is largely developed due to the need for open-source based software, moving away from the Microsoft platform. There has also been a need for cleaning up the design of the current
software, moving from a two layer design unto a three, or four layer designs. The next version of DHIS will also include a flexibility regarding database solution so that it should be possible to connect to a wide variety of databases not just included open source databases. On the user interface side it should also be possible to select from a more flexible set of interfaces than previously hopefully including GIS solutions and pivot table support.

2.6 Cultural Context

2.6.1 Introduction

Culture is a boundary condition for communication. Culture as a behavioural and thought creating factor will be one of the limitations under which we work during cross-cultural projects. When introducing a new technology or just new variations of it there will be resistance from multiple points. I will call these factors resistance points. When we try to identify resistance points within a site we would benefit from a local translation to identify the local meaning of the items connected to the deployment (Braa, Monteiro & Sahay, 2004). The creation of such a cultural specific dictionary might aid in the finding of appropriate solution to the identified problems.

Trying to introduce a system designed for a different context will nearly always have the need for alterations either in the persons involved with the system or of the system itself (Law, 2003). To some extent you could say as Sapirie does that no foreigner can introduce a system.

«There is a failure to realize that every task performed by a foreigner, no matter how expert he or she may be is a task not performed by a national and, therefore not likely to be learned, accepted, and sustained.»(Sapirie, 2001)

2.6.2 Social structures

Globalization is easily perceived as something positive to most western societies, but a large part of the world understand globalization as westernisation or Americanization and as such very much negative (Giddens, 2000).

Identifying both the organizational culture and the single individuals comprising the organization can in some cases give you a better understanding of the whole cultural aspect but it can also mislead you as a large number of cultures do not take
into consideration the will of the single individual and some think only of the single individual (Rohitratana, 1998. Jarvenpaa & Leidner, 1997).

The structure within a society has different aspects on relationships as shown in by Rohitratana (2000). Giddens (2000) points out that tradition and family structures are to a vital degree factors in a cultural and modern context. In accordance to Castells (2000), the emergence of the new social structures is “based on the already existing patterns of relationships shaped in the gradually increasing capitalist society of the twentieth century” (ibid). He defines the main elements of human interaction as “human processes structured by historically determined relationships of production, experience and power” (ibid, p.14).

Structuring relationships in three groups of experience, power and production is one way of identifying the cultural significant elements when addressing issues of relationships (ibid). It might give some indications of factors in cross cultural communications, and on communication in general, if one at all can differentiate the two.

The goal of relationships can either be experience based, production based or power based. The three issues of relationships are not static, but can affect each other.

Within any given project there are a number of identified stakeholders but there are also unidentified stakeholder to the project or as Spinuzzi (2000) puts it: “the stakeholders are not necessarily just the people in view, but can be an entire shadow audience”.

Belonging to the network society is to be part of a networked society (Castells, 2000), where the gradual belonging to, also includes the relation to artefacts as well as humans. Artefacts can be a number of things including computers,
phones and PDA's. How we relate to the network enabling technology defines us as modern beings. We are a part of a world where relations often not only depend upon technology but are limited and enabled by it.

English-Luck (1998) gives us an insight in how people use the technology as a part of their daily life. The study is based upon a large research project within Silicon Valley, to look at “technology” people’s attitude and usage of technology in daily life. The study shows that to a large degree, the cell phones, and other technological tools help families feel closer together. Even though some also feel more consumed by the employees by this, the benefits for the users are making it worth it in most cases. The study shows that the roles of the family changes with the introduction of new technology.

The Introduction of new programs or artefacts will in most cases benefit the most technological interested persons. Walsham (2001) points out that the tools applied for monitoring/controlling and aiding employee’s behaviour will affect the employees and the way in which they work. The three people in Walsham’s study shows that the technology introduced is rarely in tune with the need of the users. If the tools make the employees feel watched, or if it make them feel obsolete, most people will tend to not use the technology as intended.

2.6.3 Six constructs for identifying culture

The six constructs are identified by Teng et al. (1999) on the basis of Hofstede (1980) who identifies the first four and Hall (1976) who describes the two last structures.

**Power distance:**
The extent to which members of a society accept that power is unequally distributed in organizations.

Questions to answer: How far apart is it from the decision-makers to the employees? To what extent is power within the culture centralized, without people opposing it. Is the power within a certain culture unevenly distributed?

**Uncertainty avoidance:**
The degree to which members of a society feel uncomfortable with uncertainty and ambiguity, which leads them to seek conformity.
Questions to answer: To what degree are people willing to avoid uncertainty? Are they prone to make decisions based on measurable facts and certainty, or on intuition, and uncertainty?

**Individualism:**
The extent to which members of a society believe that individuals are supposed to take care of themselves and their family as compared to a collectivist society where there is unquestioning loyalty given to a larger group.

How does the individual view themselves? Are they a part of a large group, a small group, or not part of a group at all? The views here differ from the individual who thinks only of himself, to the ones that think of the world as a whole. This is also related to the ability to distance oneself from the actions of the group, or to take consequences as a group.

**Masculinity:** the extent to which a society is achievement oriented, assertive and competitive as opposed to femininity, which is the extent that a society values relationships and caring for others.

**Time perspective:** Hall defined time as either Monochronic which characterizes a society with a preference for sequencing tasks and working without interruption, or Polychronic which is characterized by simultaneous occurrence of many things, and involvement of many people in addressing things simultaneously.

Hofstede & Bond (1988) and Hofstede (1991) refer to this construct as either short term or long term orientation.

**Communications context:**
**Low context:** Facts are the basis for knowledge, and information is stated directly and reflects the reality in which the culture resides.

**High context:** Facts are only the ground of which knowledge stands. This communicative context reflects upon a view where conclusions are drawn from knowledge and intuition rather than fact.
2.7 Actor Network Theory (ANT)

ANT is a liquid method of observations of actors within networks. Rather than giving a smooth framework in which to put the gathered data, ANT gives an input for description. The very core of ANT is this that all things affect each other, so ANT itself will always be in an evolving state (Law, 2003). During the technology transfer or technology passing as Law (2003) would rather describe it, things change, the actors change, the network change, the technology change and ANT change. In fact it is not such that things might change, they do change as elements are introduced into new environments and are mutually evolving.

Law (2003) gives on the efforts of Madeleine Akrich a description of elements pertained within the actor network theory:

"It is organized in terms of a semiotically-derived ... notion of network. There is no assumption that specific links or nodes in the network are guaranteed ... instead both links and nodes have to be uncovered by the analyst."

"The networks are materially heterogeneous. ... All the elements have similar status".

"The various elements of the heterogeneous network ... are all equally able to act upon one another".

"Enrolment [in the network] is precarious. As a consequence ... networks are processes".

"Translation implies both similarity and differences."

Translation is also defined by Callon (1986) as “the mechanism by which the social and natural worlds progressively take form.” Within a scientific project the identity of the actors needs to be established and “the possibilities of interaction and the margins of manoeuvre are negotiated and delimited” (Callon, 1986). The actors need not only be identified but need to be tested as participants of the network and their roles and distribution defined.

The establishing of obligatory passage points is one way of defining an indispensable element in the network and is defined as “problematization” by Callon (1986). Defining a single question as a part of the problematization will give it focus (Callon, 1986). “Interessement” is reasons for enrolment in the network and enrolment is defined:
"To describe enrolment is thus to describe the group of multilateral negotiations, trials of strength and tricks that accompany the interessement and enable them to succeed" (Callon, 1986).
Chapter 3 - Methodologies

3.1 Introduction

During the span of this chapter I introduce what kind of research methodology I used during my research in Tanzania. As methods of research I present Actions-research, networks of action and usability research. During my three month stay I had several obligations and efforts in the field; those are broadly presented in chapter 3.4. In chapter 3.5 I present the different research techniques that were used by myself and the HISP team. Last I give a presentation of the HISP team in Tanzania. All these elements are boundary conditions for my research which in some manner influenced the outcome of my research of a HIS pilot in Tanzania.

Because of the nature of the project being limited initially to three city districts of Dar-Es-Salaam the basis for information was too limited to do a quantitative research of the data gathered. In response to these conditions I decided to use a qualitative research method.

Personally I had never done any similar research effort and wanted to not let my lack of experience be the limit of the research. The action-research method seemed like a flexible method for both the research field in general and for my situation in particular.

3.2 Action-research

I build my understanding of action research as described by Baskerville & Wood-Harper (1998) and Avison et al, 1999). Action research can be defined as «combining theory and practice (and researchers and practitioners) through change and reflection in an immediate problematic situation within a mutually acceptable ethical framework» (Avison et al., 1999).

Action research Within the HISP context the primary research goal is to «design, implement and sustain HIS following a participatory approach to support local management of health care delivery and information flows in selected health facilities, districts and provinces and its further spread within and across developing countries» (Braa et al., 2004).

Action-research in an Information System perspective seeks to gather information to give better grounds for action. It «concentrates on solving real life problems while creating knowledge» (Titlestad, 2004). Action-research seeks to make
the researcher part of the action taken in the research field. «Action research encourages researchers to experiment through interventions and to reflect on the effects of their intervention and the implications of their theories» (Avison et al., 1999)

The now established research method of action-research is often described through case studies and also through storytelling (Titlestad & Sæbø, 2004). A part of action-research which seems to be ignored on a theoretical level by some researchers is an evaluation of things done (Skobba, 2003 citing Dick). Within the theory the research part can be divided further into planning/observation and evaluation.

Action research empowers the users and perceives them as key knowledge bearers of the structure and social processes making up the environment in which the IS is a part of (Titlestad & Sæbø, 2004).

One can say that action-research follows up on the now established iterative system development method. Being both observer and actor defines the researcher in a different way than previously when the researchers where the silent observer.

3.3 Networks of Action

While action-research gives a lot of flexibility the networks of action (Braa, Monteiro, Sahay, 2004) gives an even broader aspect on the research, even though précising the action-research need to be contextual. Action research efforts have to a large degree been unsustainable (Braa, Monteiro and Sahay, 2004). We need sustainable and scalable research efforts. The though from Braa et al. seem to be that efforts of action can be made to work over time even after the researchers has left if the network is in place. The network is described as that of for example HISp, which has nodes all around the world. The specific sites ability to connect to this network will affect its ability to be sustainable. Within a network of competence the research subjects themselves becomes part of the network, and increase the benefit of the network and its value. Being part of the network enables them to increase their knowledge and ability to teach others when necessary. The «network of action» is not just an effort to explain how (action-)research efforts better can succeed but is also a part of HISp. HISp has elements from networks of action in it by being the network in which the action can take
place. It is the network that can both facilitate the research effort and action and the sequent HIS efforts done by health officials.

A research effort is often not politically charged, but the selection to use a Health Information System (HIS) will often be a political decision. The political agenda of the health officials and others higher in the political system is at least to have a working system. When a research has been done, rarely will anyone continue maintenance or support. Under such conditions the new system will often be left unused. This is where «networks of action» differs from other research efforts in the fact that it focuses on the network as a vital part of the research effort. The network in itself is not only a part of a university based research effort, but is also a complete solution for HIS's. This makes it possible for nodes in the HISP network to maintain post-research support and maintenance.

The UTOPIA project (Braa, et al., 2004 citing Bjerknes et al.) despite being a good tool on prototypes and workshops showed to be non-sustainable because it «failed to forge alliances with the surrounding network of journalists and other professional groups»(ibid).

«Networks of action» borrows from ANT and uses translation for appropriation and transfer of artefacts. They also use the alignment concept which HISP in particular draws upon, aligning the different nodes to each other and aligning the different levels within health care to work in the same direction creating dominant networks which work autonomously.

There are some pitfalls in this theory as it may well happen that the previously developed network of health officials will feel threatened by the new networks and then either work to disempower the new network or to create a counter network (Castells, 2000).

The interesting part of HISP in this aspect is its ability to maintain iterative, reflective and linear processes at the same time. The HISP network is a complex spiral network with altering iterative, reflective and linear processes. When the different spirals from the different HISP nodes touch they become stronger. The key issue as understood by Braa et al. (2004) is that these networks need to interact for the action-research to be most productive and sustainable.
In Tanzania it proved hard to achieve what could be viewed as a kind of critical mass. We tried to get support from all areas in Dar-Es-Salaam but even that proved difficult as the initial use of the DHIS was voluntary for the districts.

3.4 Usability research

Kantner, Sova and Rosenbaum (2003) give brief description of three theories of usability research:

- (Condensed) contextual inquiry.
  Uses a «constrained set of concerns» (ibid, p 68) to observe use of a system in communication with the researcher.

- Ethnographic interviewing.
  Centred on the use of a system within the users environment. E.g. how are computers set up at home. What constraints does the physical situation give to the creation of new software or hardware?

- Field usability testing.
  Investigates problem areas often before the launch of software. On-site testing.

The main difference from action-research is the usability research's focus on observation compared to action-research's focus on action taking, where observations become the grounds for action. All the three methods mentioned above gives areas of interest to the action-researcher. The difference is that the span of usability research is shorter in most cases and defines areas of action as solutions and answers to the observations with the action primarily not taken by the researcher but by the ones initiating the research. This differs largely from action-research where action and research evolves as the researchers do both observations and action over an extended period of time.
3.5 Research periods and timetable

The researchers both observe red, participated and gave guidelines for use and support. What we did influenced our perspective and affected our behaviour into further action. I used participative observations during the training, deployment and later use of the system.

