

# The Implementation of the District Health Information System in Mtwara and Lindi Regions in Tanzania

*A Case Study of Process and Results*

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# Abstract

There is currently an ongoing process in Tanzania to strengthen the health management information system of the country. A consortium of several partners, including the Ministry of Health and Social Welfare have decided on the way forward being based on the implementation of the District Health Information System (DHIS) in all regions. Tanzania is one of the least developed countries in the world, and there are many donor agencies involved in the country. The likely way forward for the DHIS to be implemented in all regions of the country is based on the support of these donors.

This thesis looks at the process and results of a donor-supported, and (partly) initiated, implementation of the DHIS in the two regions Mtwara and Lindi in Tanzania. The study is concerned with finding what were the results of such a project, and what can be learned from it. It seeks to answer the research objectives *“What is the current situation of the implementation of the District Health Information System in Mtwara and Lindi regions?”* and, *“What are the main conditions and actions taken contributing to the current situation?”*.

In order to analyze and understand my findings I build theoretically on perspectives from social informatics, the concept of design-actuality gaps, organizations as multivariate systems, and a conflict perspective. Qualitative research methods have been employed, in an interpretive case study approach.

Main findings of this study indicate that although many efforts have been made, and positive outcomes have been reached, some challenges are still left for the project to face. The main conditions contributing to the current situation were found to be practical issues, ownership, and the need for a focus on the health facility workers. The study suggests that there are differences between the two regions due to how the project was initiated in each region.

**Key words:** Implementation of health information systems, Tanzania, donor agency involvement, ownership, a conflict perspective

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## Abbreviations and explanations

AIDS - Acquired Immune Deficiency Syndrome

CHAI – Clinton Health Access Initiative

CTC – Care and Treatment

DANIDA - Danish International Development Agency

DHIS – District Health Information System

HIV - Human Immunodeficiency Virus

HMIS – Health Management Information System (RHIS?)

MTUHA - Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya (meaning more or less health management information system in Kiswahili)



PMTCT – Prevention of Mother to Child Transmission  
WHO – World Health Organization

# 1 Introduction

This thesis is a case study of the two regions Mtwara and Lindi in Tanzania, where the District Health Information System (DHIS) has been implemented. It addresses the topic of health information system implementation in a developing country context. It looks specifically at the process of implementing the DHIS in the two regions Mtwara and Lindi, and what seems to be the result of the implementation process so far. The thesis tries to address some of the reasons for the results found, describing both challenges – and also the opportunities – involved in the process.

The following sections are presented in this chapter:

- Background and motivation for the thesis
- The study objectives
- The theoretical framework used
- A presentation of the chapters in the thesis

## 1.1 Motivation

According to the UN, Tanzania is one of the least developed countries in the world. Since its independence in 1961<sup>1</sup>, it is one of the countries receiving the most development aid. Still, the health situation in Tanzania is facing severe challenges, and life expectancy at birth is 51.4/ 53.6 years for respectively men and women (whereas in France this number is 78/85). Another challenge is the health sector running with half of the required health workforce ([www.who.int](http://www.who.int)). WHO has long acknowledged electronic health information systems to be a central contribution to the work of improving people's health situation (Sauerborn and Lippeveld, 2000). A consortium comprising of the Ministry of Health and Social Welfare, the University of Dar es Salaam, Ifakara Health Institute, the University of Oslo, and lately also the Clinton Health Access

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<sup>1</sup> Tanganyika became independent in 1961, in 1964 it formed a union with Zanzibar, which became the United Republic of Tanzania

Initiative, has facilitated consultation leading to a consensus on the way forward for improving the health information management system in Tanzania. The operational plan for this strengthening is based on the implementation of the DHIS software (Consortium for strengthening the HMIS in Tanzania, 2009). The DHIS has already been piloted and tested by the University of Dar es Salaam in one region in Tanzania, (Pwani), as well having been implemented in Zanzibar. Previous research and studies of these processes and their results has given several indications to what are the challenges of implementing a health information system in Tanzania. Studies have shown that some of the challenges are fragmentation due to many actors being involved (Nyella, 2007, Mahundi, 2010, Lungo, 2003), they have also shown that many parallel reporting systems exist, as well as a lack of coordination between them (Lungo, 2003, Mahundi, 2010). Failure of the routine health management systems of catering to emerging information needs, leading to some developing partners developing their own information systems has been described (Mahundi et al., 2011, Shidende, 2005, Lungo, 2003). Previous studies have also depicted a lack of a sustainable strategy for when donors withdrew their support the in previous information systems (Mahundi et al., 2011).

The DHIS has as mentioned been tested and piloted by the University of Dar es Salaam in Pwani, and expertise at the university were also responsible for the implementation in Zanzibar. In the case of Mtwara and Lindi, a donor organization, the Clinton Health Access Initiative, has been responsible for the implementation of the DHIS, as is described in the below section. This process has taken place independent of the University of Dar es Salaam, who holds expertise in training and development of the system. The University of Dar es Salaam has been involved only in customization and installation of the system, as well as expertise from the university has been hired to perform initial training. This is a likely approach for implementation of the DHIS in other regions as well, as the operational plan for health management information system strengthening suggests that the implementation plan should be both affordable and that district should be covered as quickly as possible (Consortium for strengthening the HMIS in Tanzania, 2009). For this reason, experiences from

this case can provide useful lessons for similar processes to take place in other regions.

This thesis is written as a partial fulfillment of the interdisciplinary degree in the masters program “Technology, organization and learning” at the University of Oslo. The program seeks to combine the fields of informatics, workplace learning and work related sociology to understand change processes in organizations where technology is involved. All of these elements are present in the implementation process studied. This made it seem a very relevant case for trying to apply this background in order understand the different sides of the change process the implementation of the DHIS in Lindi and Mtwara regions represents.

## **1.2 The case of Mtwara and Lindi regions in Tanzania**

This is a case study of the implementation of the DHIS in Lindi and Mtwara regions. The project has been supported and driven by the donor agency Clinton Health Access Initiative (CHAI). Among other donor agencies, CHAI was already present with staff and support structures in both Lindi and Mtwara (also in three other regions in Tanzania), supporting a specific, HIV/AIDS related health program in each region. They had been present in the regions since 2008. From the organization’s work in the regions they had experienced the problems existing in the health information system with providing data that is timely, correct and consistent, and were in need for a tool to monitor the programs they supported. The organization had worked closely with the Ministry of Health and Social Welfare, were familiar with the DHIS and plans to implement it as a part of the plan to strengthen the health management information system of the country. CHAI asked for permission from the Ministry of Health and Social Welfare to implement the DHIS, including the routine health information data, and all vertical health program datasets that were available. Some vertical health program data is still outside the DHIS. The DHIS was implemented in Mtwara in

September 2009, where 100% of the support for customization, training, computers and rollout was covered by CHAI. The University of Dar es Salaam was involved in the customization, initial training, and rollout. Lindi is Mtwara's neighboring region. Seeing what was happening in Mtwara, the regional health management team in Lindi approached CHAI and asked to have the DHIS implemented in their region as well. In the case of Lindi, the regional health management gathered resources themselves to facilitate the first training, which took place in February 2010, and CHAI supported the rest of the implementation.

### **1.3 Research objectives**

The approach that have been applied in this implementation process - a donor organization supporting the implementation of the DHIS in regions where they are already involved - is likely to be repeated under similar conditions in other regions. It therefore seemed important to find some answers as to what one such project has led to. It also seemed important to gain knowledge of which conditions have led to the results found, and what actions can be taken in future projects in order to make such a project successful. This has led to the following research objectives for this case study:

- *What is the current situation of the implementation of the District Health Information System in Mtwara and Lindi regions?*
- *What are the main conditions and actions taken contributing to the current situation?*

After having summarized my findings, I will look at how these results compare to what has been found in other relevant studies from Tanzania, seeking to provide answers for the final research objective:

- *How do these conditions and actions compare with previous studies?*

## 1.4 Theoretical foundation

In order to analyze and understand my findings from the two regions of Tanzania where my study took place, Lindi and Mtwara, I build on concepts from various theories. One of them is the social informatics perspective, implying a view on information technology not only as technical artifacts, but as interdependent socio-technical systems (Kling, 2000, 2007). This view provides theoretical foundation for the importance of social context of the development and use of information technology (Kling, 2007). In order to describe approaches to organizational change, I draw on the concept of organizations as multivariate systems (Leavitt, 1964), consisting of the variables people, structure, technology and task, with strong interdependencies among the four. These variables provide entry points for effecting change, and the approach selected indicates, according to this view, underlying beliefs and prejudices about the important dimensions of organizations (Leavitt, 1964).

In order to assess the current situation of the implementation of the DHIS in Lindi and Mtwara and locate areas presenting challenges and successes, I have used the concept of design-actuality gaps (Heeks et al., 1999, Heeks, 2002), and the ITPOSMO model to assess these gaps along seven dimensions. These gaps refer to the amount of change required for the design conceptions of a health information system to match the current realities where it is to be implemented. A large amount of change required increases the risk of implementation failure, but also increases the chances for organizational benefit, whilst reducing change increases the chances of system success, but reduces the organizational benefits of the system (Heeks et al. 1999). Due to the amount of actors and goals existing in the health sector, whereof several are incompatible, a conflict theory defining conflicts as incompatible goals (Galtung, 2000) has been used. In viewing the project through a conflict perspective, an approach for increasing the likelihood for such a project's success is suggested.

## **1.5 Chapter presentation**

Chapter 2 - Literature review: A review of relevant literature and research that will assist in understanding the problem domain.

Chapter 3- Theoretical framework: A presentation of the theoretical contributions that will assist me in analyzing my findings from Lindi and Mtwara.

Chapter 4 – Research setting: Introduces the setting of the research, Tanzania, its health sector, and efforts that have been made, as well as the two regions Lindi and Mtwara, and the health information system that has been implemented there; the District Health Information System (DHIS).

Chapter 5 – Methods: I have in this thesis used an interpretive case study. Theoretical contributions about case studies are presented in this chapter, as well as how I collected my data.

Chapter 6 – Empirical findings: Presents the findings; general findings from the side of the project management, findings from each of the regions Mtwara and Lindi, and a summary of differences between the two regions.

Chapter 7 - Analysis and discussion: Theory and practice comes together as I analyze my findings through the theoretical concepts as presented in chapter 3. An assessment of the current situation is done in the light of one of the theories introduced, followed by a discussion of findings, which will lead to a summary through my research objectives in chapter 8.

Chapter 8 – Conclusion: My findings are summarized through my research objectives, and compared to relevant previous studies.

## 2 Literature review

My thesis concerns the implementation of a health information system in two regions of Tanzania. In order to better understand the problem domain, it is important to look at what experiences previous studies have yielded. These experiences will be used for comparisons with my own results when analyzing my findings. In this chapter I will go through results from other, relevant studies, as well as other literature, sorted under the topics health information systems, challenges in implementation of health information, and elaborating on some of these challenges, like fragmentation, data quality and use, and human and physical resources.

### 2.1 Health information systems

A health information system is an “integrated effort to collect, process, report and use health information and knowledge to influence policy-making, program action and research” (AbouZahr and Boerma, 2005: 579). Sauerborn (2000) points out that the objectives of health information have changed over time. While starting out oriented towards collecting information on diseases, the ultimate goal of the health information systems is now to improve action, not to gain information. There is generally made a distinction between two types of health information systems; patient-based and often complex clinical health information systems typically found in hospitals, and routine health information systems, based on aggregated data from clinics or specific geographical areas (Thorseng, 2008). This thesis is based on a case study concerning the implementation of the latter type of health information system. Sauerborn and Lippeveld (2000) suggests that the development of “rationally structured routine information systems, closely adapted to the information needs of health services at the district, health center, and community levels, can potentially contribute to the overall improvement of health service management” (Sauerborn and Lippeveld, 2000).



It is not only developing countries that face problems with their routine health information systems, most countries, industrialized as well as developing countries have routine health information systems inadequate to provide the necessary information support to individual care and public health activities (Lippeveld, 2001, Littlejohns et al., 2003, Heeks et al., 1999). Though they are not alone in the situation, developing countries do face even larger challenges in their routine health information systems. These can be challenges such as fragmentation, which again can be caused by several factors, such as the amount of development partners involved, they can be challenges of data quality and use, as well as challenges in physical and human resources. In the next section I will briefly introduce challenges in health information systems in general, before I will look closer at how these challenges affect health information system implementation, particularly using studies from Tanzania.

## **2.2 Challenges in implementation of health information systems in developing countries**

Even though a perfectly relevant, well-organized, and technologically sound routine health information system was readily available, Lippeveld (2001) argues that it would not be possible to introduce it immediately. Information systems are managed and used by people who have certain beliefs, attitudes, and practices, and “changing them will take time.” (Lippeveld, 2001: 24). Introducing a new information system very often means changing routines and work processes;

*“Changing the way information is gathered, processed, and used for decision-making implies changing the way an organization operates” (Helfenbein et al. in Sauerborn and Lippeveld, 2000: 1).*

In order to change any organization, it is necessary to have an idea of what exactly it is one is trying to change. As mentioned, there are several factors

contributing to the challenges of health information systems, even more so in developing countries. Some of these factors, or properties of health information systems in development countries will be further elaborated in the following sections.