A short presentation of when we did what:

Week one from June 5th:
- Stayed in Sinza.
- Sent invitations to the MOH and DMOs.
- Initial trip to the facilities.

Week two:
- Initial efforts to talk to the MOH.
- Initial translation of the DHIS.
- Moved to Masaki.

Week three:
- Planning and preparations for the course.
- Introduction to the Bagamoyo site.
- Continued translation.

Week four:
- Seminar on the DHIS.

Week five:
- Stationing the students at the sites—No in Kinondoni.
- Started entering 2,5 years of data into the DHIS.
- Continued translation.
- Borrowed a car from some Norwegian UN workers.

Week six
- Moved to Valhalla-Nordic compound—Borrowed a house.
- Continued entering data.
- Continued translation.

Week six-ten
- Continued entering data
- Continued translation
- Started going to Bagamoyo.
- Started observing and helping the DMO staff in Dar.
- Moved to another place in Masaki week eight.

Week eleven
Went to Zanzibar on one week holiday.

Week twelve - fourteen
Continued helping and researching the use at the sites.

Week fourteen
Went back to Norway

3.6 The HISP team in Tanzania

There has been an ongoing effort in Tanzania to introduce the HISP philosophy and the DHIS software. The initial efforts were started in Bagamoyo and have now moved to Dar-Es-Salaam. I will during this chapter give a brief presentation of the people involved and the efforts they have been a part of.

3.6.1 Stakeholders

The stakeholders in Tanzania can be divided into groups based on the roles they have within the HISP network.

- University employees
- Master/doctoral students
- Hired people
- Health officials (department/DMO)
- DMO staff (data enterer)

University employees come from either the University of Dar-Es-Salaam (UDSM) or the University in Oslo (UiO). HISP at UDSM is represented by the head of the informatics department, or Juma Lungo an employee there and PhD student at UiO. The head of the Department of Informatics at UDSM took a more political part like signing letters but not really taking any active part in the effort of spreading HISP to the regions or districts. On a day to day basis Juma Lungo was responsible for all things HISP in Tanzania during my stay. From UiO there has been support through supervisors and political support with Jørn Braa as the head of HISP. During my stay Judith Gregory acted for a short stay as supervisor on site to both doctoral and master students.

There are a number of master and doctoral students within the HISP network that has done or are doing their master/doctoral work in the field of health information in Tanzania including Zanzibar. These people which I am one of consist basically of people from Tanzania or Norway. Currently the main effort in
Tanzania is on Zanzibar where they have gone from testing to actual use of the system. There are several students working on the instalment of the DHIS software in all DMO offices on the island. Among them is Patrick Burasa who did research at Bagamoyo.

In the effort to introduce HISP and DHIS into the district of Dar-Es-Salaam I worked with Juma Lungo and Nima Shidende. Lungo was responsible for the administrative part of the project; I was responsible for the research at the DMO offices with translation and supervision of the entry of data. Nima worked mainly towards her thesis which included research at facilities in other cities in Tanzania, but she was also helping me in contact with officials during the initial phase and supervision on site at the DMO offices.

In Tanzania there was hired a person at the University to oversee the use or instalment of the software once the researchers had gone. In addition there where used several undergraduate students to enter data and translate the DHIS into Swahili. They where hired after their semester ended to complete the data entry process.

Health officials in Tanzania are a vital part of the HISP system but do not have any particular interest in the project as a research project only in terms of serving a need for sustainable data. As stakeholders they are often the ones limiting the scope or the use of the system. The DMO staff entering data is a part of the HISP network, and it was in all the researchers’ minds to try to make them feel as much part of the HISP network within Tanzania as possible.

3.6.2 Earlier efforts

Prior to my stay in Dar-Es-Salaam there had been an effort to deploy the DHIS to Bagamoyo (Lungo, 2003). Patrick Burasa and Juma Lungo were mainly responsible for that effort and they had support from the local officials to use the Bagamoyo site as a test site for DHIS. Patrick Burasa is now as mentioned situated on Zanzibar deploying DHIS for use as HIS on the island together with several other students and HISP members. Juma Lungo is still a part of the HISP network in Tanzania travelling between Dar-Es-Salaam and Oslo where he takes a PhD in the HISP area.
3.7 Conclusion

I used action-research as method of research during the study of health system deployment in Tanzania. The research method reflects the condition during the research. The research itself was conducted in an action part and a research part hence the name action-research.

Research:
The research part of the method was done by observations, interviews and questionnaires. A large part of the observations were done in a participatory way where attentions were on solve the users concern rather than the researchers.

Action:
At the outset we started some action to accommodate previous engagement, so in a way you can say all incidents in the research are action to some previous event. Actions we took during the research was seeing MOH, training DMO staff, translating the DHIS, installing DHIS and entering data into the DHIS. There where also other actions which I will describe in greater detail in later chapters.
Chapter 4 – Empirical data

4.1 Introduction
This chapter is divided into 3 parts. General Background information, a description of the work and solutions done by us in the Tanzanian HISP team and finally a more personal description of my stay in Tanzania.

In the first part I present the General background information for Tanzania and how the HISP philosophy and the DHIS software fit into the current health situation. I also give a brief description on the DHIS's standing in Tanzania at the outset of my research.

In the second chapter I present how and why we arranged our work in the way we did. I emphasise on how we worked and what we did and less on what went wrong.

In the third chapter I focus on my personal description of the things happening within the DHIS work.

4.2 General Background information – Tanzania

4.2.1 Historical and political background of Tanzania
Tanzania is a democracy situated on the east coast of sub-Saharan Africa. It reached its independence from the United Kingdom in 1961. The capital of Tanzania changed in 1996 from Dar-Es-Salaam to Dodoma signifying the importance of the country's vast interior rather than the small coastal region. The political situation in Tanzania has been very stable during the last forty years. It has had no wars, but has received a lot of refugees from it neighbouring countries. Tanzania is one of the...
25 poorest countries in the world. Some of the responsibility for this lies with the former socialist government which forced a strict import/export policy limiting a lot of possible growth.

Tanzania divides into mainland Tanzania (formerly Tanganyika) and Zanzibar. The two areas combined have approximately 34.5 million inhabitants (Tanzania, 2006:1) with 23% living in urban areas. The country divides into 25 regions, which in turn divide into districts. The three districts making up Dar-Es-Salaam has its population divided like this: Kinondoni 1.1 million, Ilala 0.63 million and Temeke 0.77 million. However there are a lot of unregistered immigrants from rural areas. Bagamoyo district has 0.23 million inhabitants.

4.2.2 Tanzanian Healthcare situation

"Health services of high quality, effective and accessible to all, delivered by a well performing and sustainable national health system" (Tanzania, 2006:2) is the vision of Tanzania's ministry of health. Tanzania divides its healthcare service into 8 levels from National to household level. Starting with national level being level 1, district is level 4. Included in the healthcare service there are some 40 000 traditional healers and 32 000 traditional birth attendants (TBA). A large portion (33%) of the healthcare is provided by Non-Governmental Organization’s (NGO) (Lungo [citing MOH], 2003).

Tanzania had developed 90% health facility coverage for the population by 1985. However, even with substantial help from developing organizations the funding could only provide 60% of the money needed to utilize that coverage rate optimally (Hingora, 2000).

The main problem in Tanzanian health care has been related to communicable disease and other types of preventable problems or diseases. The disease pattern shows a large potential for improving the general health for a large portion of the population. A lot of the treatments for the major diseases such as malaria and diarrhoea is already in place, but the lack of targeted in formation seem to be the problem area. With adequate information on areas such as treated bed nets against malaria and condom use to prevent sexual transmittable disease the healthcare could make drastic cuts in the number of people constantly needing care. There has been a know problem that the poorest sell the medicine, bed nets or any other item that is given to them to provide more basic commodities, such as food and drinking water.
There are three main health indicators presented in the theoretical framework chapter: Resource indicators, Health Status Indicators and Quality Indicators. All these need to be answered at least to some extent by the DHIS for it to be a complete statistical tool for analysing health data. The three indicators make up several more and they all concentrate on the issue of providing a sustainable high quality health service. Allow me to list them here again as issues we seek to encompass in our deployment.

- Resource indicators
  - Human resources; Staff per patient ratio.
  - Infrastructure; Patients per facility.
  - Material resources; Drugs, vaccines per person in target/risk population.

- Health status indicators
  - Hospital Attendance.
  - Social economic status.
  - Low birth weight.
  - Morbidity and mortality rates.

- Quality indicators
  - ANC coverage rates.
  - Drop out rates.
  - Hospital death rate

4.3 General Background information – HISP

4.3.1 HISP Background
The HISP project is concerned about gathering data for better understanding the short, medium and long term health issues arising within a given population. The information is gathered and interpreted at the lowest practical level of management, the district. The reason for this approach is the thought that you need "local information for local action" (Braa, 1997). Through accurate, consistent and timely data it is thought possible to improve the health care sectors efficiency and quality. At higher levels of administration the same data can be used in the same manner, but also for enhanced planning, implementation, monitoring and evaluation of health services. The HISP project has as previously mentioned accompanied software, the DHIS. It is through deployment of this solution, both software and philosophy I have stayed in Tanzania.

4.3.2 The current software situation
During my stay in Tanzania we deployed the 1.3 version of the software. During the time spent from June 2004 until now there
has been a change in the software situation from the 1.3 version to the 1.4 version. The 1.4 version is available in a stable build and has been deployed at most sites like South-Africa and India. During the time of writing testing on site in India of the new version DHIS2 have started. Due to the large gap between the software deployed in Tanzania and the current development and release I will not delve into the details of the 1.3 version that should be corrected but rather keep my focus on the more general terms that needs to be addressed in a health information system.

4.3.3 Political Situation for HISP/DHIS in Tanzania

Tanzania has a PHC approach similar to the one recommended by WHO (WHO, 2000) and the Health Information System Programme (Williamson & Stoops, 2001). Tanzania has gone through a change in its health strategy the last 20 years (Hingora, 1999) but is to a large extent dependent on aid from other countries or Non-Government Organizations (NGO) like HISP or Care (Care, 2006) to supply the health care needed by its population.

As one of the poorest countries in the world Tanzania has little money to spend on computers at health facilities. The computers therefore reside in the District Medical Officers (DMO) offices. The consequence for the data gathering in the facilities is that it is paper based and will be so in the foreseeable future.

The DHIS software is deployed initially to the districts in Tanzania and not the higher organizational units. The initial deployment of the DHIS was tested in Bagamoyo, a small town an hour drive from Dar-Es-Salaam. My work and research will concentrate on the next phase which is to deploy the software in the capital, Dar-Es-Salaam.

Tanzanian government, the University of Dar-Es-Salaam (UDSM) and University of Oslo (UiO) made an agreement in July 2002 to use Bagamoyo as test site for the DHIS (Lungo, 2003). That initiative has now extended to Dar-Es-Salaam, but the support is dwindling at the national level. However this may change due to the official release of DHIS as a HIS on the island of Zanzibar.

Tanzania has gathered data in paper based form since 1993 when they started using something called the District Processing File (DPF) (Lungo, 2003). This is data elements that are routinely collected on quarterly and yearly basis. The data elements are divided into datasets in different books. Some for quarterly and some for yearly figures. They are designated
by the Ministry of Health and should be collected by all publicly owned facilities. Private sector does not need to turn in books to the districts.

There are 12 books and they are divided mostly into different areas of interest with book 10 as the most important. In addition there are an inpatient book and a laboratory book. Book two collects all data from books three through twelve (except 10) and the two additional books.

5. Description of how to use the other books
6. Data bank (collection of data)
7. Community data (Population data)
8. Ledger (Medicine/drugs and equipment)
9. Out Patient Department (OPD) register
10. Antenatal Coverage (ANC) register
11. Under 5 register (Immunization)
12. Family Planning register
13. Diarrhoea Treatment Corner (DTC) register
15. Dental register
16. Delivery book

Book 10 consists of additional green pages that are similar to the pages in the book filled in and kept at the facility. These green pages are every third month (quarter) delivered to the district. These pages contain the data that is to be entered into the DHIS.

4.3.4 The current situation in the DMO's offices

The computers at the DMO's offices are new and of good standard and comply with the recommended specifications that follow the DHIS software.

The extra work generated from entering all the health facilities data into a computer is dealt with either by the people previously responsible for the paper based data, or they hire new people to specifically enter data. The latter solution makes the people responsible for the data able to concentrate on the analysis part.

As the Tanzanian government has already changed to a more local driven health care the transition to use software based registration and analysis of the facilities paper based data seems to be of minimal consequence to the DMO's.
4.3.5 The initial situation on the Bagamoyo site

Bagamoyo was the initial site for the DHIS in Tanzania, and its use has continued after the last researchers left. The support from the DMO’s seems a bit hesitant as paper based documentation is always wanted in the same manner as it where before the deployment of the DHIS. However there has been hired a new person to enter data into the DHIS making the previously responsible person available for more analytical tasks.

4.3.6 The initial situation in the Dar-Es-Salaam region

The DHIS in Dar-Es-Salaam was in its infancy, with a lot of political work going on. Through the University in Oslo and the University in Dar-Es-Salaam one hoped to get together an agreement to deploy the software to the entire country. In the ministry of health they wanted to try it out in a site with a larger and more complex site than Bagamoyo. They told us that “if it works in Dar-Es-Salaam it will work anywhere in the country”.

Before my arrival in Dar-Es-Salaam there where some communication between the Medical Institute Mohimbili and the Department of informatics to manage to give a five day seminar on public health, statistical analysis and the specific use of DHIS 1.3. Sad to say that due to low budget we did not manage to pay the medicine professors for their lectures so they could not give lectures at the seminar. The seminar was to take place at 28th of June to 2nd of July.

The main person organizing the DHIS effort in Dar-Es-Salaam was a doctoral student Juma Lungo. He was also my contact person and supervisor/advisor in my efforts in all my research.

4.4 Tanzanian Case Study

4.4.1 My Initial goals

My initial goals with the research stay in Tanzania were to train and observe the District Medical Officers (DMO) employees in Dar-Es-Salaam to use the DHIS to benefit their work in gathering and analysing the statistical data received from the primary health care (PHC) units. I thought that both deploying the software and training the DMO's and their employees would help me to understand their needs and expectations. I also hoped it would make me understand them better so that I could help them in their work. I was hoping
too for a better relation when observing them entering and analysing the data. If possible I wanted to look at how we could arrange the deployment and the introduction to the rest of Tanzania through the contact with the Ministry of Health. In addition I wanted to get an opportunity to see how data was collected in the PHC units. What I wanted to do was in other words to better understand the data and people to have better foundation for action. Action in terms of identifying areas where the new development of the DHIS software could improve the current version.

I divide this section into the areas where we put our efforts. The training of the medical officer’s employees, the deployment of the DHIS and the later observations of the use of the software all in relation to the DMO's. There is one paragraph dedicated to the work done at the Bagamoyo site since that site has been active for over a year and has some aspects not relevant at the Dar-Es-Salaam sites. I also describe the translation work and the entry of data done by under-graduate students from the University of Dar-Es-Salaam.

4.4.2 Training

4.4.2.a The participants

The decision makers at the districts and province in Dar wanted the education to take place at the university. Complying with this is a nice way to make the participants aware of the strong connection between the software and the university culture. After this was decided we sent invitations to the DMO's offices in Ilala, Temeke and Kinondoni, the Regional Medical Officer (RMO) in Dar and to the ministry of health. We left it to them to decide what kind of people and how many they wished to send as they knew best who would best benefit from a direct knowledge of the system as presented in the seminar. When the course ran there where eight people were attending the whole course and a few more joining in when they had the opportunity.
The participants on the course were mainly people that have as their main work entering and analysing data. The data is received through the paper based routine data forms from health facilities in the district.

The attendants was each seated at a computer to increase the time they spent with the software and computers in case they had little experience with computer use. Information on simple issues such as “its impossible to destroy the computer” and support on other issues like showing right places to search for shortcuts helped a lot giving the attendants a lot more confidence. We gave them the opportunity to do what they wanted to while seated at the computers. They where encouraged to use the computer as they liked, checking email, writing notes, surfing and for fooling around with the DHIS and the pivot tables. The idea was that fear should be removed and familiarity achieved.

Some problems arose in the use and instalment of the software. This was in part due to health workers not actually reading the on-screen directions, and partly because the software behaved curiously together with the other software. As far as I can see, the main problem is in cooperation with MS access. We addressed some problems like using the correct national settings and the use of the correct data files. Sometimes the software does not open the data files, then it helps to try to repair the software with the add/remove software option.

During the last couple of days we invited to join us the undergraduate students that were to enter the routine health data into the DHIS at the DMO's offices. Since they had to do this work we felt it would be good that they got to know the staff of the different districts and to get to know the software in a similar fashion. During the practical part of their semester the students do work as demanded by them from the University in Dar-Es-Salaam but after we had started entering the data into the DHIS the students had in reality summer vacation. As they needed work we hired them to continue the data entry. We financed this by the help from the University in Oslo.

4.4.2.b The course layout

The major part of the teaching consisted of slides and presentation based on the available teaching material from South-Africa bundled in the release of the DHIS. We where three main lecturers (Juma Lungo, Nima Shidende and me) attending the seminar through all the five days. We also had one mathematician giving a lecture on “the importance of data”
one day and the head of the Department of Informatics greeting the seminar attendees welcome and giving a short introductory lecture on the use of health data the first day and a giving a final lecture at the end of the seminar. We, the three lecturers gave lectures on different subjects supporting each other during both the lectures and the task oriented part of the teachings. I gave a lecture during a whole day on the use and possibilities of the Excel pivot tables. Lungo and Nima gave lectures on the set up of the DHIS, on the data entry and routine data module. Lungo also did a lecture on how to assure quality data. During all these lectures we helped each other out to fill in case we forgot some important area or to give support during the training part of the course.

4.4.2.c The practical bits

We started out with getting one of the two computer rooms at the Department of Informatics to our disposal for the entire week. We intended to install the software prior to the start of the course but decided to let the participants do it as part of their training. When started to install it we discovered that we needed to be logged on as administrators to make it work properly.

Each day started about 9 and lasted until 11 when we took a collective break where a meal was served. After another two hours we had another break then continued for another two hours. We had some funding from the University in Oslo to provide some food and tea/coffee during the breaks as is customary.

4.4.2.d Evaluation

At the last day we gave the participants a few questions to answer to better guide us in the next possible seminar. We made the questions as open as possible. This is an abstract of what they said:

4. Comments on the software
   1. Well made, user friendly.
   2. Provides hope for it being a factor in improving health data.
   3. Great that it is in Swahili as well as English
5. Comments on the Course Organization
   • High degree of excellent technical support.
   • Too short course - 2-3 weeks is good.
   • Provides good cooperation between participants.
   • Good team work between the lecturers.
• Nice Introduction and “the importance of data” lecture.
• Friendly instructors, good meals, good location.
• Some lecturers where not there that should have been.
• Allowances not enough.
• Competent facilitators.

6. Suggestions
• Need follow up at the offices/facilities.
• Need Regional/District meetings to follow up/evaluate the performance/problems arising and for data comparison.
• Aid the installing of the software.
• Need more tools for data collection. Especially on EPI (Expanded Program on Immunization).

4.4.3 Research on health facility levels
Nima and I started out visiting the health Facility that is located wall to wall with the DMO office in Ilala. Once there we found out we needed a letter of introduction from the District Medical officer allowing us to observe the gathering of data and the handling of that data in the facility. Once at the DMO's office we were told we needed a letter from the Regional Medical Officer (RMO) to allow us to observe the data gathering. Once that was in order we could get a letter from the DMO to allow us access to the facilities. When these two letters were in place we should be able to observe the gathering of health data on a facility level.

Needless to say that this took some serious amount of time so since my interest is mainly with the DHIS and its deployment and use I concentrated my time on the data gathering in the DMO's offices. The gathering of the data in the health facilities is on a different level of interest on my part and I therefore did not find the time to do a study of the entering of data at the last weeks of my stay in Tanzania.

4.4.4 Presentation to the Ministry of Health
After our initial seminar with the staff in different DMO offices we wanted to address the more overarching political department. We wanted to meet the Ministry of Health to present to him the possibilities of the HISP philosophy and the DHIS software. Although he knew about the software he needed a better understanding of the HISP network, and the abilities and limitations of the DHIS.

We put effort into presenting the software as a part of a larger philosophy on district based health information.
software. In doing so we presented how HISP has succeeded in South-Africa and on how it is possible to use the software as basis for action.

We met up with representatives from the Ministry at their location in Dar-Es-Salaam and talked on the different possibility of DHIS. We presented graphs form the pivot tables, tables from the report tools and slides from the monthly data module.

All in all the presentation went smoothly although the author was asked to not give the presentation due to the better understanding the audience had for Swahili rather than English.

4.4.5 Translation

The knowledge of English in Dar-Es-Salaam is good, but in smaller cities or towns in Tanzania the people entering data, or the DMO's or the people entering the data would not necessarily know English good enough for us to utilise it as the main language of the software. The DHIS 1.3 version was at the time of introduced not available in Swahili, so translation was needed. The translation was not an urgent task, since the initial deployment was in an English speaking area. However even the people in Dar wanted the system in Swahili as that is their native language. The use of the language is has become very strong in Tanzania, and has switched places with English as the official language. This is reflected in the fact that all the routine registration forms are in Swahili. With a possible introduction of a computer based registration process in the facilities having Swahili as the main software language will ease the transfer unto the computer based registration.

It was at an early stage suggested that I should take charge of the translation of the software from English to Swahili. Without any prior knowledge of the Swahili language I had a hard time understanding how to do that. However we came up with a solution. We assigned the task of translating the software to a few undergraduate students at the Department of Informatics as part of their practical work. The translation was a simple translation of the text based files from the database. Integration was made when replacing the old text file with the new translated one. To minimize the errors I encouraged them to sit together two and two to minimize the possibility for bad translations.

Since my knowledge of the Swahili language was so limited I only supervised the work, and tried to motivate the students.
to work hard through encouragement and trying to explain to them the software and the HISP philosophy together with the importance of correct statistical data for better use of health resources. Sometimes I used a dictionary to help myself understand some of the translated words, and tried to point out areas I knew from the English version where areas where one could easily misunderstand. For example the use of OK and YES and key concepts like indicators, data elements and semi-permanent data. Other than that I had to rely on the students to have attention to detail and to be as correct as they could be.

Most parts of the system have been translated, but there are certain areas that are in need of translation. Especially in the housekeeping part of the program there are shortcomings. After I left the translation was taken over by another person so I reckon that the translation should be finished by now.

4.4.6 Deployment of the DHIS in the DMO's offices

The DMO's staff was given a CD after the completion of the course and had been given instructions during the course on how to install the software. When I came to the different DMO's offices I saw that they had managed to install the software without any significant problems. They had also managed to add themselves as users and get some reports out already based on some data they had entered. This was now a problem as the users were ready to work on the system but had no data to work with. We solved that by using four of the six undergraduate students we earlier had assigned to translation to the entering of the routine data from the health centres. They again worked two and two to minimize errors and I rotated between the sites.

During the start of the entering of the data we drove around with the undergraduate students to get to know the location of the different sites. Doing so we where told that at the Kinondoni district they did not want to participate in the deployment and use of the DHIS.
4.4.6.a Data Entry

As mentioned we did not deploy the software to Kinondoni but we had two students at Temeke and two at Ilala district offices while two maintained at the University doing the translations there. After a couple of weeks one of the students at Temeke failed to show. The remaining student stayed at the office and continued to enter data until the data for the relevant years was entered.

During the initial entry of the routing health data the Data elements we concerned ourselves with was included in the dataset from the DHIS. We entered data from the F004/1-4 forms into the DHIS. The F001-F003 and F005-F006 was not considered for this level of data entry.

At the Ilala district we did not have a separate office for entry of data so the students sat at the DMO's meeting room and used Lungo's laptop to enter the data. When finished with the entry of data we simply moved the data from that laptop to the computer of the DMO staffs computer by a memory stick.

At the Temeke district office we had one student remaining after the other left. After some discussion we thought that he was probably the best one to leave alone, since he seemed like taking the process and the data seriously and saw the need for correct work. In addition to the good impression he made he also seemed to get more support from local staff than the ones at Ilala did, and more than I could give to the translation team.

During one of my visits to the district offices I found that it was discovered that we had not entered all the values on the form. To add to the trouble the new data elements that was to added was not in the default data elements provided by the DHIS and one of the other HISP members added the new data elements without making sure that they was consistent with either the other site in Dar-Es-Salaam or in Bagamoyo. They where also not of the same data element number.

Due to this mistake the students had to go through the data sheets from the already entered periods to correct the data, entering the unentered data into the new data element fields. While that should work fine we also had some trouble with the fact that we needed the new
4.4.6.b Observations on the use of DHIS

When we lost Kinondoni as district to implement the DHIS I instead helped and researched on the state of the DHIS in the district of Bagamoyo.

The general use of the DHIS has been very basic during these three months I have helped the health officials in the deployment and use of the DHIS. They have had a lot to get accustomed to in terms of software. The ones whose main concern is the data seem also to have a lot of other obligations making them unavailable to me or the undergraduate students at lengths of time.

Bagamoyo

This site has some other aspects to look into compared to the new sites in Dar-Es-Salaam as they have had experience with the software for one and a half year. The deployment of DHIS happened there in the year 2002 and was followed up during the next half year. During the year since that time until my effort in 2004 there has been no follow up either on the quality of data or the software. The DMO’s office in Bagamoyo had hired one additional person whose main responsibilities where to enter data into the DHIS.

My main focus of work was put into teaching the staff the software including helping out with some printer problems. The software they needed most help with was the Excel pivot tables. They needed it to better reflect the information they wanted to show. I also helped in making the Bagamoyo data comply with the data from the Dar offices.

During one of the visits to Bagamoyo we managed to talk to the DMO at the Bagamoyo sites and he seemed pleased with the DHIS and the possibilities but still somewhat hesitant to use it as the sole information system over the DPF.