### **2.2.1 Fragmentation**

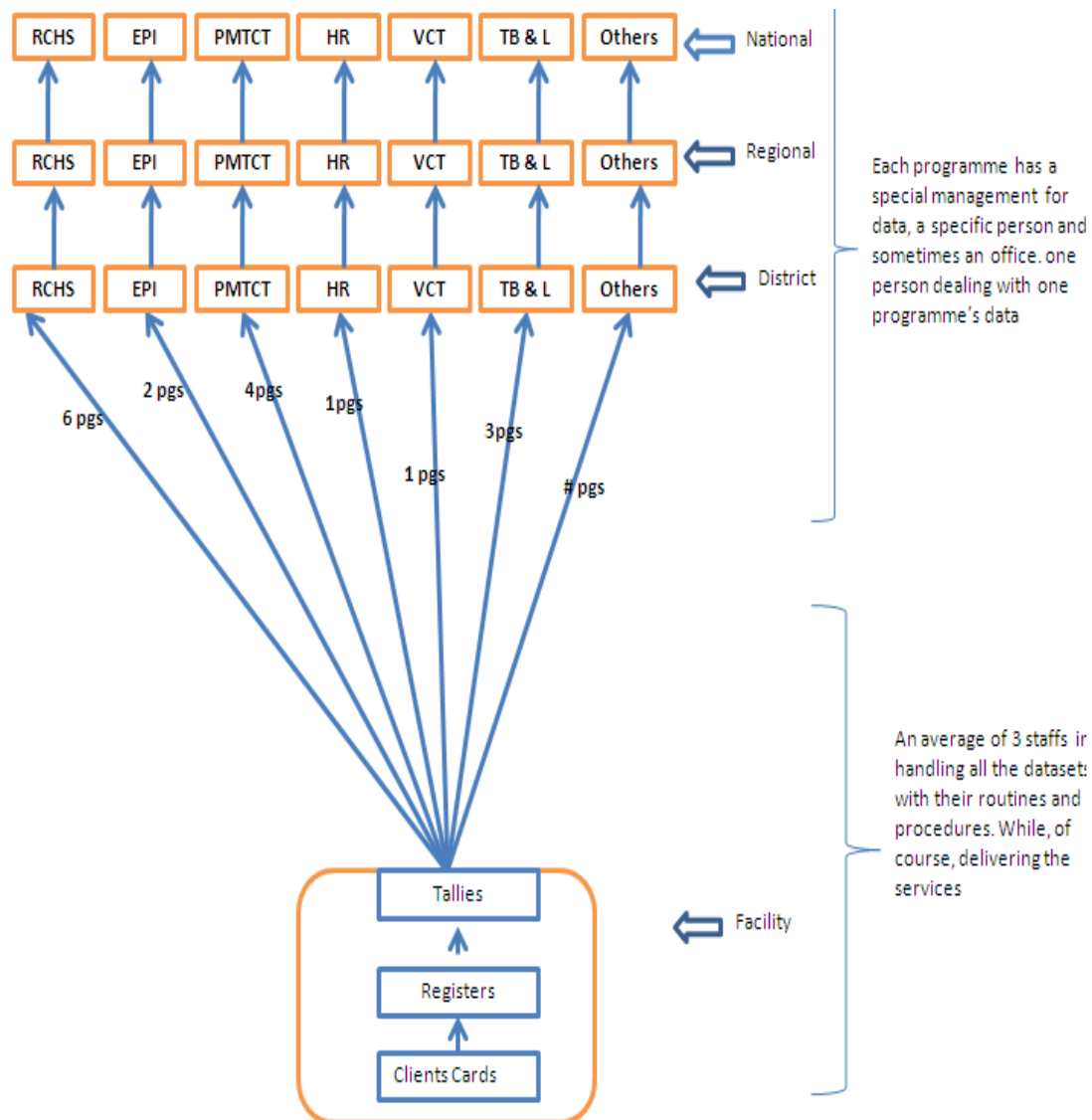
An integrated information system is advocated by many (Williamson and Stoops, 2001, Heywood and Rohde, 2001, AbouZahr and Boerma, 2005, Heeks et al., 1999, Mahundi, 2010, Shidende, 2005). Yet, most health information systems are still found fragmented to various degrees. This fragmentation might have several causes; in developing countries one of them is the extensive involvement of development partners in the health sector. Development partners are often represented in many countries, and anxious to maximize comparability between efforts in various countries, as well as being driven by demands for accountability, donors often support and implement their own data collection platforms (AbouZahr and Boerma, 2005). Development partners have traditionally had a large amount of freedom to decide what data is to be collected. This, together with the fact that resources are scarce in the health sector, and in competing for these resource no one wants to be seen as part of the other, are causes for the fragmentation of the health information systems in developing countries (Lippeveld, 2001).

From a Tanzanian study looking at the challenges and approaches of integration of the health information system in the country, the perspective of the vertical health programs is used to view the integration challenges through (Mahundi, 2010). What the term vertical health programs refers to are the various disease specific, and quasi-independent health programs existing in a country.

Historically, donor agencies or national programs within the Ministries of Health developed their own specialized information systems, mostly under pressure and with financial assistance from external donor agencies (Sauerborn and Lippeveld, 2000). These vertical health program information systems exists side by side and in addition to the routine health information systems, the latter

being considered insufficient and unable to provide the information needed. While the vertical programs were able to provide better quality data, the net result was that routine health information systems became “chaotic and bothersome” (Sauerborn and Lippeveld, 2000: 4). In Tanzania these vertical health program started to flourish in the 1980s, with programs for e.g. Reproductive and Child Health and the Expanded Program of Immunization (Mahundi et al., 2011). As both the number of vertical health programs and their data needs grew, the programs designed their own systems of data management, all from data collection tools to procedure and staffing (Mahundi et al., 2011). The need for integration of these systems became imminent, and in 1993 the work started centrally, with DANIDA as development partner, to develop a new, semi-computerized health information system that would integrate the vertical health programs in Tanzania (Mahundi et al., 2011). The health information system, given the name MTUHA from its Kiswahili acronym (Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya – meaning more or less health management information system), was rolled out nationwide by 1997, and was computerized down to the district level. The system failed for several reasons; it proved incapable of including the information needs that later emerged (Mahundi et al., 2011, Shidende, 2005, Lungo, 2003). Its database was not completed and was down most of the time (Lungo, 2003), and it did not allow for effective analysis of data, some standard reports were impossible to both print and save (Shidende, 2005). Another reason for failure of the MTUHA was the lack of a sustainable strategy, one example being that when DANIDA withdrew their support, the lack of funds led to difficulties in performing activities such as supervision, necessary for the operation of the system (Mahundi et al., 2011). The failure of the MTUHA to cater for the vertical programs’ new and emerging needs, caused the vertical health programs to flourish (Mahundi et al., 2011). A study by Lungo in 2003 (Lungo, 2003) showed that at the time there were 15 parallel systems reporting in Tanzania, which were not coordinated centrally. The health programs each had separate databases, and the study showed that there were no standard procedures for sharing the information between the Ministry of Health, other ministries or other stakeholders. Each department, program or project was responsible for the data it collected, with no one

responsible for keeping a comprehensive overview of what data was collected (Lungo, 2003). To provide a picture of the vertical health program structure in Tanzania today, a figure from the study of Mahundi (2010) can be used:



**Figure 1. A model of the vertical health programs in Tanzania (Mahundi 2010)**

This model, showing how each program has a special management for data, as well as specific staff (sometimes even an office) provides an idea of how the properties and functioning of the vertical health programs cause fragmentation in the health information system in Tanzania. This specific staff is according to Mahundi (2011) usually left for the District Medical Officer, the highest in charge within a health district, to select within the district office, and they form a part of

the district office staff. Often the same person is in the position of coordinator for more than one program. There is a lot of duplication within the system, with an example given by Mahundi (2010) showing that between e.g. the Malaria program and the Reproductive and Child Health program, 19 data elements are shared between their data collection tools. It is the same health staff responsible for using the tools – filling the summary forms monthly or quarterly - for all these health programs. A point made by Nyella (2007) in his study of the challenges and opportunities in the integration of health information systems using Zanzibar as a case, is that without a proper understanding of the challenges and strategies of integrating these disparate and often overlapping systems, the chances to align and optimize them becomes very marginal.

The fragmentation illustrated in the model from Mahundi, in figure 1, leads to excessive and uncoordinated reporting, overburdening the health workers, and causes duplication and wastage of resources (Mahundi, 2010).

### **2.2.2 Data quality and use**

There are several reasons for data quality within health information systems being low. Reasons mentioned by Lippeveld (2001) are care providers receiving little, if any, training, rarely being given standardized instructions on how to collect data, and data collected being irrelevant for their own information needs. Another reason for low quality of data is that health care providers at the lower levels are required to report large amounts of data to higher levels, as indicated in the previous section on fragmentation, and receive little or no feedback. This leaves them with little incentive to ensure quality of the collected data and to comply with reporting requirements (Lippeveld, 2001). These vast quantities of data reported leads to information overload at the higher levels, causing data often not to be used in practice (AbouZahr and Boerma, 2005: 580). Experience from South Africa has shown a negative correlation between the amount of data collected and data quality, showing that the larger the data set to be collected, the poorer the quality of the data collected (Williamson and Stoops, 2001: 105). According to Heywood and Rohde, worldwide experience is “that the more that

information is used by people who collect it, the more accurate it will become” (Heywood and Rohde, 2001: 42). A review of data sources in South Africa revealed that while information is available it is generally not accessible; Williamson and Stoops found that the mix of information that is available to health managers is often “inappropriate, difficult to understand and is generally accessed through interim, preliminary annual reports.” (Williamson and Stoops, 2001: 108). Health information systems have traditionally been designed and planned centrally; data collection tools and report forms have also, in this process, been designed centrally, with little involvement of managers and health care providers (Nyella, 2007, Shidende, 2005). A study of the data flow in the health information system in Tanzania (Lungo, 2003) and of the integration of health information systems in Zanzibar (Nyella, 2007) suggests that with efficient and extensive supervision, timeliness and completeness of reporting could reach an acceptable level. Data does not always mean decision; an example from Tanzania showed that even though information was available, and clearly showed that there were serious inefficiencies and inequities in the allocation of health resources, action was still not taken by managers in cases where there were potential losers as well as winners (Sandiford et al., 1994). Sandiford et al. (1994) suggested that this was largely due to the lack of incentives in the Tanzanian health system for good performance for health managers, and few disincentives for poor performance.

### **2.2.3 Physical and human resources**

Lippeveld (2001) points out that no health information system can function effectively without adequate human, physical and financial resources, and that in most developing countries most of these essential resources are lacking. Examples are poorly trained clinical staff at health units, no water or electricity supply, and lack of the health information system supplies like printed forms or registers (Lippeveld, 2001). Availability of staff that are appropriately trained and have analytical and statistical skills is critical, according to AbouZahr and Boerma (2005), implying that training plays a large role in the improvement of fragmented health information systems. In an evaluation done of the

implementation of a hospital information system in Limpopo Province, in one of the poorest areas in South Africa, problems related to infrastructure was considered one of the reasons for the project's failure (Littlejohns et al., 2003). The project faced problems such as not being able to find appropriate rooms with air conditioning and reliable power, and problems with applications and the reliability of the system. The evaluation study also found that the information system initially increased the workload of staff, and that they received insufficient education before the system was introduced. It was also found that the training focused too much on "how" to use the system, rather than "why" (Littlejohns et al., 2003). Concerning the computer skills of health staff, a study of the integration of the health information system from Zanzibar describes these computer skills to be low or lacking. When performing training during the course of the study it was found that out of five days allocated for training, three days were used for establishing computer skills (Nyella, 2007). Even more, the study found that those who attended the training were people with busy schedules that often were out of office. They were not the ones who ended up using the software they had been trained in, the District Health Information System<sup>2</sup>, the data entering was done by someone who had not attended training (Nyella, 2007). This was tried rectified during the study by using on the job training for those who now entered the data. Another issue concerning human resources that was brought up by this study are the difficulties faced in getting the right people to come for training. This was largely due to the incentive system of giving allowances to participants.

Mahundi's (2011) study of health systems integration in Tanzania describes that there are, on average, three health workers at each health facility. These are the staff dealing with datasets and reporting for all of the health programs, which as mentioned in the fragmentation section – are many, the vertical health programs only have designated staff down to the district level. At the same time as filling numerous reports this staff is also to perform their main task, the provision of health care.

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<sup>2</sup> This is the same software that has been implemented in Lindi and Mtwara

## **2.3 Summary of literature review chapter**

In this chapter I have looked at various experiences from other, relevant studies. A definition of health information systems has been provided, defining it as an integrated effort to collect, process, report and use health information and knowledge to influence policy-making, program action and research. It is suggested that “rationally structured routine information systems, closely adapted to the information needs of health services at the district, health center, and community levels”, can potentially contribute to the overall improvement of health service management. It has also been suggested in this literature review that in changing or implementing new information systems and changing the way information is gathered, processed and used for decision-making also implies changing the way an organization operates. Challenges that are mentioned for the implementation of health information systems in developing countries are specifically fragmentation, data quality and use, and physical and human resources. Examples of reasons for fragmentation in the health information systems of developing countries were the extensive involvement of development partners in the health sector, the freedom they have traditionally had to decide on what data to be collected, goals of enabling comparison of effort in various countries, and demands for accountability. Studies of the health information systems in Tanzania illustrated fragmentation through the many vertical health programs in the country, having their own information systems, with dedicated staff down to the district level, without much apparent coordination centrally. This has led to excessive and uncoordinated reporting, overburdening health workers and wasting resources. Suggestions from the different studies are that the challenges and strategies of integrating these systems needs to be properly understood in order to align them, and that the similarities of what they are collecting is something that can be taken advantage of in such a process. On data quality and use the literature reviewed illustrated a situation of health workers at the lower levels collecting large amounts of data, which are not relevant for their own information needs, and receiving little or no



feedback. The vast quantities of data were described to cause information overload at the higher levels, and often not being used in practice. The review suggested that health managers, nor health care providers participated in the development of information systems and data collection tools. It was pointed out that no health information can function effectively without adequate human, physical, human and resources, and that in most developing countries these essential resources are lacking. One study mentioned problems such as not finding reliable power for computers, and how a computer system initially increased the workload of staff, and insufficient training with too much focus on how to use the system rather than why.

This experience from other relevant studies illustrate conditions that are typically found in a developing country context, and that will influence the result of health information system implementation in such a context.

### **3 Theoretical framework**

In the previous chapter I went through results from other, relevant studies, which will serve as a basis for comparison with my own findings. In this chapter, I will go through concepts from different theories considered relevant in order to provide a theoretical framework for analyzing and understanding my findings from Lindi and Mtwara. Although I have been studying the implementation of an information system, I see my problem domain as consisting of more factors than purely technological ones, and will also use theoretical concepts from other fields than informatics. First of all I will introduce the field of social informatics, with its focus on the importance of social context for the development and use of information technology, forming a basis for the other theoretical concepts introduced. The concept of organizations as multivariate systems will be described, followed by the concept of design-actuality gaps from development informatics, and the ITPOSMO-model for assessing them. A theory of basic

conflict understanding will then be introduced, providing a conflict perspective found useful for viewing the problem domain, and suggesting ways forward.

### **3.1 Information systems as social systems**

*“Good application design ideas are neither obvious nor effective when they are based on technological considerations alone.” (Kling, 2007: 206)*

The implementation of health information systems is not solely a technical issue. It is a process that also consists of social and organizational aspects, which also need to be taken into consideration. In order to better understand my problem domain, I will in the following provide an introduction to the field of social informatics.

The key idea of social informatics is the importance of the social context of information technology development and use (Kling, 2007). Social informatics identifies a body of research that examines these social aspects of computerization. To provide an example of the importance of social context in explaining technology use, Kling (2000) uses the case of the introduction of the software Lotus Notes in a North American consultancy firm in 1989. The software was introduced without training and examples provided, as the director of information and technology in the company thought it was so revolutionary valuable that the consultants were simply given the software and were expected to learn how to use it in creative ways (Kling, 2000). 10 000 copies of the software were distributed, to all employees. Depending on how the software is used, it can act as an e-mail system, a discussion system, an electronic publishing system, and/ or a set of digital libraries. The line consultants were those who were intended to be the primary users of Lotus Notes, as they were placed in different locations but working with similar problems, and could benefit from the possibilities of sharing information that Lotus Notes represented. Of the consultants, the junior associates were found to be low users, while the senior associates (partners) were moderate users. One explanation for

this pattern of use lies in the incentives system of the firm. The junior associates were valued for their “billable hours” (an account they could charge their time to), and received “up or out” performance reviews every two years. The junior associates were not given a “training account” to bill the hours they used for learning the new software to, nor were they provided with any examples of how or why to use the system. They found it hard to justify the spending of 3000 USD (amount of hours estimated for training multiplied with hourly pay for the consultants) to any of their clients for them to learn a system that they were not even sure what to do with themselves. The partners had more job security, and were more willing to experiment with Lotus Notes. The example shows how already existing organizational practices can explain the use of technology; in this case how the system for incentives did not support the use of new technology for all groups within the consultancy firm. The view of the technology, in this case Lotus Notes, was too simplistic.

Kling (2007) refers to what is called the *productivity paradox*, the assumption that computerization in itself would improve productivity and lead to economic and social benefits, which a vast number of cases shows is not the result. One of the most durable findings from social informatics, according to Kling, is the analytical failure of this kind of technological determinism (Kling, 2007). He provides several social explanations for the productivity paradox: a) Many organizations develop systems that lead to a large fraction of implementation failures; or b) few organizations design systems that effectively facilitate people’s work; or c) we significantly underestimate how much skilled work is required to extract value from computerized systems (Kling, 2007: 207).

An example provided by Kling (2007) of how a claim concerning technology and social life might still be phrased in a deterministic way is: “The Web means that the public will get better information than ever before”, whereas a researcher within the social informatics field would phrase the question: “When will the Web enable the public to locate “better information”? Under what conditions? For who? For what?” (Kling, 2007: 208). This type of contextual inquiry illustrates the way a social informatics researcher would frame questions in

order to develop an analytical understanding of information technologies and social life. Information and communication technologies are often looked at as tools and simple appliances, even when referring to complex arrangements of varied equipment, rules, roles, and resources, and actual organizational practices. Kling (2007, 2000) argues for a view of specific information technologies as socio-technical systems – a complex interdependent system comprising of:

- People with various roles and relationships with each other and with other system elements
- Hardware (computer mainframes, workstations, peripherals, telecommunications equipment)
- Software (operating systems, utilities and application programs)
- Techniques (management science models, voting schemes)
- Support structures (training/support/help)
- Information structures (content and content providers, rules/norms/regulations, such as those that authorize people to use systems and information in specific ways, access controls)

(Kling, 2007: 213)

A formal definition of 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, 2007: 205)*

In my thesis I will use the notion of information systems as social systems in analyzing my findings of the implementation of the District Health Information System in the social context of the health sector Lindi and Mtwara.

## 3.2 Approaches for organizational change

In classifying approaches to change, Leavitt finds it a useful view of organizations to see them as multivariate systems. The variables are task, structure, technology and people, which interact with each other. In viewing an organization as a system consisting of these four variables, Leavitt saw several entry points for change provided. To give a brief description of what is meant by the four variables, these are:

**Task:** the “raison d’etre” – reason for being, the services provided by the organization.

**Structure:** the systems of communication, systems of authority, work flow.

**Technology:** the technical tools in use.

**People:** the actors within the organization (Leavitt does not exclude actors that are not human in this variable).

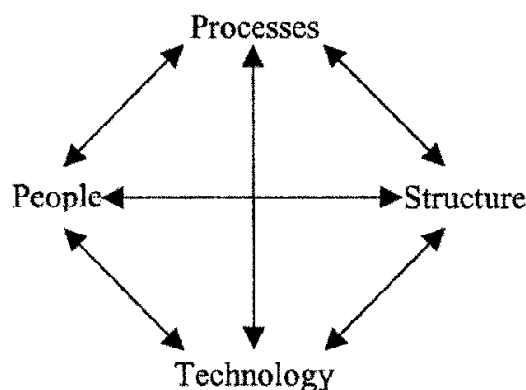


Figure 2. Leavitt's model of dimensional contingency (in this model Task is dubbed Processes, as presented by Heeks 2002)

These four variables are highly interdependent, a change in one of them is likely to result in a compensatory (or retaliatory) change in the other variables:

*“Clearly most efforts to effect change, whether they take off from people, technology, structure or task, soon must deal with the others” (Leavitt, 1964: 100)*

With these variables as entry points for change, Leavitt maps out three

approaches, which are categorized into structural, technological and people approaches. The approach selected for effecting organizational change provides a picture of the underlying beliefs and prejudices about the important dimensions of organizations (Leavitt, 1964). I will briefly go through the ideas of the different approaches. *The structural approach* is based on improving task performance by “clarifying and defining the jobs of people and setting up appropriate relationships among these tasks” (Leavitt, 1964: 102). It originally looked at workflow, with values like order, discipline and acceptance of authority. The design of work was almost entirely determined by task and technical variables, and failed to take into account the human social variables. A suggestion for a structural approach that might affect task performance is the notion of appropriate communication structures. For highly programmed repetitive tasks it might be more efficient with centralized communication structures, but for ill structured tasks, more Leavitt found that wide-open communication nets with larger numbers of channels and less differentiation among members seemed to work more efficiently (Leavitt, 1964). As for *the technological approach*, it started with what has been named Taylorism, as early as 1910, where Frederick W. Taylor took the designing and planning of work out of the “doers” head and into the heads and hands of the industrial engineers (Leavitt, 1964). Although their methods had effects in “eye, hand and muscle jobs”, they did not work very well when applied to judgment and think-type jobs. Leavitt found that many technological innovations and method changes proved to fall short because they have ignored the human side of the organization; “It is not the logically better solutions that get adopted [...] but the more humanly acceptable, more feasible ones” (Leavitt, 1964: 106). According to the technological approaches, people must be teased or educated into greater logic and rationality, and the failure of human beings to search for and use more efficient solutions is a sign of human weakness and inadequacy from this perspective. *The people approach* aims to change the organization by changing the behavior of the actors in the organization, and moved mainly through the phases of “how can we get people to do what we want them to do” to a focus on the individual and not the problem. Power equalization became a key idea of the people approaches, and yielded other outcomes than the structural or technical

approaches. Communication was of the essence; the more channels the better, the more feedback the better, in order for “power to be more equally distributed, validity of information greater, and commitment to organizational goals more intense” (Leavitt, 1964: 112). Leavitt pointed out that this stands in sharp contrasts to technical approaches in search for optimal information flows that may be far less than maximum flows (Leavitt, 1964).

Different approaches had been tried; changes have been made in aspects of task solution, task definition or task performance in introducing new tools, new structures, or new or modified people or machines. In trying to manipulate only one of the four variables a discovery was that:

*“On occasion we have tried to manipulate only one of these variables and discovered that all the others move in unforeseen and often costly directions.” (Leavitt, 1964: 70)*

Many theories based on contingency and the match or mismatch of organizational factors are still based on Leavitt’s model of an organization as a multivariate system, and still are found valuable. There are some limitations to this model. According to Heeks (2002) Leavitt’s model of dimensional fit does not account for the importance of the degree of change. Heeks introduces a model that allows for several of the dimensions of an organization to be congruent at different times, and refers to the degree of change and its impact on health information system success. In 1964 technology did not mean the same as it does in 2011. Early contingency models like Leavitt’s were criticized for seeing technology as a “black box artifact” separable from other dimensions (Heeks, 2002). Heeks argues for a more systemic view of technology, as also has been argued in the above section on information technology and the importance of social context, and sees technology as a group of related dimensions. His model will be further described in the following section.

### 3.3 Design – actuality gaps, and the ITOSMO-model for assessing them

The potential of new information systems to improve the functioning of the health care sector can only be realized if the systems are successfully developed and implemented. A study referred to by Heeks et al. on health care information system sites, indicated that half of all computer-based information systems fail (Heeks et al., 1999). These failures are by Heeks et al., divided into four varying degrees of failure; *The total failure*, where a system is either not implemented or immediately abandoned; *The partial failure*, in which there are significant undesirable outcomes and major goals are not attained, *The sustainable failure*, where the initiative has initial success but fails after a certain period of time, *The replication failure*, where an initiative has succeeded in a pilot site, but cannot be repeated elsewhere (Heeks et al., 1999). This points to a large gap between the potentially positive contributions of the information systems in the health care organizations and the largely negative reality. To deal with the wastage of resources these initiatives can lead to, it is important to understand why health information systems in the health care sector are considered failures or successes. Instead of looking at this in a normative way, looking at what should be done, Heeks et al. argue for a view based on contingency; there is “no single blueprint for success and failure in organizational change” (Heeks et al., 1999). The health information system needs to be adapted to the environment in which it is to be implemented and used, this adaptation is not purely between and within technical factors, but also including social and organizational factors (Heeks et al., 1999). Nonetheless, if a technological system is perfectly adapted to the organization in which it is to be implemented it would lead to no change. There is what Heeks et al. call a “trade-off” between change and risk for the health information systems, where increased change leads to an increased risk of failure. At the same time; reducing the change might lead to an increased chance of system success, while it might also mean reducing the organizational benefits of the system. Success and failure depends on the amount of change between the current situation, and “where the design wants to get us” (Heeks, 2002). This amount of change - the gap - between current realities (or actualities) where the



information system is to be implemented, and the design conceptions behind the information system, can be understood through the model of ITPOSMO (Heeks, 2002, Heeks, 2006, Heeks et al., 1999). The ITPOSMO-model, given its name from the acronym of its seven dimensions, is shown in figure 3, and followed by a description of its dimensions.

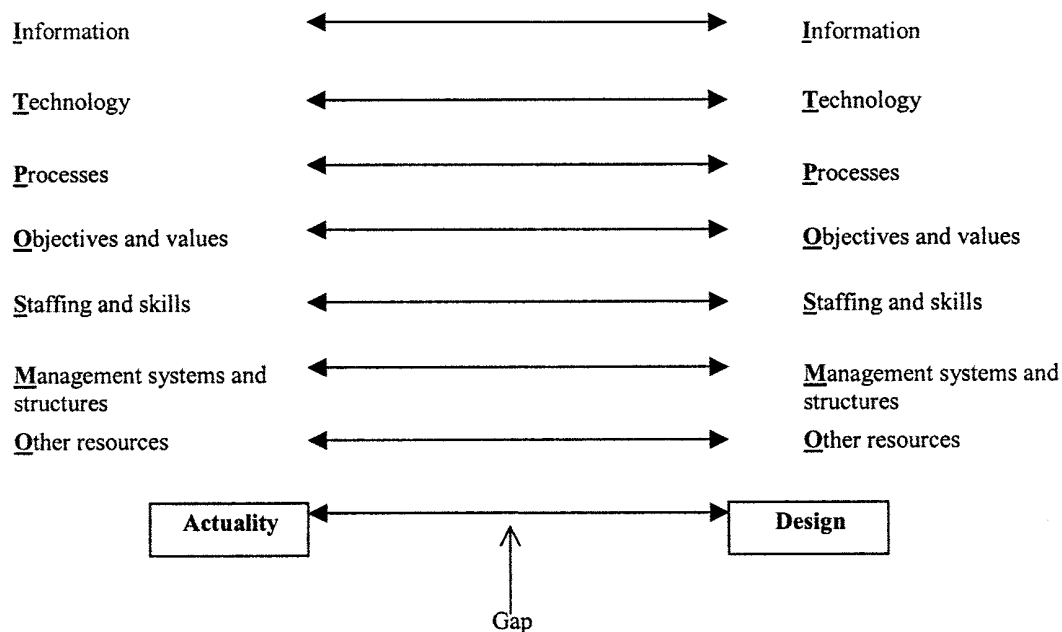


Figure 3. Heeks' design - actuality gaps (Heeks 2002)

*Information* – The formal information held by the digital system and the informal information used by the people involved with the system

*Technology* – Mainly focuses on digital IT, but can also cover other information-handling technologies such as paper or analogue telephones

*Processes* – The activities undertaken by the relevant stakeholders for whom the information system operates, both information-related processes and broader business processes

*Objectives and values* – Often the most important dimension since the objectives component covers issues of self-interest and organizational politics, can even be seen to incorporate formal organizational strategies; the values components covers culture: what stakeholders feel are the right and wrong ways to do things

*Staffing and skills* – Covers the number of staff involved with the information system, and the competencies of those staff and other users

*Management system and structures* – The overall management systems required to organize operation and use of the information system, plus the way in which stakeholders agencies/ groups are structured, both formally and informally

*Other resources* – Principally, the time and money required to implement and operate the information system

(Heeks, 2006)

The ITPOSMO model is first of all suggested as a means to assess the gaps - the mismatch between conceptions and reality, along the seven dimensions. For each of the seven dimensions the, the gap between design and actuality can be assessed.

Gaps between conception and reality can according to Heeks et al. arise in any situation. The most archetypal situations that make health information system failure more likely, are gaps between formal rationality and behavioral reality, and gaps between the context of design and implementation (Heeks et al., 1999).

I will briefly go through some properties of these two situations. First, gaps between formal rationality and behavioral reality can occur when hard rational design meets a soft behavioral reality; “hard” rational models assume “logic, formality and objectivity to underlie the workings of an organization”, while “soft” behavioral models assume factors such as “human limitations and, social objectives and subjectivities to underlie the workings of organizations” (Heeks et al., 1999). Design of the health information system can depend on which group’s worldview is dominating the design process, and which rationality is imposed.

Examples of groups and worldviews are IT professionals, placing IT in the central role, health care managers viewing financial information to have the central role, or doctors, generally viewing the medical information as having the central role (Heeks et al., 1999). Potential benefits of imposing more rational information systems on health care staff could be obtaining use of more evidence-based information about the efficacy of health care interventions. A damaging effect could be the suppression of patient-centered behaviors.

Secondly, of gaps between the context of design and that of implementation, Heeks et al. gives the examples of gaps between the public and the private sector,

and gaps between countries. An information system developed for a health facility in the private sector might be based on conceptions that do not match the context of public sector health facilities. As for country gaps, a health information system developed for an industrialized country might be based on conceptions that do not match conditions in a developing country. A problem could be introduction of information technology by health care multinationals, international consultants and aid donor agencies, but there might also be differences within countries. With a combination of these gaps when introducing a health information system, failure becomes likely.

To prevent some of the gaps that might arise between design conceptions and actuality, and to reduce those gaps that have been identified, Heeks et al. (1999) provide some techniques. Some of these techniques are:

*Legitimizing and mapping organizational reality*; to get a proper understanding of current realities is crucial. Although this might be difficult where rational paradigms dominate, a suggestion is “legitimizing reality” – encouraging participants to articulate the difference between rational and prescriptive models of what they should be doing and real depictions of what they are actually doing, where self and third-party observations and prototyping are suggested as means to expose realities,

*Reality-supporting not rationality-imposing applications*, to involve reality-supporting applications is encouraged, like giving health information systems features that imitate reality,

*Closing specific conception-reality gaps*; changing current realities to make it closer to the information system design, or by changing the information system design to make it closer to realities, for example hiring more staff and conducting training could close gaps along the staffing and skills dimension.

(Heeks et al., 1999). Other techniques mentioned by Heeks et al. are *customization* to match realities, where software vendors and developers need to demonstrate a willingness and ability to understand client contextual realities and customize the information system accordingly; *end-user development*, and *participation*, although this depends on conditions like previous knowledge of

participative techniques, and on what are the values regarding hierarchies and power; *freezing dimensions of change*; matching new design proposals exactly with current realities along a particular dimension, for example not changing the technology, but changing the design of work processes (Heeks et al., 1999).

### **3.4 Adding a conflict perspective**

There are many parties involved in the Tanzanian health sector, as has been described in the chapter 2. These are all likely to have their own sets of goals, which makes a conflict perspective useful. In a manual for conflict workers published by the United Nations Development Program authored by Galtung (2000), a conflict is defined as incompatible goals. When goals are incompatible a contradiction, an issue, is born. This view of conflicts provides a perspective that also has bearing on projects such as developing and implementing new technologies; to view conflicts as incompatibilities - incompatible goals, not incompatible persons or actors. Seen from this conflict perspective, the problem is not that the goals are “wrong”, the problem is that they are incompatible (Galtung, 2000). A difference between these two views on goals is that if goals are believed to be wrong or false – the natural remedy would be to correct, convince or enlighten people about their mistakes. When viewing goals as incompatible, not wrong, then the natural response would be to direct attention to the different parties of the conflict and their side of the situation. This theory suggests that the latter approach will be more successful in taking care of the involved parties’ interest for a positive outcome of the joint project.

This view on goals can be illustrated with an example from health information systems; it is not wrong to try to improve a health information system by computerization, it is not wrong to want data from health workers in the form of reports in order to enable monitoring and evaluation of a health situation, it is not wrong to want to focus ones time on patient care, and it is not wrong not wanting to work extra hours for filling reports one does not necessarily see the immediate use of. These could all be goals of different parties (or stakeholders) in a health information system implementation process, and some of these goals

are clearly incompatible; applying the conflict definition provided above a conflict, with many contradictions exists here.