Temeke and Ilala

The two districts in Dar-Es-Salaam that implemented the use of the DHIS had the software installed by the first week after
the seminar took place. After that time the students entered
data for a period of four weeks. By August the data was mostly
completely entered and the analysis the main concern of the
staff was quite simply to get some data into the DHIS for them
to observe the use. When they returned after the initial
training they started to enter data. It was not however
sufficient to give them a good perspective of the
possibilities of the DHIS software. They tried some simple
reports, but very little use of the Excel pivot tables. At
both sites they seem to be occupied with a huge number of
other tasks so the effort to look into the DHIS was not the
main concern as long as they did.

The main focus of my work with the Kinondoni and Ilala
districts was to support the students entering data and to
help the staff in the basic report generating procedures.

The districts started with entering data into the files that
had the data from Bagamoyo in them. The reports and pivot
tables would then often contain the data from Bagamoyo as
options to select. The Dar-Es-Salaam DMO staff felt it was
annoying and wanted it removed from the data files. This we
did.

4.5 Personal experiences

4.5.1 General

When first planning on travelling to Tanzania and Dar-Es-
Salaam I was contemplating the difference in language but it
was soon that I was told by my supervisor that English was an
official language and most everyone spoke it very well. That
was not the case to say the least.

I brought my daughter and fiancé to Tanzania and on our
arrival we was placed in an
apartment we shared with
another student, and the three
of us had to share one bed
without any air-condition. To
make a short story shorter, we
moved. We found the
Scandinavian people working in
Dar friendly and got settled in
and even got to borrow houses
and a car, making my trips to
Bagamoyo that much easier.

Illustration 7: From left: Me, my
Fiancé, my daughter and three
American friends at the house we
borrowed from some friendly people at
the Swedish embassy.
During the stay we went to Mikumi national park, the Zanzibar Island a couple of times and mainly had a great time. We even got to spend some time at the Coco beach police station.

4.5.2 Training

At the outset of the seminar we was going to hold it in English, but as most was not very comfortable with it as spoken language they wanted the whole course to be held in Swahili. Since I was not informed by my supervisor that the State “Lånekassen” in Norway actually subsidises a language course for approximately three weeks prior to such research efforts I had no knowledge of the language and was sidelined during a lot of the teaching. I knew the slides and I knew the area in general that was covered so I could easily follow the course well enough to give support in the case that was needed, but the whole language problem was a major obstacle. While this was a problem I still got to hold the one day lecture on excel pivot tables and I was asked often enough during the training session for me to get a good impression of what were problem issues.

As software was not installed when we started the course, we came very short on the first day. Since the main part of the course depends on the functioning of the software I had to stay at the University for a long time until we finally managed to make it work.

One thing we found out causing problems was that we needed to be administrators to operate the program appropriately so we got the administrator password for the computer lab and started the computers with the correct password. When we started the machines and eventually DHIS we saw that sometimes the DHIS did not work, so we figured out what was wrong, fixed it and left the program to run as to minimize the problems that the DMO staff had to experience. This was not done so much to give a good impression of the software as it was done to cover more subjects during the short time we had available.

A lot of the time I felt we took too rapid breaks and was given very little time to do actual work. The days, although separated well with two breaks had some 1 ½ hour of tea time in a six hour day. As a researcher talking to the attendees these breaks was very good for understanding more of how the DMO staff was thinking and what they wanted the system to do now or in the future. I usually tried to ask questions during the break as to enlighten these questions. However since most where not very comfortable with the English language conversation often tended to be a bit slow.
My presentation on the Excel Pivot tables started with very basic tasks, introducing people to the starting of the appropriate files and exporting to the data mart file in DHIS then importing from that file into Excel. Then the major part of the time spent was to show how you can select the values you want to include and cut that information out of the pivot table into another table for better visualisation of the data in question. During the later stages of the training the participants was asked to make some graphs based on immunization data. I selected a few data elements that they where to set together and visualize.

### 4.5.3 Research on health facility level

Since I wanted to not only take the stay in Tanzania as a research effort on the DHIS, but also a more anthropological study I was very disappointed that I did not manage to get time to visit the health facilities. I think it would have been very interesting to see how treatment was distributed and in what kind of environment the medical units operated compared to the rest of the city. I was hoping to see how the staff at the different health facilities entered data, how the ledger (Book 2) was kept up to date. I am not sure but often there are some differences between the required or encouraged way of entering the data and how it actually is entered. Such elements to enlighten the quality of data would have been very interesting.

### 4.5.4 Presentation to the Ministry of Health

Before we started the seminar in the DHIS we tried to get in contact with the Ministry of Health to get them to come and observe or maybe learn a bit about the HISp and DHIS. Generally they didn’t seem too interested in attending the seminar but we got to go there on a presentation done by Lungo, Nima, Faraja and Me.

Initially me and Lungo had gone through the slides for the presentation and tried to go through what we where to say to them. Getting all set up in one of the offices in the Ministry we started to present the HISp philosophy and the DHIS software in particular. During my initial presentation I was asked if I did not speak Swahili and upon my no was...
asked to step aside so that a Swahili speaking person could take over. I have respect for that attitude that they need to understand it more than I need to tell it. Luckily Lungo was able to keep the rest of the presentation with backing of Nima and Faraja on e.g. the HISP philosophy. At the end I also tried to answer a few questions asked directly to me in English.

Especially because of the situation with Kinondoni we felt we needed more support for the software higher up in the political system.

4.5.5 Translation

The translation of the DHIS into Swahili is important in my opinion. I agree that it should be one of the focal points of the deployment of the DHIS software into a country. But why should it be natural that it is the foreigner that does this job? As strange as I found it was also a very good experience to oversee a group of people doing work in which I had no expertise, and I got to know someone at the University.

4.5.6 Deployment and use of the DHIS in the DMO's offices

Temeke and Ilala

Even though I was told that the DHIS had been installed, it seems not to have been. But there was computers ready for the work and for the instalment / punching in of the data. After ending the course and the participants got their CD's with the data they installed the software immediately.

The task to remove the Bagamoyo data from the data files in Kinondoni and Ilala was not done immediately and was an issue a couple of times before I did it. The reason for me not to do it at once was that the entering of the data by the students had priority. Once the students had finished their work, I removed the unneeded data.

I had trouble meeting the responsible people in Ilala. Once I was there, and on telephone as well, I was told that they would prefer to speak with Lungo or another Swahili speaking person. Since this was quite clear through the seminar as well, I am not sure if they asked me every time they needed help or tried to avoid it as long as they could. In Temeke it seemed a bit different and they asked more about the use of reports and how to generate the different reports. E.g. Report on facilities that have not reported data.
To get into each site we had to be first cleared on the entrance to the courtyard of the DMO offices then we had to talk to the receptionist then we could come in to talk to the statistics people. Once on site at the district office in Ilala I wanted to take a picture of the district headquarters like I had done in Temeke and in Bagamoyo.

**Data entry**

During the error with the data elements I was frustrated that I was not told specifically what had happened by the other HISP member but worse was that it had not been taken precautions to secure sustainable data. The other member did not communicate the message directly to me but left it to the students to tell me if they saw fit. Luckily they did, so I could implement the changes on the sites in Bagamoyo and Temeke. I hope that the students actually took care to enter all that extra data correctly and from what I can gather there is no reason to suspect that they did not do their best at this work.

When I saw the lack of data elements I tried to import the data elements from the Western Cape data file. Due to the size of the data file that took too long so the solution was to enter them manually. The DHIS 1.3 database sorts by name and not primarily by the number of the data element as one might think. However in later versions of the software it uses the numbers as primary keys. Therefore I tried to maintain the same numbering on the data elements as well as the names so as to minimize the problems when a collecting the data from all the sites in a province/region based computer.

As the student entered data they complained about the use of the max/min values error message appearing continuously. It was very annoying when entering data for a more than two years and should be possible to suppress.

**Bagamoyo**

The staff in Bagamoyo managed to open the files needed and to show the plain pivot tables with just the information as it is initially when you load the spreadsheet.

What they wanted was to be able to show the information in a more precise manner to better reflect the data that they thought where interesting. Often they got information into the spreadsheet that was irrelevant, inaccurate or had NULL values.
I showed them how to manipulate the pivot tables in such a manner as the set up was most like the one they wanted. After doing so they needed to extract the information they wanted from the pivot tables entering it into another spreadsheet. In this new spreadsheet I taught them how to delete and enter new record and how to accurately show the correct information in graphs that best portrayed the information they wanted to show.

Although this was a bit more basic than I had expected I knew both from the seminar and from a health information course in Norway that the Excel Pivot tables is an obstacle for many. This teaching confirmed that a lot of even experienced computer users have trouble understanding the full possibilities of the pivot tables. During these lessons it became apparent that they feared more to do something wrong with the data than not doing the proper analysis or creating the proper graphs.

In Bagamoyo me and Lungo went to see the DMO, and do a short interview, it was very nice to see how well a previous researcher was met, and it all went very smoothly. We talked to the DMO for about 50 minutes about everything I needed to ask me connection to the DHIS at the Bagamoyo site.

4.6 Conclusion

Within the context of HISP Tanzania we managed to present a good course to the DMO staff members that where present at the training. While we deployed the software into sites in Dar-Es-Salaam we used students from the Department of Informatics to aid us in the entering and translations of data adding valuable information to a deployment effort. Later we presented this information to the Ministry of Health.

Efforts where done to ease the transfer unto an ICT based HIS by action research, interviews and participatory observations. All where conducted during the whole research period?
Chapter 5 - Discussion

5.1 Research methods

I tried to implement action-research as method of research and have only later been aware of the «networks of action» theory. If I had more thoughts on that aspect I think some of my strategy in sharing information about the HISP network with the DMO staff would have been different. I would to a larger extent tried to connect them to the nodes in Mozambique and South-Africa. Even more important I would have put more effort in gathering the HISP people in Tanzania to have an experience sharing at the end of my stay and put forth an idea to continue such gatherings during the entire use of the DHIS. Within the current situation in Tanzania that would include staff from the sites in Temeke, Ilala and Bagamoyo, representatives from the Ministry Of Health, from the Regional Medical Officers office and from UDSM.

During the initial phase of my research I focused on research without taking notes during the interaction and observation. Once back home I would write down the things said and done during the day. Since my activity usually consisted of only one meeting per day I could easily write down the conversations and observations within three to four hours after they happened. The motivation behind this was to minimize the feeling of observation in the observed. I wanted as much as possible to make the people researched to ask the questions they wanted without thinking about what I would use that information for. Bringing a notebook to the site might put too much focus on my research approach for people to act freely. Since I wanted as much open communication as possible I felt it was the best way to go at the outset. After a while it became increasingly difficult to remember all aspects and topics of discussion. I therefore decided to bring along a book where I wrote down thoughts or problems arising when I was out at the different sites. In my opinion this limited some discussions and interactions, but it allowed me to better remember the actual events better and thereby improved the overall benefits both for me as a researcher and for the people using the system.

With concern to my gathered data I can only agree with Skobba (2003) and Titlestad (2004) that the data gathered are qualitative in an action-research approach and not meant as quantitative. Even so I try to draw some general conclusions on the basis of data in later chapters. I do this in the thought that qualitative data can say a lot about this particular situation. One thing it does not probably do is
give a complete picture. It is important to mention that a
quantitative research method might not have brought a more
complete picture as any method have strengths as well as
weaknesses. When I selected action-research as research method
I did so in the thought that it was the best in the given
research situation, in line with the nature of the data I
investigate, and more personally it fitted with me as a
researcher.

When in Tanzania I was also hoping for a chance to see how
information was gathered, not in relation to the data in
particular, but how knowledge of the strategies, the health
sector and the statistics was maintained in the districts and
in the personnel actually working with the data on a daily
basis. As knowledge often resides in the persons working with
the data I hoped that the before mentioned action-research
research would also give me the data I was looking for in this
context.

I did not prepare a lot of questions or areas of interest in
advance of my visits to the different sites. Instead I wanted
to rely on the DHIS to provide us with areas of discussion. My
research goal was to see how to develop a health information
system for Tanzania, and through not defining small areas of
my interest, but instead being open to the needs and interests
of the staff on site I feel I have got information that is
relevant to the users of health information system in Tanzania
and not specifically to any research objectives. This is in my
view in line with some parts of action-research but even more
so in line with a theory put forth by Jørn Braa, Eric Monteiro
and Sundeep Sahay; «Networks of Action». It must however be
said that I often was wondering about something or had one
area in mind that I wanted to discuss in the session so to
some degree I led the conversations when I visited the
districts.

Contact with the people I trained and helped in the DMO
offices was kept as informal as possible. Since my action-
research approach was an open ended research solution to not
find anything specific, but rather let the problems of the
users be the areas of interest and communication I needed
honest answers to my question and honest questions for help.
Whether in a standard research effort or in any other research
effort we have to balance between not getting any answers and
getting the answers that are what we want to hear. Under the
cloak of research we give ourselves authority that if not used
carefully will create less honest communication. In a worst
case the research subject will try to impress you with giving
you the answers you want to hear no matter if they are true or
not. In the view of the six constructs from Hofstede (1980)
and Hall (1976) (Ying, 1990) power distance, uncertainty avoidance and individualism will all play important roles in a research object's ability to answer truthfully in a given situation. Especially with standard research methods where a lot of the research is done under the researchers control will there be an increased possibility for colouring of the answers.

With regards to methods I did also use two of the three usability research methods to some extent, but it was not my main concern. Ethnographic interviewing was used to clarify the DMO staff's working conditions, how they got data from the district's facilities and how they took care of that data. What did they do to quality assure the data? Secondly I used field usability testing mostly at the seminar we held, but also on site to better understand how to develop the next solution of DHIS. Condensed contextual inquiry was only used very flexible under the seminar when we gave the participants concrete tasks to solve. One problem we had with the seminar bit was that we could only observe how people reacted in that setting. It would have been interesting as well to observe them at their sites during the initial installing phase.

During my stay in Tanzania I wish I had drawn a concept map (Avison et al., 1999) to better understand the different relationships and the different concepts in effect in Dar-Es-Salaam. Drawing a concept map could have helped me in understanding whether or not I was aligned with the DMO staff or others in relation to the deployment of the DHIS.

The benefit of the action-research in field work in my experience is that we get a chance to follow up on our efforts, gaining knowledge from a continuous work. Altering as you go along will increase the knowledge gathered as you can experiment with interventions and theories in a new way (Avison et al., 1999) compared to previously used methods when you needed to have readily formed theories and questionnaires to address the different aspects you hoped to shed light on. Action-research is in this aspect a dynamic solution to a problem that often is dynamic. The dynamic often comes from the fact that we are dealing with people, and people are very rarely predictable even less so for the researcher in a cross-cultural context. Action research is a flexible solution to a flexible problem and so it fits better into a project like HIS as the project is about crating use and software for health tacticians not only research outcomes.
I tried to keep in mind the location of the offices, placement of desks and all the little things that signify behaviour or rank within the DMO offices that could have an impact on the use and deployment of a HIS in Tanzania. As Titlestad (2004) states «using the computer could be seen as a symbol of status» and that was also the case in Tanzania.

After the end of the seminar we organized the students at the sites and on the continued translation. I went to two places per week. Either in the districts in Dar-Es-Salaam or Bagamoyo or at the university where the students where doing the translation. During the two months I spent on that I went to the University 5-6 times counting translation related visits only. Other than that I was at the university nearly every other day. I went to Bagamoyo seven times, Ilala 6 times and Temeke 5 times. When I was at the sites I usually spent 2 hours there to talk, observe and aid in computer or DHIS related issues. Most of the times I went out like this I was alone, but at some ovations, especially in Bagamoyo, others accompanied me.

5.2 Social implications for ICT systems in Tanzania

5.2.1 Introduction

Defining technological solutions such as the DHIS as not solely technological and thereby moving away from the notion of technological determinism is altering the view of a IS as something unaffected by the environment in which it appears. In Tanzania the alterations made by the pilot project in social structures seemed evident. The two week training and subsequent deployment seemed to alter the social networks within the different DMO sites and between the sites.

The network of HISP in Tanzania was as described containing a lot of people from national to district level of the health system and people from the university in Dar-Es-Salaam and Oslo. The social context of this network is a part of what limits or enables the progress of the DHIS.

For Tanzania the introduction to the DHIS happened prior to the efforts described in this thesis at the Bagamoyo site. A year after that time people from the University of Dar-Es-Salaam and the University in Oslo managed to get an agreement with the ministry of Health to try it out in sites in Dar-Es-Salaam as well. As the agreement had been reached the Ministry of Health stated that «if it could work in Dar-Es-Salaam it could work anywhere in the country». The introduction of the
system into a large city context was perceived as the ultimate test of the systems ability to cope with large quantity of data and a complex environment. However the test of the capability of the database has already been proven in large cities in countries such as South-Africa, Malawi and Mozambique. An aspect that would be of importance but seemed not of concern to the MOH is the outer district staffs knowledge of computers and English. In this regard Dar-Es-Salaam has a high degree of literacy and could be viewed as a place where an ICT reporting system would defiantly work. On the contrary the Bagamoyo could be viewed as a rural pilot site and as such that test had been done on the DHIS which now made the pilot in Dar-Es-Salaam the natural progression.

Based on experiences in the Tanzanian HISP context we see indications on the fact that the health information system is not loosely coupled to politics, power or economics. Power, politics and economics play a role in the decision to use HISP and the accompanying tool DHIS as both HIS and health philosophy for the healthcare system. Political brokering is a part of everyday life of the DHIS in Tanzania as it is in most HISP countries (Titlestad & Sæbø, 2004).

### 5.2.2 Information infrastructure

Within the Tanzanian context installed base is the elements concentrated around DPF and the computer based system at the region level. The system can be viewed as a constant system. Not necessarily in the form it is now, but as an evolving infrastructure made up of people entering and leaving the network not able to alone change the system in a significant way but as a process they do. So now the HISP is a part of that network, and DHIS/HISP or possibly a third option might be a part of the future of this network or infrastructure.

The different nodes in the administration had very different approaches in meeting the notion of HISP. At the nation level it was to investigate the potentials of HISP. On the provincial level the attitude was more reluctant not attending the training and not answering inquiries. Most positive interest was found at the different DMO sites. However also there it differed greatly with no deployment at Kinondoni, positive interest but sparsely delegated time at Ilala and a general positive attitude to the DHIS and the researchers at Temeke.
5.2.3 Structuration theory

Even if Giddens did not intend structuration to be used in relation to ICT systems it is possible to use his theories of structuration on the structure and agents within HISP in Tanzania. A number of researchers use his theory to explain the duality of processes and structures (Braa & Hedberg, 2002).

The structures in the Tanzanian health care sector are defined as one HMIS called DPF. This consists of the 13 books made for recording data and tally sheets made to cross of single incidents of e.g. Measles vaccination. Processes define as recording of statistical health data at all public health sites throughout the country. The recorded data is sent to the districts and then further up to the national level.

The DPF is the basis for data elements which is to be entered into the DHIS and as such is a constraining factor as long as no real power has been given to the district to choose what indicators, data elements or semi-permanent data to record. Giddens theory of structuration can be used as describing the DPF as constraining but also as enabling in the fact that it gives people opportunity to use the data elements in conjunction with the given indicators to establish a thought trough system of data gathering. Using the structure will eventually change the structure in accordance to Giddens, but in the case of Tanzania it seems like a very slow moving process.

The HISP team in Tanzania is looking to change the structural process of Tanzanian health care not just to alter its recording procedure, but to alter the level on which action is performed and the collecting of data is performed. DHIS is for now in a pilot state where the DHIS and DPF are simultaneously run systems.

5.3 Health Care

5.3.1 Introduction

As I was not allowed to observe the gathering of health data in the facilities I can not talk of observed behaviour but have to make some assumptions based on input from the DMO staff, the books and data collected and finally observations done by other members of the HISP team in Tanzania.

The magnification of effects of diseases is, crudely said, equivalent to the economic situation in the country. When talking about Tanzania, which is one of the poorest countries in the world, there should be a lot of problems to tackle. The
problems are largely due to the scarcity of resources and the density of the population making effects of contagious diseases greater. It is in this context the DHIS in the Tanzanian capital with an estimated population of 3 million has to provide data to improve health care service and distribution.

5.3.2 Primary Health Care approaches
Tanzania has done great efforts to implement the “health for all” policy, but since Tanzania only have funding to operate 60% of its facilities the distribution of resources such as medicine, health personnel and equipment is important to provide quality healthcare for as many people as possible.

Data elements such as define in the forms in the books and the ones subsequently making up the national health indicators support, intentionally or not, the notion of improving not only health status in general but also to improve at least some of the other three areas influencing a persons quality of health. Examples are «Total number of family planning acceptors (new and old) ».

5.3.3 Evidence based medicine
The need for evidence based action is apparent and is supported by large organizations like US AID, WHO and UN. The HISP foundation is built on evidence based approach and its software the DHIS is the tool to make that possible. Using the strengths of information technology which is data collection and analysis might increase the possibilities of basing action on evidence rather than gut feeling. The need for the healthcare system to be less dependent on people to do the analysis of a situation based on “gut-feeling” is particularly important in a third world contexts where the scarce resources already are stretched out over a number of fields. Often the third world countries receive large donations for use within the health care sector. Unfortunately the health care system does not always benefit from this as the funding is often for specific technology or suppliers from the donating country. In other words the donation is not open for the receiving country to spend as it wants or needs but is to a large degree predetermined on how it is to be used.

5.3.4 Management indicators
The Tanzanian forms for data gathering is extensive and holds information for detailed registration of health related issues
on a national level. In addition ready made tally sheets are given out to ease the registration so that a simple line signifies the treatment of one patient. This eases the registration in contrast to the sometime overwhelming number of data you need to register for one patient at a number of the books. From what I have read (Shidende, 2005. Lungo, 2003) the collection of data seem to be a integrated part of the daily life of the PHC centres and errors done here has not been any worse, but rather similar to other sites where data error is sometimes found when data gathering is not a prioritized task.

The data elements gathered through the 13 books and especially those defined in book 10 report 004 for gathering on a monthly basis are defining what focus the daily health care at the health facilities have. In addition there are sectoral performance indicators both annually and periodic which are key elements the different administrative health levels need to answer. Based on the management indicators mentioned in chapter 2 and the yearly and periodically indicators defined by the Tanzanian government (Appendix A) in addition to the data elements we have a good base for assessing not only quantity of care but also quality of care.

Tasks after identifying resource, health status and quality indicators are revising the existing essential data set to include relevant data for the coverage and quality of health services and population health status by a given time.

During initial deployment of an IS training of a large portion of health personnel on data collection, collation, reporting and use of relevant information should be maintained in such a way that knowledge is redundant. This was done in the Tanzanian pilot sites, as every district had two or more people present at the training course. Only the regional medical office did not have staff attending at all times.

To improve the quality of data we needed simple forms to fill in and luckily in some cases Tanzania use tally sheets as recording device rather than the more complex books. This rather simple recording method has shown to be sufficient in other situations (Braa & Hedberg, 2002) and by being simple it increases the probability of establish a quality feedback system between the Sub-district and the health facilities that improves the feel of significance of the extra effort health personnel or officials have.

Within the Tanzanian sites there where no post efforts to improve the consistence of data. The main instrument within DHIS in improving consistency and quality of data is to set up boundary values to limit the possibility of entering to large
or too small values. However this is hardly sufficient to identify data cooking.

5.4 IS, HIS, RHIS and DHIS in Tanzania

5.4.1 IS

General information’s systems stand in a context as described by amongst others Kling et al. (.2000) and is not unrelated to its environment. The social context of the IS in many aspects as important as the functionality it contains and has a history to tell by being in a specific place at a specific time. The incentive to gather information or choose a IS often a political decision in itself. The decision to use or not use an information system has political, social and economical ramifications. The choice of IS thereby alters the structure of the power relations. We can see organizational behaviour toward information and IS as something unstable, changing with the political viewpoints of key decision makers or the organization in which it is situated. Examples of this within the HISP network are evident in for example Cuba (Titlestad & Sæbø, 2003) where the political situation deeply affected the success or rather failure of introduction of the DHIS. Similarly, but on a smaller scale, we saw political and economical situations affecting the introduction of DHIS into the pilot sites in Dar-Es-Salaam. Particularly in one district it turned out impossible to continue the pilot project due to failing political support. For HISPs part the choice of HIS is not only a choice to use a specific computer program, the DHIS, but it is the choice to use a district based health information system approach partly acknowledging that action need to be performed as close as possible to the origin of data.

Information systems are not synonymous with ICT systems (Kling, 1999) but the need for them to be increases with the increased amount of data. The increase in number of IS's that are also ICT systems are not just because of the increase of ICT but because decision-makers are starting to recognise the huge benefits had by collecting data into computers for reports, analysis and visualization. The value of the data especially within the health sector is far greater than the cost of a few computers needed to collect and

Illustration 10: DPF collected at the Ilala DMO office. Picture by Nima Shidende
collate the data in for example Dar-Es-Salaam. As presentation were given on the use and potentials of pivot tables all the DMO staff was very interested since it gave an immediate picture of the situation in a user-friendly way that the DMO staff could understand at first sight.

Because of the many benefits from having a computer based IS the main reason for not storing or collecting data into a technology based IS will be economical. In a western country the information systems are often synonymous with an information technology system while in a third world context the data gathered are often stored and collected in paper form. Previously in Tanzania only the regional level gathered data in computer form. Because of this large difference in economical situation the understanding of the term information system will probably be more twofold in a third world context than in a western context.

Many authors of research papers seem to be agreeing on the fact that there is enough information but the decisions made are rarely based on the large quantity of information available.

"If information can impact on health by influencing decisions, it would seem obvious that the flow of information system must retrace the steps taken in the decision-making process." (Sandiford et al., 1992)

Feldman & March identifies as a problem decision makers lack of ability or will to make decisions on sufficient material, but instead requesting even more information. The problem can be viewed as a complex issue of decision makers deciding over limited resources and as such will rather hold the decision to spend money until they can be sure that the decision is appropriate, effective and timely. In most cases the consequences for taking the wrong decision is more severe than for doing nothing.