According to the conflict perspective presented by the United Nations Development Program (2000) a conflict is seen as both a potential source of development, and a potential source of violence. Promoting development is a key aspect of conflict work. This conflict perspective indicates that any actor with unrealized goals feels frustrated, frustration that might lead to aggression (Galtung, 2000). Violence or aggression in the context of health information system implementation would not necessarily mean physical violence, but could be seen as oppositional behaviors such as non-use, or vertical health programs (as has been mentioned in section 2.2.1 on fragmentation) making their own information systems because of unrealized goals of getting the data they need from a routine health information system.

This perspective of conflict theory suggests that the elementary conflict formation with two parties pursuing one goal is rare:

*“The normal conflict has many actors, many goals and many issues, is complex, not easily mapped, yet that mapping is essential” (Galtung, 2000: 14)*

The method suggested by this conflict perspective, the Transcend method, represents an approach to mapping the conflict, and suggests that in order for any solution or joint project to be a success, it needs to start with realizing and acknowledging every parties' situation or objectives. One of the gap closure techniques suggested by Heeks et al. (1999) to increase the likelihood of success of health information systems was mapping and legitimizing organizational realities, as described in the above section. Adding a conflict perspective provides approaches and concepts that can be useful in this process. Mapping, legitimizing, and bridging the legitimized goals can summarize the approach. Empathy and creativity are brought into conflict practice in dialogues with each of the parties, trying to understand them, their logic, identifying valid goals and nonviolent approaches to attain these goals, eliciting joint creativity to find

“ways of transcending incompatibilities”, and applying creativity to contradictions (Galtung, 2000: 5). This conflict perspective suggests that conflict transformation in principle can happen at all levels of conflict; global, social, and the inter-/intrapersonal, which I will get back to when applying concepts from this conflict perspective in the analysis of my findings from the Lindi and Mtwara health sectors.

### **3.5 Summary of theoretical framework chapter**

In this chapter the area of social informatics has been introduced, underlining the importance of social context for the development and use of information technology, and providing a foundation for the other theoretical concepts introduced. Social informatics is defined by Kling (2007) as the interdisciplinary study of design, uses and consequences of information technologies that takes into account interaction with institutional and cultural contexts. The term productivity paradox was also introduced; referring to the assumption that computerization itself would improve productivity and lead to economic and social benefits. According to Kling (2007) the most durable finding of social informatics is the analytical failure of the kind of technological determinism the productivity paradox represents. Social explanations for its analytical failure was presented, among them being that few organizations develop systems that effectively facilitate people’s work, and how the amount of skilled work required for extracting value from computerized systems is underestimated. The view of specific information technologies as socio-technical systems was introduced, seeing them as complex interdependent systems comprising of people in various roles and relationships with each other and with other system elements, such as hardware, software, support structures and information structures, to mention some.

Leavitt’s (1964) view on organizations as multivariate systems, consisting of the variables people, task (processes), structure and technology was introduced, a view providing several entry points for organizational change. Seeing that these variables are highly interdependent, an effort to change taking off from one of

them will soon have to deal with the other variables as well, potentially leading to unpredicted and costly changes in the others. The approach selected for effecting change provides a picture of the underlying beliefs and prejudices about the important dimensions of organizations, according to Leavitt, a notion that will be discussed further in the analysis of my findings. Approaches to organizational change are categorized into *structural approaches*, taking of from task (processes) and technology, looking at changes in workflow; *technological approaches*, where “people must be educated into greater rationality” and the failure of human beings to take into use more efficient solutions is a sign of weakness; and the *people approaches*, aiming to change an organization by changing the behavior of the actors in the organization, where power equalization, feedback and communication is in focus. This theory provides useful concepts in order to both describe my findings and to later make some suggestions towards future approaches. There are some limitations to the theory. One of them is the narrow view on technology, viewing it as a “black box artifact”, where a more systemic view is required, as advocated by for example social informatics. Another shortcoming is the lack of mentioning of the degree of organizational change and the importance of that degree of change. Heeks et al. (1999) mention the degree of organizational change when they talk of the “trade-off” between change and risk for health information systems. Reducing the size of change may increase the chance of system success but also reduce the organizational benefits of that system. Conversely, increasing the size of change may reduce the chance of system success but also increase the organizational benefits of the system. Finding the balance between the size of change and risk would also be part of a solution to health information system projects, as well as the ability to understand clients’ contextual realities and to customize information systems accordingly. Design-actuality gaps are introduced as a concept, as well as the ITPOSMO-model for assessing the gaps along its seven dimensions; Information, Technology, Processes, Objectives and values, Staffing and skills, Management system and structure, and Other resources. The gap between the actualities or current realities where the information system is to be implemented, and the design conceptions of the information system, are measured along these dimensions. Reducing the design-actuality gaps would

increase the likelihood for success. Some techniques mentioned by Heeks et al. to prevent these gaps from occurring, or to close these gaps when they have occurred, are to start the development process by legitimizing and mapping organizational reality. Getting a proper understanding of the current realities is seen as crucial; to legitimize organizational reality and encourage participants to provide real depictions of what they are doing, instead of rational and prescriptive models of what they should be doing. Other techniques mentioned by Heeks et al. are involving reality-supporting, instead of rationality-imposing applications, customization to match realities, and end-user participation in the design process as far as the specific context allows for it. The theoretical concepts above have many elements resembling those described in conflicts. I have therefore found it useful to draw upon theories of basic conflict understanding as it is explained in a manual for conflict workers distributed by the United Nations Development Program.

## **4 Research setting**

Before describing and analyzing the findings from my fieldwork, I will provide an insight to the setting of the research, as well as description of the health information system that has been implemented; the District Health Information System (DHIS). Context is an important matter, as has been described in the previous chapters. I will in the following sections introduce the backdrop of the case study; Tanzania, its health sector and some efforts that have been made over the last years, and recently with the DHIS, and then give a description of the specific areas of my case study; Mtwara and Lindi regions and their health management and administration.

### **4.1 Tanzania**

Tanzania is the country of the Serengeti, mount Kilimanjaro and the beaches of Zanzibar. With its low crime rates, political stability and friendly reputation it is



experiencing an increasing level of tourism. Tanzania is also one of the poorest countries in the world, and one of the countries receiving the most development aid, since its independence. It is the country that through the years has received the most bilateral development aid from Norway, receiving 730,9 million NOK (approximately 135 million USD) in 2009 ([www.landsider.no](http://www.landsider.no)). The United Republic of Tanzania has about 40 million inhabitants, a predominantly rural population, with approximately 57,8 % of the population estimated to live under the poverty line of 1 USD per day. About 70 % of the population is employed in agriculture, mostly for self-sufficiency ([www.who.int](http://www.who.int), [www.landsider.no](http://www.landsider.no)). The union between the independent states of Tanganyika (independent since 1961) and Zanzibar (independent since 1963) was formed in 1964, and since then they have been part of the United Republic of Tanzania. Today Zanzibar is semi-autonomous, has its own president, government and parliament, security and foreign affairs being union matters. Tanzania Mainland (the common name for Tanganyika) and Zanzibar each have their own Ministries of Health and Social Welfare. The health sector in Tanzania Mainland and efforts that have been made will now be introduced.

## **4.2 The health sector in Tanzania Mainland and efforts that have been made**

Following are some quick facts on the health profile of Tanzania:

- Life expectancy at birth is 51.4 years for men, and 53.6 years for women (in France the equivalent numbers are 78 and 85)
- HIV/ AIDS prevalence (15-49 years) of 5.7 % in Tanzania Mainland
- Chronic malnutrition of 38 % in Tanzania Mainland
- Probability of dying under 5 (per 1000 live births) is 108 (in France this number is 4)
- The health sector in Tanzania is running with less than half of the required health workforce

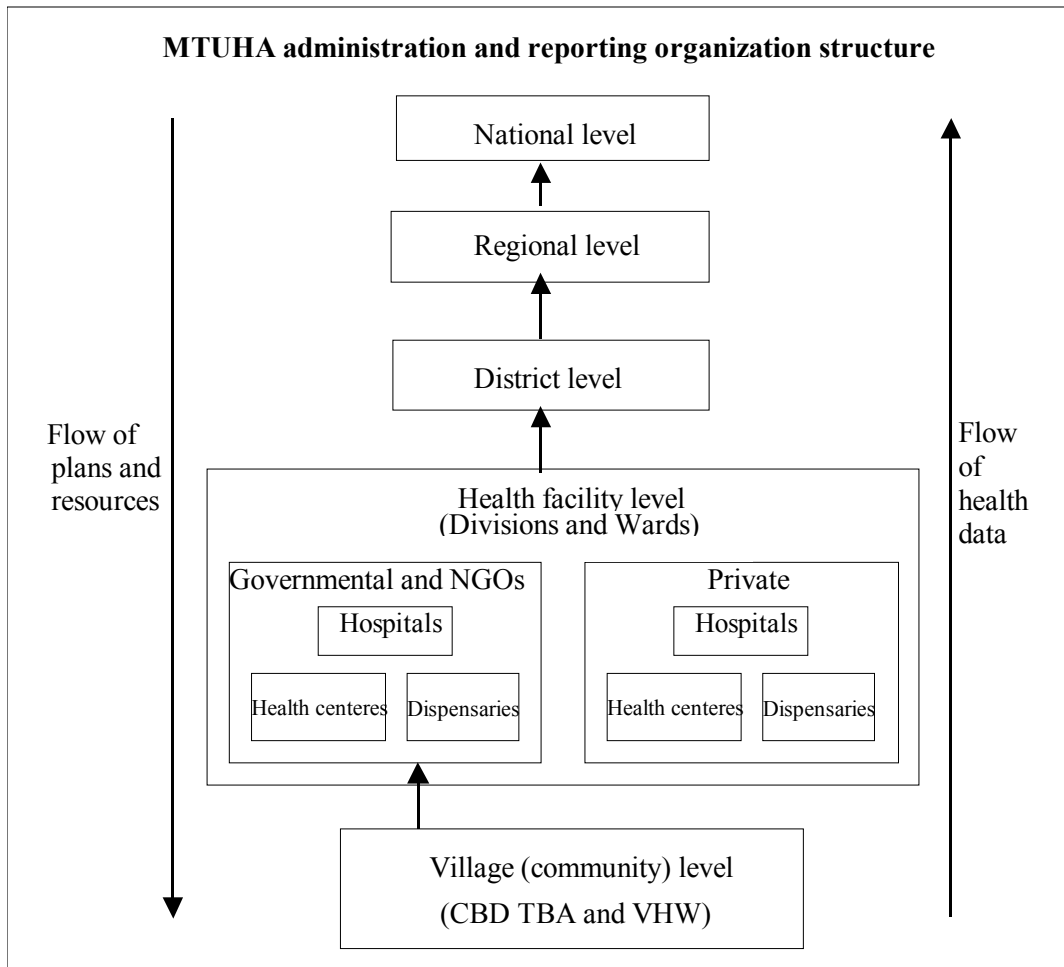
- Comparing government staffing norms for health facilities to the existing level of staffing, only 35 % of positions are filled with qualified health workers, leaving Tanzania with a severe human resources crisis (www.who.int, MoHSW, 2009)

These numbers indicate some obvious challenges for the health sector in Tanzania. In the following I will present the structure of the Tanzanian health sector, and describe some of the efforts that have been made in the sector. Trying to gain a clear picture of the health sector in Tanzania can be challenging. It is a sector where many reforms have taken place, as well as there being many actors involved. Just to provide an example of actors involved, the webpage for the development partners group in Tanzania ([www.tzdp.org.tz/dpghealth/](http://www.tzdp.org.tz/dpghealth/)) lists 17 bilateral and multilateral agencies supporting the health sector in Tanzania, the Embassy of Denmark (DANIDA), the Canadian International Development Agency, the Japan International Cooperation Agency (JICA), Irish Aid, UNICEF, the Royal Norwegian Embassy, the African Development Bank and the Clinton Foundation, to mention some.

I will in the following describe what the health sector looks like in Tanzania Mainland, and some reforms and efforts that have been made in the last years. Tanzania Mainland is divided administratively into 21 regions, 113 districts and 133 local authorities; these local authorities are also referred to as Councils, and often coincide with districts. The health sector also follows this administrative organization. In 1994 the Health Sector Reforms started in Tanzania, with the aim to improve access, quality and efficiency of health service delivery. As primary health care was adopted as the most cost-effective way to improve the health of the people, the major focus of the Health Sector Reforms was on strengthening the District Health Services, as this was where primary health care took place (MoHSW, 2009). One of the dimensions of these reforms were the decentralization of health services, transferring power to lower levels of administration, the Local Government Authorities. The district health services became part of the Local Government Authorities in 2001, which are now responsible for delivering public services in local health as well as other services.

This means that the Local Government Authorities also has a need to know the status of health services performed in their municipality, and also want health information from all vertical health programs. The region is now meant to have more of a facilitating role, while much of the power to make decisions is moved down to the district levels. The highest authority within health in a region is the Regional Medical Officer, and for the districts (or councils) the highest authority is the District Medical Officer. In 2001 the Comprehensive Council Health Plan was also introduced as a management tool, a plan that was to be prepared by the councils annually, based on information from the health facilities. It was also meant as a tool offering stakeholders insight into the Council's health activities.

There are many stakeholders involved in the Tanzanian health sector, as is described in section 2.2.1 about fragmentation. In the same section, the effort to create one comprehensive and semi-computerized health information system, the MTUHA, is also described. The system was created with the support of a Danish development partner, DANIDA, and was computerized down to the district level. It is considered to have been a failure, one of the reasons being the lack of flexibility and the inability to cater for new and emerging needs. In most districts the computer-based part of the information system is no longer used, while the paper based part of the information system, also referred to as MTUHA (registers, forms and books), is used in all regions, districts and health facilities, and constitutes the routine health information system in Tanzania. (MTUHA, as mentioned in section 2.2.1, is the Kiswahili acronym for Health Management Information system). The data flow of the MTUHA is illustrated in figure 4 (Mukama, 2003):



**Figure 4. The routine health management information system: administration and reporting structure (Mukama 2003)**

A consortium of partners, including the University of Dar es Salaam, the University of Oslo, the Clinton Health Access Initiative (CHAI), as well as the Ministry of Health and Social Welfare, are currently working on a project to strengthen the health management (or routine) information system in the country. CHAI is an organization that is a part of the Clinton Foundation, and was originally a program for supporting health interventions in the HIV/AIDS area. They have now expanded their area of intervention to cover broader aspects of health in the countries where they are present (more information about the Clinton Foundation and CHAI can be found on their website: <http://www.clintonfoundation.org/what-we-do/>). CHAI is present in several parts of Tanzania, among them the two regions of this case study; Lindi and Mtwara. The organization is supporting a health program within the HIV/AIDS

area in each of the two regions; Care and Treatment in Mtwara and Prevention of Mother to Child Transmission in Lindi, and has been present in the regions with staff and support structures since 2008. Their activities in the regions include training of health staff in program-related areas, supervision and support of programs, and collaboration with other development partners in the region. The consortium of partners working to strengthen the health management information system in Tanzania, has agreed on the way forward being based on the implementation of the DHIS. Before 2009 the DHIS was in use in Zanzibar, and in the region Pwani in Tanzania Mainland, the latter being a pilot region for the DHIS for the University of Dar es Salaam. In 2009 the DHIS was introduced by CHAI in Mtwara, with permission from the Ministry of Health and Social Welfare, and implementation of DHIS in Lindi followed in February 2010. This will be described in more detail in chapter 6, in the empirical findings. Before introducing the setting of the two regions Lindi and Mtwara, I will in the following section provide a description of the DHIS.