In the Thai case study in Rohitratana (2000) people cared more for the hierarchy within the company, or family than taking the decision on sound information. The weak link between decisions and information is identified as a key problem since information’s forte is primarily its ability to aid decisions. Information can be used in a political sense to aid the positions and power balance in the organization. The selection of data to gather, selection of what data not to gather, structure of data gathering and software are all political decisions that have political and economical implications.
From what I saw in Tanzania and the political relationships interested in and not interested in the DHIS I say I have observed the same, that political issues or agendas outweigh other interests and decisions are much used in an affirmative sense, to confirm prior beliefs or positions.

"Perhaps the stories of information perversity tell us less about the weakness of organizations than about the limitations of our ideas about information" (ibid).

In the case of Tanzania the use of DHIS stranded on the perception of the system as something cheap, something that they did not even have to pay for and consequently not a god product. In this case I reckon we did not emphasize the value of the system in the right aspect.

The idea that information is neutral can perhaps be put to rest both because of the political and economical aspect, but also the fact that information system can not be separated from their context (Walsham, 1993). Information systems in context bear witness of field, interest and focus. IS will therefore always tell us something about those using it and the decision-makers. In the case of DHIS in Tanzania it seemed like we were not taken seriously enough as competitors to WHO, US AID or the national

As we see in Tanzania and many other countries that HISP/DHIS is a part of we not only introduce ICT system to a new environment but we introduce it to a level where there has traditionally been very little effort to put resources. Shifting the power balance is in-line with the thoughts of HISP where information is the basis for action and by giving the data and information to the districts shifts the power balance within the province and possibly the national health system. In Tanzania the effort to introduce DHIS into the districts, setting up computers to statistical workers will almost certainly change the power balance in the DMO office and if implemented on a national level will increase the power at the district level in accordance with the HISP philosophy. The closer decision makers are to the data the more accurate and timely the decisions will be and subsequently the action will have potential to be more appropriate. The different levels of administration in Tanzania showed signs of understanding the power shift in this strategy and as such the reluctant attitude at the region level may be attributed to this factor. It is however important to note that this is an assumption and not something specifically stated.

Titlestad (1994) describes that a positive relationship towards technology entails a low threshold in use. We saw in
the course, that the attendants with a positive attitude seemed to get better progress than the others. Among the others we saw a development through the free and open use of the computers. They became positive and the threshold for them to access the computer and undertake new tasks became lower and lower as the course progressed.

5.4.2 HIS

Within a third world context a number of aid organizations are present offering more or less complete HIS's covering either patient or statistical or both types of data. Such efforts include US AID, WHO and HISP. Selecting HIS is not just a medical and statistical decision, but also a political decision. For Tanzania's part initial statements was to get a system that covered statistical recording and analysis of the data. Using the national indicators as a target goal for lower limit as the amount of data the DHIS should cover seems natural. And the system has no trouble creating or maintaining these values and indicators.

Routine health information systems have the power to maintain a history of the development of population health, health services and quality of services. It has the ability to cover all three reasons for data collection; decision basis, monitoring and evaluation. Other modes of gathering data can hardly be said to cover this as the routine HIS can. Tanzania has had a routine HIS for quite some time and the gathering of books and forms on an annual and quarterly basis seem to work rather well. However due to facility staff needing to physically go to the DMO office with the data a lot of the data are late. Routine reporting could certainly be made easier with internet based reporting or simple e-mails with the updated data files. This is easily possible to do as the DHIS have excellent support for importing and exporting data files.

District based health information systems has support from Lippeveld and Sapirie. The HISP network is concentrated on using the DHIS as support for a district based health information system putting local knowledge to use within that local context. In Tanzania the Ministry of health seemed positive, but not very eager to act out any of this district based immediately. The approach seemed to be more of developing an understanding of the HISP approach and network than to investigate the possibilities of DHIS. However they where interested in that aspect too their main concern in relation to the DHIS was investigate its potentials to compare to the product they were themselves developing,
5.4.2.a WHO's HIS assessment

The WHO's three HIS assessment objectives “determining the adequacy and relevance of the HIS”, “evaluate the extent HIS supports the management of services” and “identifying the weaknesses of the IS” all needed addressing during the pilot project. With the previously discussed back ground one could argue that not only should and information system be adequate and relevant but also appropriate within the context and environment it is intended.

The 13 books and in particular book 10/form004 and 005 and the national indicators forms the basis for what the MOH perceives as relevant data to gather. The DHIS can be customized to include all these values of which many are in the standard data elements. If needed there are no problem adding, deleting or altering the data elements at a later stage. The same goes for the national indicators that can be made from scratch or as with the data elements can be based on standard indicators available within the DHIS. The highly configurable nature of DHIS is its force and was appreciated by the staff participating in the training. In fact some where a bit awestruck that they could actually add or remove anything within a computer system. When there also is the possibility to add semi-permanent data such as population and alter these entries and show all information or a selection of the information in a graph or table form most aspects of a HIS is covered. When considering the DHIS there is however a small lack of usability in the use and efforts you need to put into creating a GIS view of the health data. Apart from that the adequacy and relevance of DHIS in the Tanzanian environment of information gathering can be said to be present while it also supports the management of services by providing sustainable data.

In reference to the weaknesses of DHIS there are some related to the technical aspects but as those will be continuously altered and has already changed a lot compared to the version we used in 2004 in Tanzania I see no point in going into detail on that part. In reference to other weaknesses of the DHIS is in my opinion much related to its environment as a free university based software. Although I use it as a positive argument it can be used the other way around and it was in fact a negative argument for the Kinondoni district. One aspect in this regard is Sapirie’s (2001) warning that IT people defining categories of health and setting up minimum datasets have less credibility than if it is done by public health professionals. However in the case of HISP courses in public health are given to the master and PhD. student so as to introduce them not only to information systems context but also to public medicine in general giving researchers knowledge beyond that of a normal software developer.
5.5 HISP

5.5.1 The HISP philosophy and establishing a DHIS

The HISP philosophy is of localized action based on appropriate customized data sets defined by the local administration unit. Within HISP there are a network on which nodes can draw upon in the implementation, support and deployment of the software. The nodes in the HISP network have different aspects on the use of DHIS. Some are just starting, some are in a pilot project and some use it as the national HIS. This wide range in how developed the DHIS is within the different nodes of the network makes the network more able to tackle new nodes.

The six steps mentioned by Williamson & Stoops (2001) can be a test on how far we got in the Tanzania HISP project. It must be said however that this was a pilot project and therefore a lot of decision power that would have helped in facilitating these efforts was not present.

Establish district information teams

In Tanzania the government has divided teams by the city districts with information workers working on the collection, collation and assessing of the data gathered at facilities throughout that city district.

We used the training to partially develop an understanding of the HISP team as a whole trying to focus on the university approach where people are continuously available for later support.

Information audit of existing data handling processes

In Tanzania the health sectors gathers data on a routinely basis but as we saw some where not equally good at reporting on the given times and the private sector does not report at all.

We did not have the time, necessary permissions or the backing from the government to do any alterations in the data process. DHIS in the pilot phase was intended from their point of view as a simultaneous data recording process and not as a replacement to the DPF at any level of administration.

Formulations of goals, indicators and targets

Tanzania has designed a set of indicators that are the key answers that the data elements need to answer. All books and forms are intended for gathering information to be basis for these indicators. In addition Tanzania has formulated a national health policy which states:
"The overall objective of the National Health Policy is to improve the health of all Tanzanians, with a focus on those most at risk, and to encourage the health system to be more responsive to the need of the people" (Hingora, 2000)

We did not have any mandate to alter goals or targets, however in regard to the indicators we wanted to alter them according to the needs of the district as well as the national and regional demands. When this was not done it was due to time restraints and that focus was to get the system up and running with the standard indicators as described by the Tanzanian government (Appendix A).

**Capacity building of health care providers**

The effort to gather information on a routine basis is established in Tanzania and it is defined as part of every staff member's work routine. The books, forms and tally sheets form a great number of entries each day that are taken care of by the individual health care worker. It is fair to say that they have a lot of registration to do and additional staff would probably be appreciated in any of the sites but since the Tanzanian health care sector are under budgeted I think it is not very realistic to get more staff and more resources than are already present. However the DHIS and HISP philosophy of rethinking the indicators, data elements and processes might increase the amount of relevant data that can be gathered and possibly then decreasing the amount of time and resources spent while the quality of data increases.

**Development of an information culture**

The DMO teams in the Dar-Es-Salaam had a joint interest in sharing information and did so during training. One of the main requests from the DMO staff after the seminar was to gather once or more a year to talk about experiences and problems arising during the use of the DHIS and to compare data.

Trying to connect the Tanzanian HISP sites to other nodes in the international network of nodes must be said to have failed. It was not in the mind of the researchers to put the nodes closer together and without any form for email available at the districts offices we saw little potential of corresponding with the rest of the network on a regular basis. However we hope that in the future the workshops in eastern Africa can be held together to maintain a sense of belonging to the larger HISP network.
5.5.2 DHIS

One of the key features of DHIS is its ability to be custom made for a very low cost. There are no reprogramming, no large scale services or alterations needed. The tasks seem to not need a lot of computer experience, so that any of the data enterers could add data-elements and semi-permanent data. One could argue that providing such high degree of customization might deplete the stability, and integrity of the software as well as the data. In Tanzania we did not manage to maintain data integrity at all times. Due to missing data-elements not being entered correctly in the different districts database could have given erroneous data at the provincial and national levels.

The new version of the DHIS, DHIS2, bears great potential in increasing the connection between the different levels of administration due to it’s highly network based approach. The internet in sub-Saharan Africa has seen an improvement of access points and internet availability through an increase in internet service providers (Mbarika et al., 2002) and thereby increases the possible benefits from such a networked HIS solution as DHIS2 will become.

5.6 Cultural contexts

5.6.1 Introduction

When in Tanzania I saw first hand how it was difficult to be a foreigner in a project. However as Sapirie (2001) describes the sustainability of a project acted out by foreigners while I saw problems arising in the deployment, training and daily support due to the need for DMO staff to use English when they talked to me. Avoiding resistance points was attempted but this was one of those things that was close to impossible to do something about in the three months I was there. Luckily the HISP team mostly consisted of people speaking Swahili and based in Tanzania so the efforts done were sustainable over time with people from the university able to provide later support. In addition a person where assigned from the university to act as a support person for the DMO staff after I left Tanzania.

Creating local translation to aid the initial phase was not done as according to Braa, Monteiro & Sahay (2004) but intentions were to do an analysis of the local elements and persons involved in the HISP network to better understand the items connected to the deployment and their significance to the DMO staff or other stakeholders.
When an IT system is in daily use, the intended use of the system will not always be the same as the actual use. Walsham calls this drift, and sees it as a natural part of an IT system. The benefit is that the system will be utilised in a positive way. Being positive for the user usually means it has a corporate value as well. Making people use of a system in a way that is contradictory to the way they perceive their society and culture, will only result in unhappy workers or an unused system. Therefore the importance of a system that considers all these facts and uses them as positive factors rather than obstacles is vital to success. Neo-Colonialism is exclusion rather than invasion. The segregation and stagnation of the underdeveloped countries start when economic aspects come first.

5.6.2 Social structures

The global aspect of the HISP network and emphasized even though we did not connect the nodes. This was generally perceived as something positive by the participants in the seminar we held. This global aspect can be said to not have the western aspect as in most global aspects as described by Giddens (2000) but have a more African aspect as the main site of HISP is in South Africa and the software and philosophy has implementations in a number of other African countries. When starting a new paradigm, lowering the amount of resistance points will possibly enable researchers or developers to introduce the new technology successfully. The same goes for appropriating a similar solution. However it is hardly likely that it is possible to lower the resistance points to zero as there are too many variables in most deployment or research efforts to make that a likely scenario.

Due to the different aspects on the individual a large problem in cross-cultural projects is how to understand cultural indigenous people’s behaviour and mindset. When a population doesn’t consider the will of a person as something relevant, but only take into consideration what is best for their family, tribe or organization it is hard to transfer a moral code from a population where the individual is the focus. One key area is thus to identify global context or individuality as described in the Six Constructs.

In a context like HISP in Tanzania all aspects of Castells (2000) power-experience-production relationships will be present. No single part of the system can be specifically identified as one or the other as all elements are interacting and generating different relationships with different parts of the system. In a cultural diverse environment these boundaries will fluctuate or even be reversed. In many cases we will also
see a lesser and lesser differentiation between the Power and the Production relationships. We are more and more seeing constellations of power relations that has made the step from power to production and with that the alienating of the individual.

If workers feel sidelined (Braa, 1997) or controlled by using a program, they tend to not use it, or at least not to a full extent. This makes strategic consequences for a software or information system that has no support from the people using it marginal. The importance of getting all or at least key workers to understand the benefits and usefulness of the system, and thereby make them use it, is the most important issue for any projects. In a cultural understanding I think also it would be wise not to forget the differences in attitude towards home and work sphere. As English-Luck showed, technology changes behaviour, but this is for hi-tech knowledgeable people in Silicon Valley. In different contexts we might see different approaches based on that specific culture. In Dar-Es-Salaam we observed people very fast enabling themselves to use computers and everyone had cell phones.

5.6.3 The six constructs
In many cases the 6 constructs gives us a good tool for identifying a cultural in relation to our own, but as Walsham (2000) points out, it is possibly a too crude approach to be valid in all cases. It must be said that its not just attitude within an organization such as the health sector in Tanzania that opinion's in regard to the six constructs are defined but in the population as a whole since the national/geographical aspect influence cultural behaviour. This effort to describe the six constructs in effect in Tanzania is based on observations at all the before mentioned interventions.

Power distance
Power distance can be understood in the Tanzanian context as fairly great. Respect towards authority is very high and it seemed a lot like the power where situated at a few people. However it seemed like most people got respect for the work that they did and that each had a more set place in the hierarchy within the organization, accepting it both ways.

Uncertainty avoidance
This was kind of hard to reveal as most health action is based on intuition or non-data based elements. In Tanzania's case
this was not truly answered for my part and needs more interviews and observations to answer.

**Individualism**
Individualism in Tanzania is strong ties to families and an understanding of join efforts and help to friends and relatives. Abilities here to think as a single individual seemed easier for the higher up in the hierarchy than for those lower down.

**Masculinity**
The DMO staff as observed seem to be in mid range of masculinity while not seeming very competitive but more concerned by others.

**Time perspective**
Western societies often have a monochronic time giving them not much room for improvisation, thus trusting more on the embedded, rather than the embodied, or embrained knowledge. All this would make it easy to think that western way of thinking would fit better inside the IT world, but it does surprisingly not (Teng et al., 1999). In Tanzania people seemed polychronic as tasks where performed simultaneously and in different contexts. It seemed still to be at full control most of the time even when involving multiple people.

**Communication context**
Within the HIS context there has been a number of authors previously describing strategic health decisions as not being based on facts but rather on assumption or as support for prior goals or beliefs. This seems like to be present in Tanzania as well. However this is an assumption and is based basically on slim evidence and Sandiford (1992).

Teng et al (1999), which discusses Hofstede and Hall, addresses six hypotheses from which they draw some conclusions. Primarily their findings suggest that there is little difference between eastern and western managerial perception of use of IT; "It appears that cultural values that exert significant influence on IT’s use in decision making are those that are directly involved in information processing in organizations” (ibid). However good news this is for the IT business, it is not applicable to the development of IT systems in general. What this implies is that the mere perceptions of use of an IT system in decision-making are not
very influenced by culture. What they point out, and I think is a valid point is that the information processing part of the company will be influenced by culture. They have identified information processing as a key issue for decision makers when they use IT systems.

5.7 ANT

5.7.1 Introduction

General descriptions of ANT (Law, 2003) define ANT as networks of relationships, where the actors, which might be human or non-human, interact. The actors can limit the system or give it conditions for growth. Relationships are determined by factors outside the actors that are to say within the network. Actors are those making an effect on other objects and any actor defined as making an impact will automatically be a part of the network. Defining actants, limiting them to definitions is easier done after the event have occurred. The actants ability to tell the story is important, the project and the actors will tell a story whether they do so specifically or not.

ANT can be seen as descriptive of networks and of a number of other motivational factors and relationships in effect on each other. "If something supports many viewpoints, it’s just because it’s highly complex" (Latour, 2004), his point being that if the object is complex putting it into a rigid framework might not benefit it or describe it correctly. ANT is a liquid method of observation of the object. Rather than giving a smooth framework in which to put the gathered data, ANT gives an input for description.

The theories in ANT are well reflecting when working with action-research since they both work by input. When action-research demands action upon input from an actor ANT tries to explain that relationship.

5.7.2 Tanzanian ANT case

When I choose to use ANT to look back at the research effort it is because it is an excellent descriptive tool and especially so in relation to research projects as described in Callon (1986), Latour (1986) and Law (2003).

The HISP effort in Tanzania made up a network of relations between the Universities of Oslo, Dar-Es-Salaam and Mohimbili of the Ministry of health, DMO offices, RMO office and the persons from all these institutions. For now this is the
openly identifiable network. In the Tanzanian HISP network actors in the network where relatively free to enter and leave the network.

In the case of HISP in Tanzania the problematization and defining of an obligatory passage point (Callon, 1986) is clear and easy to see. The researcher and driving force in Tanzania Juma Lungo seem to be that actor. Defining him as the actor which the network can not function without is based on the huge efforts done both towards the officials in Tanzania, universities in Norway and Tanzania and with the researchers within the international HISP network.

Negotiations to enter the network is not just done as political or official documents but are played out during the entire span of the research effort.

As the concept of translation identifies HISP in Tanzania as something similar to other nodes in the HISP network there are also differences as part of the translation that identifies HISP in Tanzania as something unique. The Tanzanian context has as it may seem a lot in common with both the South-African (Braa, 1997) and the Cuban (Titlestad & Sæbø, 2003) HISP nodes. In Tanzania the government is socialistic and have kept the country closed to foreign initiatives for a long period of time not unlike in effect that which is the case in Cuba. At the same time there are large differences in the Cuban as well as the South-African context from that in Tanzania.

At first sight from a newly arrived researcher in Dar-Es-Salaam the Tanzanian HISP context was very smooth with clearly defined limits to who was going to be a part of the network. Definitions on who would attend the seminar, what districts to implement the software into so all looked fairly straightforward. As described in chapter 4 that was not the case for long.

Team members and health staff were going in and out of the network as described by Callon (1986) with varying degrees of time for commitment. Large part of commitments where economical in nature. Actors would join or part the network as economical issues was not in order. Actors like the lecturers at Mohimbili, the students, the DMO staff and the person that supervised the DHIS post deployment all went in and out of the HISP network due to financial issues. Working within the HISP project, a university based open source software solution for third world countries its not in my thought that economical issues should limit the efforts as all are doing something to improve the general health for all. In hindsight this might have been a bit naïve. However it was easy to see how the participation in the network was a process as described by Law
(2003) members seemed convinced that participation in the project was a good thing, not defining why, so they wanted to be a part of it but the personal or perhaps the general economical situations in Tanzania was determining in whether or not they became actors in the network.

At the Ministry of Health it became clear that for the political side of the HISP network we needed to convince a number of people but found it hard to identify all stakeholders as a number seemed to be parts of the shadow audience (Spinuzzi, 2001). In our case we met with a lot of people up through the system before we actually met someone that could say what the key decision makers would want or needed. IN fact we actually never met the minister himself but only representatives of his office. Even so he was very much a part of the network defining whether or not we would go further with the pilot project or not. During the presentation we gave positive feedback was given. This was encouraging and positive for the HISP in Tanzania as support from the ministry is obviously needed for continuous efforts. Later support where given by other key politicians after I left Tanzania.

5.8 Suggestions

5.8.1 Suggestions to the DHIS

Since the efforts done in Tanzania the DHIS has undergone some radical changes. First there where a new version the 1.4, which was a new, improved build with better graphical interface amongst other. Now the testing is done on the new DHIS2 version. Due to this my suggestions will be mostly general with not many references to the specific DHIS 1.3 version although some will be made as illustrations.

DHIS is a tool for recording routine health data but since it is intended as a sole HIS for the national health care it should contain possibilities to record events such as information campaigns or vaccination campaigns to better understand the efforts and their effects on the general and specific health situation within the given area.

Later research efforts in Tanzania could benefit the Tanzanian HISP effort by looking into the use of the DHIS for other books than book 10 form 004. Especially interesting would be the possibility to get form 005 the yearly report form.

That DHIS today can only show 13 months statistics within one data element while you enter data, is not good enough. It is a good indicator for errors, as the comparison will show if the data is not in alignment with the other elements. It is not
good enough however for anything like an analysis. The DHIS2 should give the possibility to compare values on-the-fly, while entering data if needed.

In use, the pivot tables have much larger effect on visualizing the entered data than the report tools currently available in the DHIS has. We should not underestimate the advantages a GIS application could have on the simple report tool.

When looking at the software in the specific context of using for health statistics, it appeared elements that could be created more suitable for the specific country. While the DHIS is in such a respect highly flexible, it is not flexible enough. The power of the flexibility within the DHIS is in such a manner as the District Medical Officers (DMO), or their representatives have little or no difficulty in mastering the program. Of course not on a complete level, but sufficient enough to start entering data. If the software should be made more flexible or easier to customize, it would also consequently mean that the level of expertise would be higher than it is now. The current version of the DHIS covers most of the potential forms, data elements and organisational levels which is needed. However it is not done in a way that reflects the layout of the forms created by the MOH.

5.8.2 Suggestions to HISP in Tanzania

In further workshops, we need to have the software installed in advance on at least a few computers to illustrate the instalment.

During the course we should have better introduced the different students to the different medical staff so as to increase the bond between them and make it easier to introduce them to each other at a later stage if necessary.

Analysing and presenting should be better connected to indicators and specifically the indicators put up by MOH.

We should have at the outset made ready the data elements list as so described by Braa & Hedberg (2002) from conversations with the districts and the ministry of health. Focus here should have been fairly easy since the Tanzanian government did not open up for a new dataset, but wanted us to use the books with accompanying data elements made for data gathering. I think we were too occupied with the many practical tasks in deploying the software to have full attention to the important factors for maintaining a high quality dataset from paper to computer based information system.
Chapter 6 - Conclusion

6.1 Introduction
In this chapter I intend to sum up the empirical study and literature review as discusses in the discussion and focus on those elements giving the best view on my initial research goals. Setting out I defined some very general goals for this thesis: To research the potentials for a district based health information system in Tanzania based on the initial introduction of DHIS at specific sites in Dar-Es-Salaam. The findings in Dar-Es-Salaam and Tanzania should in turn be possible to generalize to concern most Sub-Saharan countries.

In addition I wanted to: Identify key issues in the deployment and the use of a health information system based on experiences gathered in Tanzania and to discuss cultural theories as a means to understand working in a cross cultural context and further to use ANT in describing such work and the actor and networks involved.

As doing research in the possibilities of a HIS in Tanzania it is difficult not to see its benefits and be marked by the positive attitude in the people in various positions within the Dar-Es-Salaam health system. My view on the possibilities of implementing the DHIS into the big city context of the Dar-Es-Salaam sites and the rural site in Bagamoyo is very positive. Information was demanded and needed to maintain services and the personnel had a very positive attitude towards the HISP team and DHIS.

1. My research effort has not been strategic health care. It is not solution oriented but research oriented and will not demand any health care reform or concise or concrete solutions to implement.

6.2 Methods
Methods used in the field were action research basing most action on the direct input or need from the participators in the seminar, translation, data entry or deployment. The action-research approach made the whole research experience very dynamic with input and action happening simultaneously at time.

Interviews conducted on site were never limited to the question I as a researcher had but was open-ended and a lot of positive feedback came out of this approach.

With concern to Methods used in Tanzania a better use of the network-of-actions research method could have increased the
benefit for the different sites. Especially in Bagamoyo, set apart from the training in Dar-Es-Salaam, there could have been improvement if we could have connected it to the efforts don in the HISP network in Dar-Es-Salaam.

6.3 IS/HIS/DHIS/HISP

The DHIS in Tanzania was by the researchers not only perceived as a HIS but also as a social system made up of actors in a large network. This network got tested through the actors entering and leaving. At many times we needed to negotiate the participation in the network whether it was the software not working properly, data elements missing or people not doing what we thought they should.

The thought to achieve familiarity in training to not only the DHIS but also to computers in general seemed to work well. We accomplished it through gaining positive attitude to the software and computer through time spent on the machines, and from the fears being addressed and minimized. We put great effort in recognizing the users as key information holders and the closest to the data and therefore the ones that could tell us what to help them with.

Addressing the six points of a DHIS introduction could be done much more consistent than we managed but I need to stress that a lot of efforts where put into political brokering and into trying to get everyone to pull in the same direction.

We need to address not only what we want to do with the data gathered but also why we gather the data we do and to what extent that data is going to be grounds for action.

Making the future DHIS as flexible as the DHIS is in its current version should be on the same line a priority as it should be to incorporate new and better looking features while they also should not be dependent on any specific technology but be open-ended.

6.4 Culture

To help us structuring the knowledge are many good tools, but trying to simplify or frame the knowledge gained through an ANT approach on a specific set of sociological set of standards, may only leave us just as lost as we where, however openness towards the information and a clear picture of how it is perceived by the individual is important for gathering the right information.
We need to think of the environment in which we introduce the technology, whether it is in Tanzania, India or Norway. As residents in a country we have however a greater possibility of understanding the conditions of the subject within that country. It is when we adventure beyond the well known we need cultural understanding. If our knowledge is of people in relation to us and the program it will make us to a greater extent able to appropriate the tools and programs to the users.