#### **4.2.1 The District Health Information System**

The DHIS is designed to support health workers and managers at all administrative levels through a balance between flexibility and standardization, and with a strong emphasis on using information for local action ([www.hisp.org](http://www.hisp.org)). It was developed by the Health Information Systems Program (HISP) - a global, action-based research project with the vision of “developing sustainable and integrated health information systems that empower communities, health workers and decision makers to improve the coverage, quality and efficiency of health services” ([www.hisp.org](http://www.hisp.org)). The research project started in three districts in Cape Town, South Africa, and is now active in around 15 countries in Africa and Asia. Among these countries is Tanzania, with a group of HISP members at the University of Dar es Salaam participating in the project of strengthening the health management information system in the country. Several versions of the DHIS have been developed, the version in use in Tanzania is the DHIS2, but will be referred to only as the DHIS in this thesis. The DHIS is an open source software, and can be downloaded and used at no cost. It is a tool for

collection, validation, analysis and presentation of aggregate statistical data, and is recognized and recommended by the World Health Organization. Some of the functions of the DHIS are the possibilities of making customized reports, presenting the data entered in different types of graphs, trend analysis, a dashboard with live graphs, web-based pivot tables, and the possibility to export data to Excel in order to manipulate and present data in different ways, as well as exchange data with other systems. In figure 5 is a screenshot from the DHIS in Tanzania, showing a dashboard with live graphs in one of the districts in Lindi:



**Figure 5. Screenshot showing the dashboard of the DHIS in a district in Lindi**

A report from the DHIS can also look like the report in the screenshot from the same district, in figure 6, showing a summary form from the health facilities in the district, summarized in the DHIS after having entered health facility data:

Tanzania Data Warehouse

Reporting unit:

Reporting period: November 2010

Ministry of Health and Social Welfare PMTCT Antenatal Clinic (ANC) Monthly Summary Form	
ANC 01. Number of new clients this month	126
ANC 02. Previously known to be HIV Positive	3
ANC 03. Total number tested	125
ANC 04. Number of new clients had HIV test at ANC	121
ANC 05. Tested HIV-positive	12
ANC 06. Post-test counselled for positive and negative HI	125
ANC 07. Number of partners tested for HIV at ANC	2
ANC 08. Partners Tested HIV-positive	0

**Figure 6. A monthly summary form in the DHIS**

After having presented the DHIS and some of its functions, I will in the next section introduce the setting of Lindi and Mtwara.

### **4.3 Mtwara and Lindi Regions**

My case study was done in Mtwara and Lindi regions, in the south of Tanzania. A map of Tanzania illustrating where in the country the two regions are placed is presented in figure 7 ([www.mapsofworld.com/tanzania/tanzania-political-map.html](http://www.mapsofworld.com/tanzania/tanzania-political-map.html)).



Figure 7. Map of Tanzania showing the regions Lindi and Mtwara

The southern zone of Tanzania as a whole is considered unattractive by the new generation, who in large portions move out of the region because it is not found economically attractive. The main economic earner of the regions are the cashew nut crops, much of the land is not arable. Infrastructure such as roads is underdeveloped, and many roads are nearly impassible during the rainy season (The Planning Commission Dar es Salaam et al., 1997). In Mtwara a report from 1997 describes the life expectancy rates as being considerably lower than the average in the country (The Planning Commission Dar es Salaam et al., 1997). A preliminary poverty ranking by the government of Tanzania places Lindi among the most deprived regions in Tanzania ([www.tanzania.go.tz/poverty.html](http://www.tanzania.go.tz/poverty.html)),



illustrating the level of poverty considering that it is one of the poorest regions in a country described as one of the poorest countries in the world.

The two regions are divided into respectively five and six districts. Mtwara is divided into five districts: Mtwara Urban/ Mikindani, Mtwara Rural, Newala, Tandahimba and Masasi, and Lindi is divided into six: Ruangwa, Liwale, Kilwa, Nachingwea, Lindi Rural and Lindi Urban. These districts also represent the health districts. The highest authority within health in each region is the Regional Medical Officer, while the highest authority within health in the districts is the District Medical Officer.

#### **4.4 Summary of research setting chapter**

In this chapter I have provided some insight to the setting, or context, where the District Health Information System (DHIS) was implemented. The Tanzanian health sector and some recent efforts made in the sector have been described. The setting of the two regions where this study was performed, Lindi and Mtwara, has been provided, as well as an introduction to the DHIS and some of its functions.

# 5 Methods

In this thesis I will conduct an interpretive case study. In order to understand the phenomenon I am studying, the implementation of the District Health Information System in Lindi and Mtwara, I need to gain an understanding of the people involved in, and affected by, this process, and the social context in which they live. For achieving this goal, quantitative categories designed beforehand would not provide very relevant answers. Thus, I have chosen to use a qualitative research method, and have used data sources such as interviews, observation and documents analysis.

In the below sections I will elaborate further on the term interpretive case study, as well as go through my research approach, which data collection methods were used, and how this contributed to shed light on the case.

## 5.1 Interpretive case study

A case study is an empirical enquiry that

- investigates a contemporary phenomenon within its real-life context, especially when
- the boundaries between the phenomenon and the context are not clearly evident

(Yin, 2009: 18)

For the case of the health administration and management in Lindi and Mtwara and the implementation of DHIS there, this is a description that fits. Stake sees the case as a bounded system; it has working parts and purposes (Stake, 2005). Certain features are within the system, within the boundary of the case, and certain features are outside, these outside features are significant as context. The case researcher digs into meanings, and works to relate them to context and experience, while data is continuously interpreted. Case studies can be *intrinsic*; performed to get a better understanding of the case, the case itself being of interest, and where it is not meant to theorize beyond the case, or *instrumental*;

meaning that the case is mainly examined to provide insight into an issue or to redraw generalization (Stake, 2005). The empirical findings of this study might not be directly applicable in other regions, but the analytical results of this study could provide useful insights for implementation processes in similar settings.

I have used the interpretive paradigm, which implies something about the underlying assumptions about what constitutes valid research. In interpretive research the researcher starts out with the assumption that “access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings” (Myers). Interpretive methods of research in information systems are “aimed at producing an understanding of the context of the information systems, and the process whereby the information system influences and is influenced by the context” (Walsham, 1993: 4-5). In order to clarify meaning, the triangulation is commonly used, meaning a process of “using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation” (Stake, 2005: 454). This constitutes of using a combination of data collection methods and sources. Triangulation does according to Yin make the case study research “hard”, although it has traditionally been seen as a “soft” form of research (Yin, 2009). No observation or interpretations are perfectly repeatable, and triangulation serves as a clarifier to how the case has been seen (Stake, 2005). Apart from serving as a clarifier to how the case has been seen, triangulation also helps to identify different realities, and there can be many.

## **5.2 Research approach**

My introduction to the ongoing project of strengthening the health information management system in Tanzania was my participation in a workshop in DHIS training, lasting for two weeks in Dar es Salaam in January 2010. Although the main topic was training in the DHIS, the workshop also consisted of discussions concerning academic papers and research proposals. My initial proposal was looking at different aspects of training. During the workshop I was able to get an understanding of some of the difficulties regarding the implementation of the

DHIS in Tanzania, and in other countries, as experiences were shared from the different participants, not only concerning training. These were representatives with experience from both Tanzania, Malawi, South-Africa, India, Ethiopia and more. Representatives from the Ministry of Health and Social Welfare were present, sharing their points of view, as well as many participants representing the University of Dar es Salaam and HISP. Through group discussions I learned of different challenges in implementation; the fragmented nature of the health information system, the national HMIS – MTUHA, and the many vertical health programs with their own information systems, donor demands, among other issues. After coming home and taking further classes in the topic of HMIS, my interest changed from aspects of training to processes of implementation. After discussions and learning (through the HISP network) of the initiatives that had taken place in Lindi and Mtwara, the research proposal changed into doing a case study of the status of the implementation of the DHIS in these two regions. It was not entirely clear how far the work in Lindi and Mtwara had got when departing from Norway to do my fieldwork in November – December 2010. Document analysis done beforehand was thus concerning implementation of the DHIS elsewhere in Tanzania, as well as general studies and documents on the implementation of health information system in general. Appointments were made to meet with the trainers from Dar es Salaam who had performed the initial trainings in the two regions, in order to get some background information before departing for Lindi and Mtwara. A meeting had been scheduled in each of the two regions, and from there the plan was to use the “snowball” method, using contacts from these meetings to arrange more interviews. While still in Dar es Salaam, it turned out that a training in a human resources software was to be conducted by the Ministry of Health and Social Welfare and the University of Dar es Salaam in Lindi and Mtwara. Participants from all districts were to be there, meaning access to several informants in one place. Initial access to the regions was through participating in the planned visits to both regions together with a HISP team. These visits were facilitated by CHAI, locally and centrally. Eight interviews were undertaken at the location of the human resources software training. For interviews not taking place at the training venue (in Mtwara), contacts established during the visits facilitated by CHAI were used in order to

set up interviews and visits to regional and district offices, health facilities and CHAI offices. My fieldwork in Tanzania lasted for 21 days, of which 14 days were spent in Lindi and Mtwara. As the human resources training was conducted in Mtwara for both regions, most of my time was spent in Mtwara. The first five days spent in these southern regions was together with my supervisor and a HISP team, for one week I was alone, and for the last few days a colleague came in from Dar es Salaam who participated in my last interviews, and conducted some of her own. Data collection methods used will be further elaborated on below in the following section.

### **5.2.1 Data collection methods**

In order to reach an understanding of the status of the implementation of the DHIS in Mtwara and Lindi, I needed to speak to various persons that had been involved in the process, and most importantly the ones that were using the DHIS at regional and district health officers. I also wanted to speak to those collecting the data, as the data and the information it constitutes is the basis of any health information system. In order to understand the implementation process I also needed to speak to representatives of CHAI, the organization that has facilitated the implementation of DHIS in Lindi and Mtwara, and the representatives from the University of Dar es Salaam that have been involved in the training and installation of the DHIS. I have used the concept of triangulation in this case study, using several data collection methods clarifying how the case has been seen. These are interviews, both formal and informal, document analysis and observation.

#### ***Interviews***

Before departing to Lindi and Mtwara it was important to get as much background information as possible, and informal conversations were held with those who had conducted the initial training sessions in both Lindi and Mtwara. When arriving in Lindi, one day was spent in each region with visits arranged by CHAI, where participants from both CHAI and the regional health offices participated. The regional offices, as well two district offices and one facility

were visited in each region. The report from these visits can be found in appendix 3.

For the interviews performed at the venue of the human resources training in Mtwara, informants were sought out during the training, and asked if they had time during breaks or before/ after the training hours to participate in an interview. I was given some time at the start of the training session for each of the regions to present myself, and my topic of research. Once having agreed to be interviewed, the informants were given a brief oral introduction of who I was, the purpose of the interview and the thesis, as well as being presented with a written explanation and consent form during the interview. Eight interviews were performed during the training sessions. These were interviews with:

Mtwara	Lindi
<ul style="list-style-type: none"> <li>- Regional HMIS coordinator</li> <li>- District Medical Officer</li> <li>- Acting District Medical Officer</li> <li>- 2 HMIS focal persons</li> </ul>	<ul style="list-style-type: none"> <li>- Regional HMIS coordinator</li> <li>- District Medical Officer</li> <li>- HMIS focal person</li> </ul>

One interview was arranged through a contact from these training sessions, and five and six interviews in each region were arranged through contacts made from the initial visits with the HISP team, through contacts from both CHAI and the regional health office in Lindi. These were interviews with:

Mtwara	Lindi
<ul style="list-style-type: none"> <li>- Acting Regional Medical Officer</li> <li>- Regional Aids Coordinator</li> <li>- District Medical Officer</li> <li>- District Immunization and Cold Chain coordinator</li> <li>- Health facility staff: in-charge at dispensary</li> <li>- Programmer CHAI</li> </ul>	<ul style="list-style-type: none"> <li>- Regional Medical Officer</li> <li>- Regional Aids Coordinator</li> <li>- Acting District Medical Officer</li> <li>- Regional CHAI manager</li> <li>- Community volunteer sponsored by CHAI (in district office)</li> <li>- Health facility staff: nurses</li> </ul>

A complete list of all interviews and conversations can be found in appendix 1. Interview guides can be found in appendix 2.

In one of these interviews a CHAI representative assisted me with interpretation, in two of them a fellow researcher assisted with interpretation. For the rest of the interviewees English was spoken at a sufficient level so that I could perform the interview without interpreters.

Due to the lack of sign posting in Tanzania in general, there was also a need for someone to give directions on two occasions. In these cases CHAI volunteers kindly assisted in giving directions when I was driving to the facilities, and thus in two cases were present at interviews, in one case also assisting with interpretation, as mentioned earlier.

Upon returning to Dar es Salaam two more interviews were done. One was with one of the trainers that I had already been having informal conversations with prior to going to Lindi and Mtwara, and one interview was done with the central manager of CHAI.

Each interview lasted between 30 minutes and 1½ hour, and was semi-structured and based on open-ended questions. In most interviews a recorder was used, while I also took notes. When the informant was not comfortable with the use of a recorder, I took more extensive notes, and took the time to fill them out more extensively as soon as I could after the interviews.

### ***Observation***

Observation was used when performing interviews with staff onsite. They were asked questions navigating around in the DHIS software in order to see what their level of competence in the DHIS was, and how comfortable they were with using the software. Observations were also made while travelling between the various health sector sites, both observing the infrastructure such as roads, and observing the data representation in the form of what was hanging on the walls of statistics and graphs.

### ***Document analysis***

Documents, reports, and workshop summaries have been good sources for information. Particularly documents like the Health Sector Strategic Plan, and agreements around the HMIS strengthening project going on in the country were very useful sources of information. These contributed to my understanding of the project of strengthening the HMIS as a whole, and to place the efforts made in Lindi and Mtwara in the bigger picture of the ongoing efforts to improve the health sector in Tanzania. In order to be able compare my results with other efforts made in the country, a review of several previous studies performed in Tanzania was also performed.

### ***Possible limitations:***

The scope of this study is a clear limitation. Although I was able to gain a picture of the implementation process during my stay in Lindi and Mtwara, more aspects could have been investigated more in depth with spending more time in the regions. The mentioned lack of signposting and generally bad roads were reasons for not being able to visit more districts to perform onsite interviews and observation, as I did not want to venture these roads on my own. Especially when not mastering the local language and English is not widely spoken. Language was sometimes a barrier to understand what was communicated around me. Although most of my interviewees spoke English, some did not, which was mainly the case at the health facility level. In the cases where I had a fellow Tanzanian researcher with me they would assist with interpretation. Exactly what information I missed out on is hard to say. In one case when visiting a health facility alone, a person working for CHAI would come with me to the health facility and assist with interpretation. This can be a limitation, as those interviewed had been in contact with this person previously, as well as the organization he represented, and purpose with my visit could be misunderstood. In order to avoid misunderstandings, I was very specific in explaining my background, what the topic of my study was and why I wanted to speak to them. Due to time limitations, the need for directions, and language barriers, this was



still a help to achieve my goals of interviewing persons across levels, and of getting to the facilities in question.

### ***Analysis***

My interview questions were based on my initial readings in the field, and regarded some categories I was expecting to find data on. While performing interviews, some questions changed underway, and new categories emerged based on what my interviewees told me about the case, and which I found when going through my data material when out of the field. These are the categories found in the presentation of my empirical findings. For the analysis of my findings I have used the theoretical concepts presented in Chapter 3 to assist me in understanding, analyzing and discussing my empirical findings.