Making people use of a system in a way that is contradictory to the way they perceive their society and culture, will only result in unhappy workers or an unused system. Identifying the social context of a culture can be done by starting to look into the different aspects of the six constructs. Even though it is not meant as a clearly defined set of principles to understand any culture it might improve the understanding of oneself as a researcher in cross cultural studies where for example the different time aspect might be hugely different. In my experience being able to understand certain behaviour based on these constructs helped me in understanding the culture better and eased the research effort for my part.
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Abbreviations

ANC  Antenatal Care
ANT  Actor Network Theory
DHIS  District Health Information System
DMO  District Medical Officer
DTC  Diarrhea Treatment Corner
GIS  Geographical Information Systems
HISP  Health Information Systems Programme
HIS  Health Information System
ICT  Information and Communication Technology
IS  Information Systems
IT  Information Technology
MoH  Ministry of Health
NGO  Non-Governmental Organization
PHC  Primary Health Care
RHIS  Routine Health Information Systems
RMO  Regional Medical Officer
STD  Sexual Transferable Disease
TBA  Traditional Birth Attendants
UDSM  University of Dar-Es-Salaam
UiO  University In Oslo
WHO  World Health Organization
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<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Indicator</th>
<th>Source</th>
<th>Level of reporting</th>
<th>PRS Indicator</th>
<th>Baseline 2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input</td>
<td>Total GoT Public allocation to health per capita</td>
<td>Annual PER Health Update for numerator, National Population Census 2002 for denominator</td>
<td>Central</td>
<td>No</td>
<td>Tsh 2,265</td>
<td>Tsh 2,795</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Regional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>District</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Input</td>
<td>Total GoT and donor (budget and off-budget) allocation to health per capita</td>
<td>Annual PER Health Update for numerator, National Population Census 2002 for denominator</td>
<td>National</td>
<td>No</td>
<td>Tsh 5,100</td>
<td>Tsh 6,361</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Input</td>
<td>Recurrent expenditure broken down by level Central, Hospital Services; Preventive Services</td>
<td>Annual PER Health Update for numerator, National Population Census 2002 for denominator</td>
<td>National</td>
<td>No</td>
<td>Tsh 190 (Central)</td>
<td>Tsh 246 (Central)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tsh 1,077 (Hospital)</td>
<td>Tsh 1,100 (Hospital)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tsh 894 (Preventive)</td>
<td>Tsh 1,231 (Preventive)</td>
</tr>
<tr>
<td>4</td>
<td>Input</td>
<td>Distribution of Medical Officers as a proportion of the staffing norms by health facilities</td>
<td>Integrated Human Resources System (PSRP) for numerator; Staffing levels for Health Facilities/Institutions for denominator.</td>
<td>Region</td>
<td>No</td>
<td>0.57</td>
<td>0.62</td>
</tr>
<tr>
<td>5</td>
<td>Input</td>
<td>Distribution of Assistant Medical Officer as a proportion of the staffing norms by health facilities</td>
<td>Integrated Human Resources System (PSRP) for numerator; Staffing levels for Health Facilities/Institutions for denominator.</td>
<td>Region</td>
<td>No</td>
<td>0.21</td>
<td>0.34</td>
</tr>
<tr>
<td>6</td>
<td>Input</td>
<td>Distribution of Public Health Nurse as a proportion of the staffing norms by health facilities</td>
<td>Integrated Human Resources System (PSRP) for numerator; Staffing levels for Health Facilities/Institutions for denominator.</td>
<td>Region</td>
<td>No</td>
<td>0.56</td>
<td>0.61</td>
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<tr>
<td>7</td>
<td>Input</td>
<td>Percentage of GoT funds available for budgeted and actual district health activities against the total overall funds available for districts</td>
<td>Public Expenditure Supply Vote; Quarterly Technical and Financial Reports of Phase I, II and III LGAs</td>
<td>District</td>
<td>No</td>
<td>18% (Budgeted)</td>
<td>17.6% (Budgeted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15% (Actual)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Process</td>
<td>Number of districts reporting and showing use of the HMIS, NSS, Performance Monitoring data in the preparation and use of health plans.</td>
<td>Quarterly Technical and Financial Reports of Phase I, II, III LGAs</td>
<td>District</td>
<td>No</td>
<td>24%</td>
<td>N/A</td>
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<tr>
<td>9</td>
<td>Process</td>
<td>Proportion of public health</td>
<td>Health Management Information</td>
<td>Region</td>
<td>No</td>
<td>17%</td>
<td>N/A</td>
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<td>Category</td>
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<td>Source</td>
<td>Level of reporting</td>
<td>PRS Indicator</td>
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<td>------</td>
</tr>
<tr>
<td>10</td>
<td>Process</td>
<td>Percentage of public health facilities without any stock outs of 4 tracer drugs and 1 vaccine</td>
<td>Health Management Information System</td>
<td>Region</td>
<td>No</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Process</td>
<td>Average number of days with no drug kits in public health facilities.</td>
<td>Health Management Information System</td>
<td>Region</td>
<td>No</td>
<td>10 Days</td>
<td>10 days</td>
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<tr>
<td>12</td>
<td>Output</td>
<td>Cost-sharing fees collected by the public health facilities as a proportion of targets.</td>
<td>MoH Appropriation Accounts and Hospitals Annual Financial Reports.</td>
<td>Facility</td>
<td>No</td>
<td>0.46</td>
<td>N/A</td>
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<td>13</td>
<td>Output</td>
<td>Number of outpatient attendance per capita.</td>
<td>Health Management Information System for numerator; National Census for denominator</td>
<td>National, Regional and District</td>
<td>Yes</td>
<td>0.71</td>
<td>0.72</td>
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<td>14</td>
<td>Output</td>
<td>TB treatment completion rate (cure rate)</td>
<td>National TB and Leprosy Programme</td>
<td>National, Regional and District</td>
<td>Yes</td>
<td>81% (2001)</td>
<td>80% (2002)</td>
</tr>
<tr>
<td>15</td>
<td>Output</td>
<td>Total number of family planning acceptors (new and old)</td>
<td>Reproductive and Child Health Services</td>
<td>National, Regional and District</td>
<td>Yes</td>
<td>22%</td>
<td>17% (2002)</td>
</tr>
<tr>
<td>16</td>
<td>Outcome</td>
<td>The proportion of children who receive three doses of vaccine against diphtheria, pertussis (whooping cough), tetanus and Hepatitis B by their first birthday.</td>
<td>Expanded Programme on Immunisation (EPI)</td>
<td>National, District</td>
<td>Yes</td>
<td>81%</td>
<td>78% (2002)</td>
</tr>
<tr>
<td>17</td>
<td>Outcome</td>
<td>Percentage of children born to HIV-infected mothers who are HIV+</td>
<td>PMTCT Programme</td>
<td>National, Regional and District</td>
<td>Yes</td>
<td>7.4% (2002)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Outcome</td>
<td>HIV prevalence 15-24 age group</td>
<td>Sentinel HIV Surveillance</td>
<td>Sentinel Sites</td>
<td>Yes</td>
<td>9.4%</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Outcome</td>
<td>Proportion of births taking place in Government Health Facilities</td>
<td>Health Management Information System</td>
<td>National, Regional, District</td>
<td>Yes</td>
<td>68.5%</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Outcome</td>
<td>Top 6 causes of morbidity among OPDs attendees and top 6 causes of mortality</td>
<td>Health Management Information System, National Sentinel Surveillance System</td>
<td>Regional, District and Sentinel Sites</td>
<td>No</td>
<td>Mortality: Malaria – 38% ARI – 14.53% Diarrhoea – 7% Pneumonia – 7% Worms – 5% Eye Infec – 5%</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Category</td>
<td>Indicator</td>
<td>Source</td>
<td>Level of reporting</td>
<td>PRS Indicator</td>
<td>Baseline 2001</td>
<td>2002</td>
</tr>
<tr>
<td>-----</td>
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<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>21</td>
<td>Impact</td>
<td>Percentage change in mortality attributable to malaria among children under-five</td>
<td>National Sentinel Surveillance System</td>
<td>Sentinel Sites</td>
<td>Yes</td>
<td>Dar: 11% increase Hai: 10% decrease Moro: 2% decrease</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Impact</td>
<td>Proportion of deaths to women of child-bearing age due to maternal causes</td>
<td>National Sentinel Surveillance System</td>
<td>Sentinel Sites</td>
<td>No</td>
<td>0.02 (Dar) 0.007 (Affluent rural) 0.036 (Poor Rural)</td>
<td>Dar: 0.051 Hai: 0.011 Moro: 0.047</td>
</tr>
</tbody>
</table>

**Periodic Indicators**

<table>
<thead>
<tr>
<th>No</th>
<th>Category</th>
<th>Indicator</th>
<th>Source</th>
<th>Level of reporting</th>
<th>PRS Indicator</th>
<th>Baseline 2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output</td>
<td>Proportion of population reporting to be satisfied with health services</td>
<td>Household Budget Survey</td>
<td>National and Regional</td>
<td>Yes</td>
<td>0.62</td>
<td>0.62</td>
</tr>
<tr>
<td>2</td>
<td>Outcome</td>
<td>Proportion of births attended by a skilled health worker</td>
<td>Demographic Health Survey</td>
<td>National, Urban/rural, Regional</td>
<td>Yes</td>
<td>0.358</td>
<td>0.358</td>
</tr>
<tr>
<td>3</td>
<td>Outcome</td>
<td>The proportion of children who receive three doses of vaccine against diphtheria, pertussis (whooping cough), tetanus and Hepatitis B by their first birthday.</td>
<td>Demographic Health Survey</td>
<td>National, Urban/Rural, Regional</td>
<td>Yes</td>
<td>0.773</td>
<td>0.773</td>
</tr>
<tr>
<td>4</td>
<td>Impact</td>
<td>Infant Mortality Rate (IMR)</td>
<td>Demographic Health Survey, National Population Census</td>
<td>National, Regional</td>
<td>Yes</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>5</td>
<td>Impact</td>
<td>Ratio of the IMR of the poorest quintile to the IMR of the least poor quintile</td>
<td>Demographic Health Survey, National Population Census</td>
<td>National, Regional</td>
<td>Yes</td>
<td>1.249</td>
<td>1.249</td>
</tr>
<tr>
<td>6</td>
<td>Impact</td>
<td>Under-five mortality rate</td>
<td>Demographic Health Survey, National Population Census</td>
<td>National, Regional</td>
<td>Yes</td>
<td>147</td>
<td>147</td>
</tr>
<tr>
<td>7</td>
<td>Impact</td>
<td>Life expectancy at birth</td>
<td>National Population Census</td>
<td>National, Regional and District</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Impact</td>
<td>Proportion of under-fives moderately or severely stunted (height for age)</td>
<td>Demographic Health Survey</td>
<td>National, Urban/Rural, Regional</td>
<td>Yes</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>9</td>
<td>Impact</td>
<td>Proportion of under-fives moderately or severely wasted (weight for height)</td>
<td>Demographic Health Survey</td>
<td>National, Urban/Rural, Regional</td>
<td>Yes</td>
<td>0.053</td>
<td>0.053</td>
</tr>
<tr>
<td>10</td>
<td>Impact</td>
<td>Proportion of under-fives</td>
<td>Demographic Health Survey</td>
<td>National, Regional</td>
<td>Yes</td>
<td>0.295</td>
<td>0.295</td>
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<tr>
<td>No.</td>
<td>Category</td>
<td>Indicator</td>
<td>Source</td>
<td>Level of reporting</td>
<td>PRS Indicator</td>
<td>Baseline</td>
<td>2001</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>moderately or severely underweight (weight for age)</td>
<td></td>
<td>Urban/Rural, Regional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Impact</td>
<td>Total fertility rate 15-49</td>
<td>Demographic Health Survey, National Population Census</td>
<td>National, Urban/Rural, Regional</td>
<td>Yes</td>
<td>5.6</td>
<td>5.6</td>
</tr>
</tbody>
</table>

**Notes:**
(a) Annual Indicator 4, 5 and 6 - The data was extracted from the Integrated Human Resource System, Civil Service Department - the data is made up of all civil servants that receive their salary/personal remuneration's directly from the central payroll, Treasury, Ministry of Finance. The indicator excludes national Ministry of Health employees and other organizations (Muhimbili Medial Centre, KCMC Hospital, Bugando Hospital, Ocean Road Cancer Institute, Muhimbili University College Health and Sciences) on the premises that they may actually distort the number of skilled personnel who are available to the regions in the provision of health services.
(b) Annual Indicator 11, 13, 20 - Based on 2002 HMIS data
(c) Annual Indicator 14 - Based on 2001 and 2002 (Source: - NTLP)
(d) Annual Indicator 15 - Based on 2002 data and refers to New Acceptors only (Source: RCHS)
(e) Annual Indicator 16 - Based on 2002 data (Source: EPI)
(f) Annual Indicator 18 - Based on 2002 Data from HIV Sentinel sites (Source - NACP)
(g) Annual Indicator 21 - This is for all acute febrile illness, most of which is believed to be malaria
(h) Periodic data is drawn from surveys and census data. The Demographic Health Survey data is taken from the 1999 Survey and the next survey is due to be undertaken in 2004.
(i) Periodic Indicator 1 - User satisfaction, i.e., no problem experienced with the care provided, is drawn from the HBS 2000/01 and refers to Public dispensary/Hospital, Regional Hospital and Community Health Centre (users of multiple sources excluded)
(j) Periodic Indicator 2 - The proportion of births attended by a skilled doctor, nurse or midwife
(k) Periodic Indicator 8, 9 and 10 - Refers to percentage below -2 standard deviation (SD) units from the median of the NCHS/CDC/WHO international reference population