## **5.3 Summary of research methodology chapter**

To answer my research question regarding the status of the implementation of the District Health Information System in the health administration and management in Lindi and Mtwara, and what conditions and actions taken have contributed to the current situation, a case study approach seems appropriate. I have through data collection methods like interviews, document analysis and observation tried to gain and communicate new knowledge. I have used categorizations for presenting my findings that emerged from my theory and literature review, and later used specific theoretical concepts for analyzing and discussing my finding, as well as comparing the results from my analysis with results from previous studies.

## 6 Empirical findings

This chapter presents the findings from Mtwara and Lindi, and is divided into three main parts:

In section 6.1: Findings that are general for both regions are presented, seen from the side of the project management

- This part is based on interviews with a top Clinton Health Access Initiative (CHAI) manager, and a Health Information Systems Program (HISP) member based at the University of Dar es Salaam, who was involved in the process of implementation and training.

The second section 6.2: Findings from Mtwara, presents the findings from the Mtwara region

- This part is based on interviews with regional, district, and health facility staff, as well as staff from CHAI

The third section 6.3: Findings from Lindi, presents the findings from the Lindi region

- This part is based on interviews with regional, district, and health facility staff, as well as staff from CHAI

The findings are divided into regions due to the differences that were found between them, and in the last section, 6.4, these differences are summarized.

### **6.1 General findings from both regions, from the side of the project management**

#### **6.1.1 Background**

The situation how it was in Mtwara and Lindi, and partly still is, was that there was no regular flow of information, and a lot of data collection that is uncoordinated, “one does not know what the other is collecting”, according to a

HISP member involved in the implementation and training of the DHIS. There is a lot of data collected that are not used at all, in any reports, and in some cases very different data is reported. The same person involved in implementation and training puts it “you know, it is ok if one is saying 200 and the other is saying 210, but it is unbecoming if one is saying 200 and the other says 1000”. The data the districts works with for the Council Comprehensive Health Plan, which is prepared annually, “you cannot go and validate anywhere [...] they say 30%, then you ask 30% of what, and they cannot answer, there is no backup anywhere”, the CHAI manager says. CHAI has been supporting health programs in the two regions since 2008, and he noted from CHAI’s work in the region that whenever the regional health management had to prepare a report based on information from the health facilities, there was this “scramble around making data”. Examples mentioned were for when the president or the prime minister came to visit. When looking those data from the different visits one could see that they were different and not consistent. There is also a case described where different reports gave a different number of health facilities in a region, whereupon a team was sent out to count all health facilities, signs that make the CHAI manager say that “the need for information is there”.

Concerning the failure of the semi-computerized MTUHA (that started out in 1993, and was rolled out through 1997) was that there was an “assumption that after the integration the system would become stable, there was no mechanism to handle new requirements”, the HISP member involved in implementation and training of DHIS says. What happened was that different stakeholders started producing their own books and reports, and some even developed their own systems. The HISP member involved in the implementation of the DHIS in Mtwara and Lindi points to the fact that things change fast in the health sector, one has to deal with new requirements, and a health information management system has to be able to “accommodate new needs, if not those dealing with you have to create alternative mechanisms, and later they are competing with you”. The same person says that development partners have been one of the major sources to chaos in the data collection, and that there are no mechanisms in

place from the government that “guide the partners on how to work in the country”.

### **6.1.2 The way it started**

CHAI were supporting health programs in both Mtwara and Lindi. They were in need of a tool to monitor their efforts and had heard of the DHIS through their cooperation with the Ministry of Health and Social Welfare. CHAI had also in the past been involved in the DHIS implementation initiative in Zanzibar. First of all it was started in Mtwara, how it later started in Lindi will be described in part 6.3. The ideas and discussion around implementing the DHIS software in Mtwara started in Dar es Salaam in June- July 2009. At the same time the DHIS was being piloted in another region, Pwani, which had been going on for some time, with the University of Dar es Salaam responsible. CHAI asked for permission from the Ministry of Health and Social Welfare to introduce the DHIS in Mtwara, and was granted permission to do so. The original plan was to start with having as much vertical health program data as possible available in the DHIS, and most of the available datasets were included; Prevention of Mother to Child Transmission, Expanded Program of Immunization, Voluntary Counseling and Testing, Sexually Transmitted Infections, and Care and Treatment. Permission was also asked of the Ministry of Health to also include the existing MTUHA paper based information system. New, revised MTUHA forms were under progress and a year overdue (still not ready in December 2010), CHAI decided to start with the current ones. They got permission and full support of the Ministry of Health to introduce the whole health management information system, and made sure that the backlog was cleared for a year before, so they had their data in the DHIS software. In July – September CHAI had a volunteer learn the DHIS, which in September moved to Mtwara. She did an assessment together with the regional health management team of what they needed, and they agreed to start. CHAI asked trainers from the University of Dar es Salaam to come to Mtwara and do the training in the DHIS software. On the choice of the DHIS software a trainer from the University of Dar es Salaam says that CHAI knew of the DHIS software from before, and “did not want to reinvent the wheel”. Concerning getting

permission from the Ministry of Health and Social Welfare, the HISP member and trainer comments: “With the bureaucracies it takes time, it is not like in South-Africa where you could try it in some regions and show the results from there, in Tanzania it is not possible to do something for two years without the top knowing and approving”. When talking about which part in the implementation process that was the most difficult the same person answers, “the administration parts were almost all of them difficult”, deciding on validation rules was given as an example.

### **6.1.3 Project organization and management**

CHAI were responsible for introducing the DHIS software, and in Mtwara 100% of the financial support for planning, customization, training and rollout came from CHAI themselves. In Lindi there were differences, which will be elaborated on in part 6.3. Permission was asked from the Ministry of Health, and the University of Dar es Salaam was as mentioned involved in customization, training and rollout. They started by defining available indicators and organizational units, some of this customization was done in Dar es Salaam, and some was done in Lindi and Mtwara. CHAI hired staff to enter the backlog from one year back. The CHAI manager says about this process “setting up the system and getting data entered so that people can see and use them, I think it was a process well done”.

The HISP member involved in implementation and training says there is a problem in the project of lacking authority to enforce the system. For the Ministry of Health and Social Welfare in Tanzania Mainland, if only three out of its 21 regions are submitting exported files from the DHIS: “why bother wasting resources on learning about it?” It is also possible to print the “old” version, and the HISP member says, “you will not find the Ministry of Health pressing these one or two regions that have the DHIS”. The CHAI manager thinks that the Ministry of health should have the national data warehouse up and running, so that the usefulness of the DHIS can be demonstrated. Speaking of the Ministry of Health and Social Welfare the CHAI manager says their role is to coordinate, “I

think they have a very important role that up to now they are not playing, their role should also be to reign the vertical program information system, they all have big monitoring and evaluation departments with a lot of staff". The same person thinks that both CHAI and the University of Dar es Salaam should be transient, and that regions instead of going to these two institutions when they have a problem should go to the Ministry of Health. The way the CHAI manager suggests to make the cycle work is to have the regions send their reports, generated through the DHIS software, to the Ministry of health, instead of receiving them directly from the regions themselves. As a donor, they would then pressure the Ministry in order to get the data for the programs they are supporting.

The CHAI manager says one of the roles of the University of Dar es Salaam is the adaptation of the software, adding that this can also become a bottleneck. "To have only one or two who can do some of the adaptation is a bit risky, you need to have a whole pool of people who can do that, within the UDSM, in the ministry, even in the partners". He adds that the role of the University of Dar es Salaam is to expand their expertise on the software, "not just make it like a proprietary software [...] they can remain the super technical experts, not do everything, they have to work with the others". He thinks that one of the roles of the University of Dar es Salaam is to train donors and people from the vertical programs, "it is very critical, because it will extend the arm, the reach of the UDSM". A recommendation from the same person for other regions is to "start now" and train some people in each region, so that they will already be used to the idea when the health management information system is rolled out with the new forms. For CHAI, the manager says that one of their roles is to keep interest, and making sure that experience in Lindi and Mtwara is shared across to other places.

The HISP member participating in the project of implementing the DHIS software in Tanzania says about he development partners that "they have contributed a lot". But he thinks the way they work should be streamlined, "there has to be a way of communicating between them and the other development

partners, and with the Ministry of Health”. Different donors need different data, and an “enormous amount” of data is collected. He suggests a forum where they can all be brought together, “and to see how we can do this, how we can cooperate”. He thinks that in order to be accommodative to all stakeholders’ needs, one mechanism could be regular meetings for reviewing the software. There should be a timetable for it, it should be systematic, “not operating on an ad hoc basis, when someone comes with new requirements we should know; go to that office, those are the procedures”. The same person adds that the DHIS is a software, and that HISP is interested in much more than that, they are interested in the information systems, the software only “forms a part”. With the DHIS software he thinks awareness and a forum for discussion is created on what data is collected and what tools are used.

A CHAI manager on his side suggests that there should be a monitoring and evaluation forum, which should be a team comprising of a “Monitoring and evaluation focal person, the HMIS focal person, vertical program managers – the people using the data – to meet and analyze”. The CHAI manager thinks that the vertical health programs should have a role of allocating resources to monitoring and evaluation, and not specifically for their own programs. To illustrate this from the vertical program managers’ point of view he gave an example of a national vertical health program manager in the HIV area telling him in the past “I am willing to give up the M&E team (monitoring and evaluation team), as long as no one asks me about data about HIV”. He was afraid the alternative system to his own would not work, at the same time as still being held responsible for data. The CHAI manager has a background and interest in health management information systems. In the organization, CHAI, the efforts in this area is overseen and supported by him directly, which he thinks gives it stature in the organization.

#### **6.1.4 Training and skills**

The initial training in both regions was held by trainers from the HISP network at the University of Dar es Salaam. One of the trainers noted a lot of variation

between what the participants knew from before. Some were fast, and some had inquiries about whether to double-click or if it was “only once”. There is no formal ICT training, “they catch ICT from the different software of which they have been trained”, the same trainer says. What they go through in the training is first using ½ day to establish computer literacy, introducing file systems and other topics targeted towards the rest of the training needs. Following are topics like data entry, data quality, indicators, numerators and denominators, validation rules, minimum and maximum ranges, export and import, and reports. One of the trainers emphasizes that the concentration was on use, “during training they cannot catch half of what you are saying”, and some things were just shown to them and said that this is available and possible, for example defining indicators. One function the same trainer recommended should be working perfectly during training is the data set reports, which is “the first WOW”, as it compiles automatically, whereas manually the compilation takes a lot of time. The training was not aimed at one specific group, about three people from each district were trained. According to one of the trainers this was done “to be sure that some of them would be active, you cannot know, you bring several so that at least one, sometimes it’s a matter of chances”. A person working for CHAI in one of the regions was trained, and later conducted a second training, referred to as a refresher training, for staff from both regions.

Because of the level of computer skills in the districts, the CHAI manager wanted the forms to be like they are “in the field”, because the people using the system are “not that high experts”

### **6.1.5 Use of the DHIS**

The CHAI manager says about when he would see the implementation of the DHIS as completed that “I would say my work is done if all districts have a DHIS running, and that they have a system of making sure when there is a breakdown or whatever it is working, so it is always up and running. Data entered regularly and timely, reported in a timely fashion, data being utilized as a routine, and need for help from CHAI is getting less and less”. As mentioned one of their goals



is to share the experience from Lindi across to other places, and adds “but in order for Lindi and Mtwara to share, they must have good quality data, they must be using it very well, because you don’t want to recommend something out there, and then somebody comes to look and it is full of holes”. He says that the utilization of data is still the biggest challenge, and also mentions the challenge that people still see the data as data for CHAI: “It is a problem that people still see data as data for CHAI, because we are doing DHIS”. One of the trainers says that the ultimate goal of the DHIS is information-based decisions at all levels, but also that change is slow. “It takes time for them to be able to use it in their planning, use it, make decisions based on the data from the DHIS”. Different ways of representing their data are not asked for until local CHAI staff in the region asks them, reports can be customized for them, but “they don’t know that they can use it”. The CHAI manager explains that his expectations for the DHIS before it was implemented was that it would revive the availability of data, but also “encounter this culture of utilization of data - revive the culture of regular reporting and looking at the data, making sure they are good quality and using them”. It is also an expectation that all districts will use data from the DHIS software when preparing their annual plans, the Council Comprehensive Health Plan.

#### **6.1.6 Support and supervision**

The CHAI manager says that the plan is to reduce support significantly by 2012. It will be reduced gradually so that in 2012 they are “doing most of it self-sustaining”. He says that CHAI will then have another focus, but still use the DHIS software for measuring output and outcome. Supervision of the DHIS software is incorporated in the supervision of the programs CHAI already supports, Care and Treatment (in Mtwara) and Prevention of Mother to Child Transmission (in Lindi). This is done “to make sure it is in their plans”, the CHAI manager says. They incorporate the supervision of the DHIS with the existing, as the regions are receiving funding for supervision from other programs as well. A person from the University of Dar es Salaam involved in the project says that “[...] what we want to do is not to create a parallel system, but integrate with already existing

procedures, you'll find that there are already procedures and a data flow mechanism in place". He adds that the DHIS software is "an open box", one has to start with the procedures already there.

The CHAI manager says about feedback that the districts should demand it, "they have more to win and to lose if there is no data than at my level here", and that CHAI is trying to build a culture for feedback. He says the districts should demand feedback and help, not wait for the regular quarterly supervision cycle when, for example, the computer is down because of a virus, which he thinks is the case now. "I expect the RMO (Regional Medical Officer) and DMO (District Medical Officer) to be as passionate as I am", and for the moment thinks they are more active than proactive, but with differences between the two regions Lindi and Mtwara. The same CHAI manager says about the health facilities that they "just send their data upward, the feedback they get is if their data is wrong". He would like it to be an arrangement where the health facility staff comes to the district office once per quarter to have a meeting with discussion on their data. He sees it as "very crucial, that they can help increase the awareness of information, the use and also the quality of data". This is something that will be discussed in a meeting coming up soon in Lindi, and it is something the regional health management team in Lindi has asked for themselves.

### **6.1.7 Shortage of staff**

The Ministry of Health has approved the position of monitoring and evaluation officer, "but the expertise for that position does not exist" the CHAI manager points out, "we don't have people who can qualify for those positions". There are volunteers working in most of the districts visited in both regions, to whom CHAI are paying their stipends on behalf of the districts. "[...] That is why they feel they are more CHAI", a CHAI manager says about the volunteers interviewed viewing themselves as "CHAI volunteers". These volunteers were "given" to the districts to work in the communities, but the greatest need in the district was in the data, "so they pulled them back", the CHAI manager says. He adds about the situation of how the volunteers view themselves - "this is my project that failed". He has

been speaking to the regional health management about getting approval for hiring some of the community workers into the government system, so they can keep doing the work they are doing. The CHAI manager also thinks the region should start now in allocating staff who are specifically for HMIS, “not doing any other task”.

When it comes to technical support, CHAI volunteers, pertaining to the CHAI offices in both regions, have covered this role.

### **6.1.8 Health facility reporting**

The CHAI manager would like the ideal health information management system (HMIS) to be developed based on key critical indicators “which clearly monitor the progress of health status in the population”, and based on those indicators have “good summary reports that are feeding into the DHIS”. These summary reports should be based on “a few comprehensive registers and forms at the facility level that do not make the health workers jump from register to register entering the same information”. He mentions that there is a lot of duplication and a lot of work to gather the same information for the indicators that are needed. One example given is the Prevention of Mother to Child Transmission registers, which has information about pregnant women – how many antenatal visits they have attended and so forth. Then there are the “normal” antenatal registers that have the same information, but no HIV test. “These are redundancies I don’t expect to find in a normal functioning HMIS”, the same CHAI manager says. He specifies that other additional information needed than from the routine health information system can be collected with regular surveys. There are no direct effects for the health facilities of installing the DHIS at this time.

### **6.1.9 Technical issues**

CHAI has provided both regions with computers for all of its districts, and had the DHIS installed on them. Something the CHAI manager sees as ideal is to have

computers at health facility level, but that this is something that cannot be dreamt of at this time.

#### **6.1.10 Not everything is in the system**

According to the CHAI manager a very long-term goal is to eliminate the parallel systems, and he sees the DHIS software as having the potential of doing so. One of the trainers involved in the implementation also says that the primary objective is an integrated and uniform source of information. The HISP member involved in the training and implementation of the DHIS software says it fits for Tanzanian conditions because of its flexibility, and that there can be co-existence in the same software. He sees an ideal system to be accommodative and robust in solving different people's needs, and that the DHIS software as a very dynamic system in that respect. A CHAI representative wants ownership to come from the region and district staff, and says that "everything can be done" talking of what the district staff have mentioned that they would like to be in the system. He also says that he wants what is there routinely working first, before other things are added.

#### **6.1.11 Summary of general findings from the side of the project management**

Describing the situation the way it was before, and in many aspects still is, the two informants mention problems of no regular data flow, uncoordinated data collection, and inconsistencies in data reported. The district prepares an annual plan, where numbers are difficult to validate anywhere because there is no backup. CHAI needed data to monitor the health program they were supporting in Mtwara, had heard of the DHIS and been slightly involved in it before in Zanzibar. Discussions started in Dar es Salaam in June-July 2009. CHAI asked the Ministry of Health and Social Welfare for permission to introduce the DHIS, and include the paper-based parts of the national routine health information system (MTUHA), which includes several reports, among them reports in the HIV/aids-area. They were also given permission to implement in Lindi region. Trainers

were hired from the HISP-network at the University of Dar es Salaam, which were paid by CHAI, whom also provided the regions and districts with computers. In the case of Lindi, the regional health management facilitated the training, while CHAI covered the rest. Adaptation of the software was done in Dar es Salaam, and partly in the regions. The CHAI representative thinks the roles of both their own organization and the University of Dar es Salaam should be transient, the Ministry of Health and Social Welfare having the coordinating and supporting role, which they think the Ministry up to now have not taken. A role the CHAI representative sees the University of Dar es Salaam to have is to share their expertise and train other stakeholders. The trainer from the University of Dar es Salaam suggests a forum to create awareness around the data collected, where stakeholders could be gathered and a path to coordinate the efforts in the health information systems could be discussed. Systematic review of the DHIS software is also suggested.

The University of Dar es Salaam conducted the first training in both regions, where a local CHAI employee was trained and later conducted a second training in both regions. The initial training had its focus on use, but a certain amount of computer literacy also had to be established, as computer skills were varied. Those selected for training were 2-3 persons from each district, to be sure that at least one would start using the DHIS actively. In Mtwara the District medical officers did not participate in the training, which they did in Lindi. The utilization of data is still regarded as a big challenge, several reports can be tailored for the users of the system, this is not asked for, and a lot of the work in presenting the data using the DHIS is still done by local CHAI representatives. Supervision of the DHIS use is included in the supervision CHAI already performs for the programs they support, but it is a goal that support from CHAI will be reduced significantly by 2012. CHAI have “given” volunteers to the districts in both regions, which they are supporting by paying their stipends. These volunteers are on one-year contracts, there is talk of employing them in the districts after the year has passed. There is a shortage of staff, and many of these volunteers work with data entry in the DHIS, although they were meant to have other roles. Other systems are still in use, and the DHIS software does not include all data that is needed in

order to create the reports the districts have to prepare and send to the region. Technical issues such as computer viruses are a big problem, and keeping backup is still not widespread.

## **6.2 Findings from Mtwara**

### **6.2.1 Background**

The CHAI manager thinks that part of why the acceptance when CHAI wanted to introduce the DHIS went fast, was because they “saw maybe this could help”, and they knew the old health management information system, the paper based MTUHA. He himself considered the old system to have collapsed, as health facilities collect data, they send it to the districts, and from there no one are asking for the data. The way it was before, he says that the region had to call and follow up with supervision when they wanted data, and that “they were all complaining about the HMIS”. One of the District Medical Officers interviewed in Mtwara says that before, with the manual system, files were lost many times. “You try to find it and it is not there”. Others saw a need for the system in order to make the entering process easy, and to have data stored in a safe place. A regional staff member describes the paperwork as it used to be as “tiresome”, and that you had to get information from many places. About how much time used to be consumed for paperwork he says it was “all the time, because there was no system for data or collection or storing, so you just depend on the paperwork [...] all working hours just working with paper”.

### **6.2.2 The way it started**

Since Mtwara is where the DHIS was first implemented and where it started, the description of the way it started in Mtwara can be found in the general findings part. CHAI and the Ministry of Health and Social Welfare did the planning of the implementation of the DHIS, using the University of Dar es Salaam for

installation and training, one of the regional coordinators, responsible for coordinating the routine health information system, says he was just involved in training.

### **6.2.3 Training and skills**

The District Health Information System software was implemented in Mtwara in September 2009. A five days training in the software was conducted the same month, which was facilitated by CHAI, and held by trainers from the University of Dar es Salaam. A subsequent training in the software was held in August 2010, lasting for five days, and referred to as “refresher” training. A volunteer working for CHAI, with a background in business computing, had previously been sent to sites in Tanzania where the DHIS was already in use, in order to get an understanding for it. She participated in the first training, held by trainers from the University of Dar es Salaam, and later held the second, refresher training.

All of those interviewed at district level in Mtwara had attended both trainings, apart from those who were in the position of District Medical Officer, whom were not trained in Mtwara. One of the District Medical Officers had attended one of the trainings while working in another institution, but not in his current office. Of the interviewed that had attended training, three of them mentioned that they would like to have even more training. When asked what they would like more training in, their answers were graphs and analysis, one person also mentioned more training in Excel, as this is the format the reports come out in. One person formulated the need for more training like this: “you know, when you conduct training, there are other things, you cannot catch it clear. When you go back to the field you find that you come with other problems”. One of the regional staff members interviewed had not participated in any of the trainings in the DHIS software, while the others had participated in both trainings. He does though remember the DHIS software as being presented as a test, that all districts would be involved, and that some indicators would not be there. A member of the regional staff thinks that “of course” more training is needed. Referring to the district level he says “there are so many areas, maintenance,

service, so many elements, and the one filling data needs to know them - what was dealt with at the training was only data entry, import, export, and data completeness, there are other elements that those dealing with it (DHIS) still need to know". Another regional staff member would like to have more training on "everything – the one we had was an introduction, we need more detailed, for the region". She would specifically like to have training on how to get summaries in the DHIS software for the six districts in Mtwara.

#### **6.2.4 Use of the DHIS**

##### ***Use and non-use of the software***

The use described in interviews varies a lot according to position. For those interviewed who were in the positions of HMIS focal person, they all described their use as entering data, and that they entered data every month. The Extended Program on Immunization Coordinator interviewed in one district described his use as "not much", and that he does not practice, and does not compile his reports in DHIS. He says he would like to use graphs (from the DHIS), but that it is because of little practice this is not done; "if I do practice I could do it". In the case of this district there is a CHAI community volunteer who works with the DHIS software, which describes her use as entering data. She detects the errors on the hard copy that is received from the health facilities, not through functions in the DHIS software like validation, this is a function she has never used, and tells others in the office to do supervision based on that. She says that program coordinators comes to enter their data themselves in the DHIS, but compile reports manually; "They do not know that they can print it out from the system, they were not in the training", the CHAI volunteers says, and adds that they are not very interested to learn. In one district visited, the use of the DHIS software, apart from entering data, is described as tracking data completeness, and printing reports every month that are given to the District Medical Officer. For an HMIS focal person interviewed, who is also a clinical officer, the use depends on his work in the out-patient department, and that he first finishes his shift at the



out-patient department, then, after having completed prescriptions he has time to work with the DHIS.

One of the regional staff members interviewed uses Excel to make tables, and also uses two database systems for two vertical programs in the area she is coordinating. The same person does not use the DHIS software, and sees it as mainly for district use. She mentions a form “from the DHIS” (for one of the datasets that is included in the software, Sexually Transmitted Infections), that has to be filled out for each program through DHIS or manually, which districts “sometimes put in the DHIS so it can be printed, and sometimes they send it”, illustrating how routines are varied and not entirely clear. A picture of the mentioned form below, which is a summary form from one of the vertical health programs:

MINISTRY OF HEALTH AND SOCIAL WELFARE  
NATIONAL AIDS CONTROL PROGRAMME  
**DISTRICT MONTHLY STI SUMMARY FORM**

DISTRICT: MASASI  
 REGION: MWAZA  
 Total number of health facility: 43  
 Total number of health facility providing STI syndromic management: 23  
 Number of facility reported: 18

OFFICER REPORTING:  
 Name: PRINC. 6  
 Designation: PRINC. 6  
 Tel. No.                     

REPORTING MONTH: October YEAR: 2010  
 Submission Date: 14/11/2010

INDICATOR	AGE GROUP AND SEX										TOTAL		GRAND TOTAL
	<15		15 - 24		25 - 34		35 - 49		≥ 50		M	F	
	M	F	M	F	M	F	M	F	M	F			
Number of new clients with Genital Discharge syndrome	0	0	7	10	14	17	17	7	1	1	39	35	74
Number of new clients with Genital Ulcer Disease	0	0	6	5	7	3	5	4	1	2	19	14	33
Number of new clients with Pelvic Inflammatory diseases		0		7		7		3		0	0	17	17
Number of new clients with VDRL/RPR +VE	0	0	1	0	0	5	7	4	0	0	8	9	17
Number of new clients with other STIs	0	0	0	1	1	2	4	0	0	0	5	3	8
Total new visits this month	0	0	14	23	22	34	33	18	2	3	71	78	149
Number of Episodes re-treated - 2nd line	0	0	2	3	0	1	0	0	0	0	2	4	6
Number of Episodes re-treated - 3rd line regimen	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Episodes referred for 3rd-line regimen	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Contacts treated	0	0	2	5	2	5	7	8	1	0	12	18	30
Number of clients counseled and advised on condom use	0	0	16	28	24	39	40	26	3	3	83	96	179
Number of clients linked to HIV counseling and testing	0	0	9	23	20	36	29	33	7	6	65	100	165
Number of clients referred from other services (OPD, IP, TB, VCT IP and ANC)	0	0	12	4	8	20	9	6	0	0	29	30	59

1st Copy White - to RMO by the 14th of the next month of reporting month  
 2nd Copy Pink - Remain at the District Medical Officer (DMO)

The Printing cost of this form was supported by jic

Figure 8. Summary form from district for a vertical health program

### ***Use of the data from the DHIS***

The District Medical Officers interviewed, do not interact with the system themselves, they describe their use as only receiving reports. One District Medical Officer says that in their regular morning meeting at the district they “just look at the figures” and do not use graphs or printouts from the DHIS. “We don’t put the number in terms of histograms, although I know there is that possibility from the DHIS”. Another District Medical Officer answers, “if I need any data I go to the focal person” and that she never interacts with the DHIS herself. On the regional level, two of the interviewed regional managers do not interact with the DHIS software at all. The third person uses the DHIS software when he goes for supervision visits to the districts, supervising their use. He sees how the data is entered in the system, how the districts report, and how they produce a report from the data. The same person is the one who receives the reports from the districts, either by email or by an external hard drive, and then passes it on. The person interviewed who is acting in the position of Regional Medical Officer says the person permanently in this position uses the regional HMIS coordinator in order to get data.

The regional manager who uses Excel and other databases sometimes receives data from the districts, but only for two of the vertical programs, and not always. She says that people from the districts send their data to the HMIS coordinator, “because he is the focal person for HMIS and DHIS”. For one of the vertical programs, Care and Treatment, there is a data clerk sponsored by CHAI that enters the data. The Care and Treatment data is sent straight to the data clerk, she enters the data and sends it to the Ministry of Health and copies the regional staff member in. An improvement mentioned by this regional staff member would be to have one person in her office only dealing with data, and to have the DHIS “working in the region”, and being able to get summary reports from the region through the DHIS. She illustrates the multiple data sources like this: “You find data for CTC (care and treatment) in the CHAI office, data for region in the HMIS coordinator’s office, other data in my office, you see?”

An IT staff working for CHAI says, “if they want something fancy, they ask”. Before meetings he might receive inquiries for graphs from regional or district staff. They mostly ask about Care and Treatment and Prevention of Mother to Child transmission, and they might ask for standard reports. “Districts were trained on creating reports, but they have forgotten”, he says, “they have problems with sending the data to the region, compiling in the DHIS is a challenge”. A CHAI manager says that by the quarterly meeting held in November/ December 2009 Mtwara showed data they were collecting. He also says that this was mostly done by a person working for CHAI there, “she was doing most of the work”, because they wanted them to see the value of the software, “so it was in our interest to have the right data”.

### **6.2.5 Budget**

Of those who were asked questions about the room for DHIS in their budget in the form of printer cartridges, paper, and transport for doing supervision, the answer was that there was no place specifically for this in the budget. Paper and cartridges would come from the stationary post in the district budget.

### **6.2.6 Support and supervision**

#### ***Supervision, feedback and support to the districts***

One of the district medical officers interviewed says that the supervision from the region is not performed on a regular basis. Most of it is component-based, vertical supervision. There may come someone from Care and Treatment, or someone from Prevention of Mother to Child Transmission. A donor organization, EGPAF (Elisabeth Glaser Pediatric Aids Foundation), is specifically mentioned as doing supervision as well. The same district medical officer says he likes it when they come, but that their visits are sometimes overlapping; they come from different places but ask the same questions; “sometimes it disturbs us, but there is no way”. He does, though, say that he finds this outside view useful, and that it helps, as the vertical programs’ graphs usually are comprehensive. These programs normally bring graphs and data in tables, “they

bring it and show us how we are doing [...] it affects the way we work, when you perform well and you are recognized it is motivating“.

One HMIS focal person says that there are quarterly meetings with the region, and that this is where she first heard of the DHIS. Another HMIS focal person says that if there is any problems with the DHIS he communicates with CHAI, “I call and they come to correct the problems”. They come to assist with problems like computer viruses and how to make reports. An HMIS focal person from another district says about feedback that it is “most important”. They receive quarterly supervision from the region, the HMIS focal person says to have received one report from the region since they started with the DHIS. During review meetings that are held with CHAI and the other districts they are shown the status and “where we are”, as well as comparison with other districts. In another district they normally received feedback from the regional level quarterly, “but if something is wrong they send it back right away with corrections”. Otherwise, information that they are doing well comes after a while. A regional staff member says that supervision is performed quarterly, “unless there is something wrong”, and that facilities are visited when necessary.

### ***Supervision, feedback and support to health facilities***

In one district the District Medical Officer says that they go with “their own” paper reports when going for supervision visits to health facilities, not reports printed from the DHIS software, and that they keep a manual file for it. Sometimes the supervision is done before the data has been submitted from the facilities. The district staff that performs the supervision is supposed to give feedback to the health facility the second day after the supervision was done. An acting District Medical Officer says that the visits to the health facilities are not done on a regular basis, there are sometimes visits 1-2 times per month, for example to deliver vaccines, and that feedback is usually oral. Reports they have submitted will sometimes be brought back to them and shown them if there is something wrong, in this district they also bring one from the previous month to compare. An HMIS focal person says that when the data received is incomplete, they sometimes call the health facility, and sometimes visit them. The same HMIS

focal person does not bring printouts from the DHIS software when she performs supervision to facilities, but this is something she has promised the facilities to do in a meeting she recently held with them. The discussions she has with the health facility staff are usually based on problems. She describes the discussions as her analyzing the problem and clarifying it to them, and there are also quarterly meetings are held with the health facilities. An HMIS focal person in another district says supervision of health facilities is done once a month, and that they do not have quarterly meetings with them. If they detect errors in the reports handed in from the health facilities, they either edit them right away if they are there, or they communicate with the health facilities by cell phone if they detect the error later on. An HMIS focal person in yet another district says they have quarterly supervision visits to health facilities, but they go to the facilities monthly to collect data. When they go for supervision they help them in rectifying reports, and “insist” on them reporting early. They are supposed to write a report when they return from supervision, “in order to report to higher authority”, and they also copy it and send it to the health facilities. In another district they pick up the reports from the health facilities when they are visiting them, or the health facility staff brings it when they are collecting their salaries in the nearby bank. To communicate with the health facilities they have bought mobile phones from a local telephone company, and put airtime for these mobile phones in the budget, so that they can call them e. g if they are late with handing in reports.

In the health facilities visited they say feedback is received when there is a need for clarification. It is found useful by the facility staff, but they would like to have more feedback on positive things, not only to be corrected. They do, though, say that feedback motivates them to perform better, and that changes are made thereafter, e. g concerning equipment and procedures. A clinical officer in a health facility says that they do not receive any feedback on the reports submitted; "they only call when something is wrong in the data". They say they never have received any supervision reports. The district looks at work performance and at reports, and they also give technical support. The facility staff says the ones doing supervision show them if there is something they do not

know how to do, but they cannot call the district about complicated reports. Concerning supervision, the same clinical officer says that the ones coming for supervision do not always call in advance, sometimes they surprise them. The helpfulness of supervision "depends on who are the supervisors that day. Sometimes it can be someone who cannot help, if it is the PMTCT (Prevention of Mother to Child Transmission) person she can help with the queries". Once they report to district, they say to never see that info again. It is only two (vertical health) programs that bring analysis on data performance, where the program for Care and Treatment is one of them. The walls in one of the health facilities illustrates how feedback has been random and sporadic, as there are old graphs (from before the DHIS) hanging on the wall, which have not been updated since respectively September 2008 and May 2009, time of visit was December 2010):

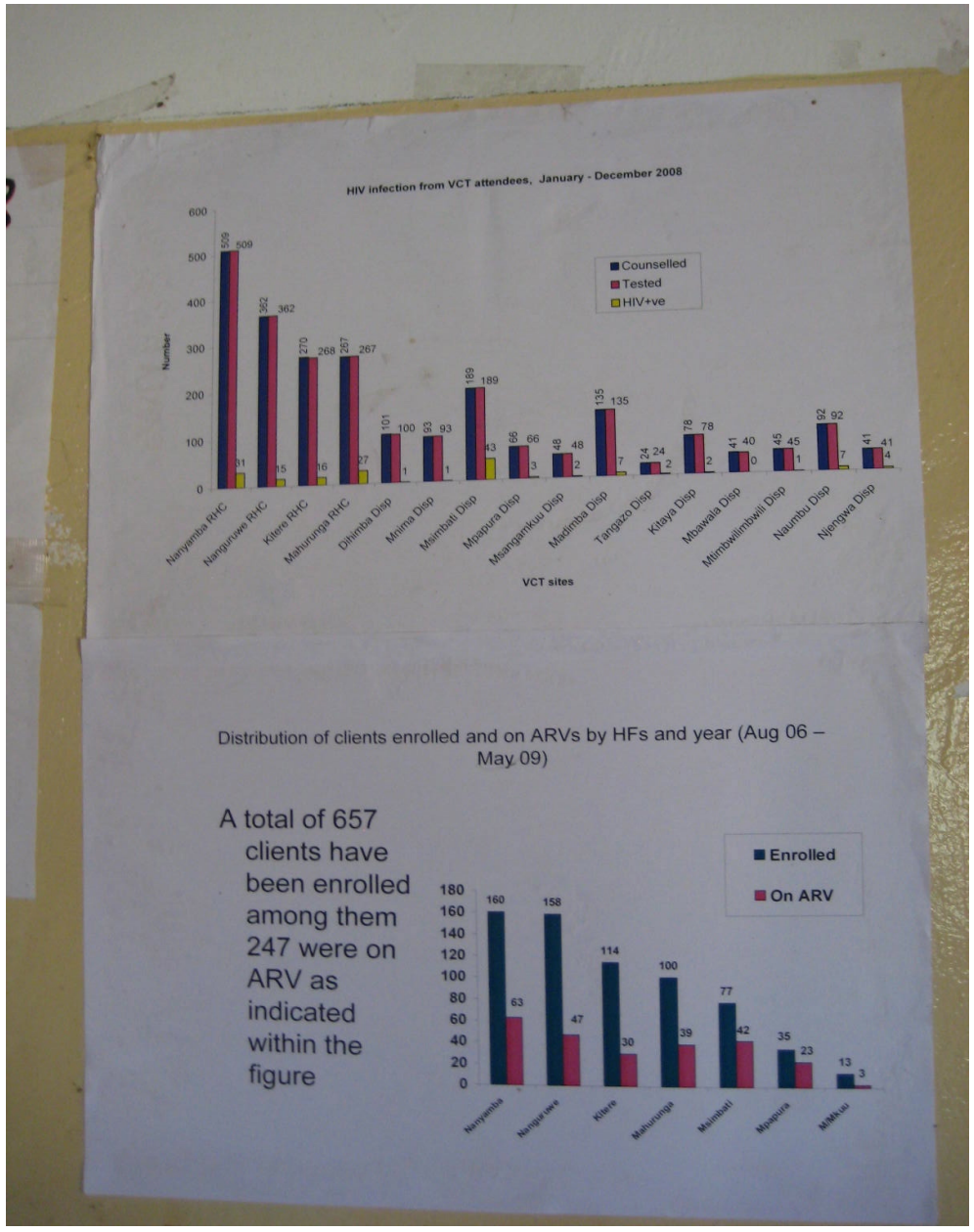


Figure 9. Old graphs on the wall in a health facility visited (not from the DHIS)

They facility staff interviewed say they learn a lot from the ones they have received, and that it would be nice to be getting more of this, as well as a comparison with other facilities, they would find it motivating. The clinical officer interviewed describes submitting reports as sending data to a "black box", but when it is not sent, they would call from the district. To hand in the reports she takes the bus or uses her own personal transport, which is something she mentions she would like to be paid for. The district does not come to collect data.

### **6.2.7 Shortage of staff and turnover**

Shortage of staff and turnover is mentioned by several of the interviewed. One district medical officer says that the district previously had a lot of acting district medical officers, and did not have proper members for the district management team. They are now trying to restructure, but still have some co-opted staff that is borrowed from elsewhere. One of the co-opted staff just left for studies, the effect is illustrated by the districts medical officers comment; “I depend on him so much, but now he is in Dodoma”. There were still graphs hanging in the district offices, made by the co-opted staff using Excel, which since he left had not been updated and were from 2008. The same district medical officer says that “in this area you need to sell yourself, we have to prove our existence”. Others mention that there is a lot of turnover, and one mentions that he would like to have all data in one software because of shortage of staff. A regional staff member points to the health facilities having too few staff, they are too few compared to the information needed. He also views the reporting, in general, as an extra duty: “comparing with the few staffs, with information needed, not only the DHIS, though, there are other informations, and then the other commitments which is their duty, so it’s an extra duty of course”.

### **6.2.8 Two roles/ time**

Apart from the district medical officers interviewed, everyone at district level have more than one position. One is Cold Chain Officer as well as HMIS focal person, another is HMIS focal person as well as District Nursing Officer, and one is HMIS focal person as well as clinical officer. For the ones who are HMIS focal persons as well as clinicians it means that they also have patients to attend to, “there are few nurses, I cannot be specific for DHIS”, an HMIS focal person and District Nursing Officer says. The nurse also says she has to work weekends sometimes to have time to finish the work. For the HMIS focal person who is also a clinical officer, he says his use of the DHIS software depends on his work in the outpatient department. He first finishes his shift there, then, after having



completed prescriptions, if there is time he works with the DHIS. He says he thinks it would help if more people knew how to use the DHIS, and finds that there is not enough time for both roles; “I am supposed to work at the OPD (outpatient department), also I am supposed to work with the DHIS [...] we found that DHIS, it needs more time”. A regional health manager also points out that those dealing with data at district level need assistance, “they have other responsibilities, not only dealing with data, they need more time, they have very little”. The same person also says that the DHIS is good, and is possible to be done if “there’s commitment for those who are involved in the health and in the DHIS [...] at all levels, because at the health facility level someone needs to fill the data, later send the report to the district, and there’s a time limit for exporting the data from the district to the regional level, and even from the regional level there is a time to send to national level. So, to make these time limits, commitment is needed”. He specifies “when I say commitment it is when someone uses his own time to make these things complete”. But again he emphasizes that those working with the data need more time, because of their other responsibilities.

At regional level there is also the case of having two roles; the acting Regional Medical Officer is also a dental surgeon, the Regional Aids Coordinator is a nurse by profession, and the HMIS coordinator is also the Cold Chain Officer. The regional aids coordinator says that even though she is a nurse by profession “there is no time for that”, she is just doing HIV activities, and has many activities to implement.

### **6.2.9 Technical issues**

Of those who mentioned technical issues during the interviews, computer viruses were what was most commonly mentioned, and what was the most common cause when they had to call for support. This is also what one of the IT staff working for CHAI says is the most typical support call he gets. One District Medical Officer says they had problems with viruses in the beginning, which led to the computer being out of use for a few weeks. This also meant that all data

that had not been sent to the region had to be entered again, as there was no backup.

In one of the other district offices they had not had a printer for a long time. A printer was coming from an outside institution in one month, so for the moment reports could be produced, but not be printed.

### **6.2.10 Not everything is in the system**

Several of the interviewed mentioned that the DHIS software does not include all of the data they have to work with. One District Medical Officer says that an improvement would be for it to include anything necessary for the district to produce a report. Others mention specific forms that are not there, but nonetheless contain information that the districts have to send to the regional level, and that some forms are still paper based. All of those mentioning the issue of everything not being in the system say that they would like to have everything incorporated in one system. A District Medical Officer thinks that one should: “[...] at least broaden it so as to include anything necessary for the district to produce the reports. You know, even the MTUHA does not comprise of everything that is needed in the report. So the software, slowly, slowly it has to incorporate other reports so as to have something that is a bit comprehensive, enough for the council (district) to produce any report that is needed.”

### **6.2.11 Health facility reporting**

When talking about the health facilities, one District Medical Officer talks of the HR areas as “still compromising”. “Some facilities have only one health worker, some facilities have a nurse attendant being in charge, a nurse attendant has one year of training”. The same District Medical Officer says that the “data that comes from them has to be counter-checked, it takes a lot of time, we have to follow up a lot”. Another issue regarding the health facilities is that close to all of the summary reports are in English, and that their English is not so good. They are referred to by one District Medical Officer as “untrained staff”, he also says that

they try to give them training, but the district is big, and they have a lot of things to do apart from supervision. Others mention that data received from the health facilities sometimes is incomplete, and others again say that it is a struggle to get data every time. One DHIS focal person says that the facilities have improved after the district started using the DHIS software, and that they are getting better at some forms. A regional manager emphasizes how the reporting is an extra duty for the health facility staff “at the health facilities they have few staffs, comparing with the few staffs and the information needed, not only the DHIS, there are other informations, then the other commitments which is their duty, so reporting is an extra duty”.

### **6.2.12 View on report filling from health facilities**

In one of the health facilities visited the way they filled reports was to divide up and fill them, starting with the priority reports and submitting as soon as the report is completed. The Prevention of Mother to Child Transmission report was said to take 4 hours to fill, and the report they thought was the only one difficult to fill was the vaccination report, as it also had calculations. This was the one they got returned most often with comments on, the other ones were “ok after comments in the past”. They say training on how to fill the vaccination reports would be useful. Reports are sometimes filled after hours, with no extra pay.

In the other health facility visited in Mtwara, a clinical officer says about report filling that it is done after hours and in weekends, three days are used to fill reports. There is cooperation in filling the reports in this facility as well, although it is made clear that it is her responsibility that the reports are filled correctly. The vaccination report is mentioned as difficult, also in this case because of the calculations it requires. Another report considered difficult to fill out is family planning, as it requires information from many places.

### **6.2.13 Summary of the main findings from Mtwara**

Clinton Health Access Initiative (CHAI) asked the Ministry of Health and Social Welfare if they could introduce the DHIS in Mtwara, as was described in section 6.1, as they were in need of data to monitor the health programs they were supporting in the region, and did not want to “reinvent the wheel”.

Representatives from the Mtwara health sector did not participate in these talks. The DHIS software was implemented in September 2009. CHAI had volunteers enter a one year backlog of data for all of the health programs which were included in the DHIS software. Two Health Information Systems Programme members from the University of Dar es Salaam were brought in for installation and to hold the first training session. A person working for CHAI was trained, moved to the region, and conducted the second training, held in August 2010. In Mtwara, District Medical Officers were not trained; apart from those working in this position all the interviewees had participated in both trainings. They would like even more training, particularly on how to use the DHIS to make graphs and to analyze the data. Some mention that apart from more training, practice is needed. The use of the DHIS varies according to position and organizational level. Those in the position of HMIS focal person at the district level use the software to enter data, district health program coordinators interviewed did not use the DHIS, while at regional level one of the interviewed used the DHIS, and used it for receiving reports and passing them on to national level. The CHAI office uses the DHIS extensively. There are several factors mentioned that affects the implementation and use of the DHIS software; some were shortage of staff and turnover; in many districts staff are hired as “acting” in various positions while the person originally holding the position can be gone for several years. People are moved around, leading to a high rate of turnover, and there is a lack of skilled staff in the health facilities. Many holds more than one position, and have two roles, whereof one of these may be a clinician as well as program coordinator or HMIS focal person, leaving little time for data entering. Access to computers for both practicing and entering data is limited. Supervision from region and district is not perceived as regular, not in district level nor in health facilities. In one facility the lack of feedback led to the description of submitting

data to the district like sending data to a “black box”. At district level supervision can be overlapping, as supervision is also performed by various donor organizations, although district staff appreciates the comprehensive graphs some of these organizations bring. Other factors were computers often being virus infected, in some cases leading to the loss of data, and the DHIS being out of use for some time. There are still other information systems that both district and regional staff has to get information from in order to produce the reports they are required to send to higher levels. Several of the interviewees would like everything needed to produce reports to be incorporated in one system.

## **6.3 Findings from Lindi**

### **6.3.1 Background**

In Lindi they faced much of the same problems as Mtwara regarding the information system. They had problems with the tools in use and the Regional Medical Officer saw the DHIS as a solution to this. At the district level they talk of the hard copies they used before, and the problems they faced with storage and when looking for information. At one district office visited they said that before the Ministry of Health used to ask for different reports when they needed them, they only received occasional reports, not on a regular basis.

CHAI was already present in Lindi as well, where they had been supporting a particular health program within the HIV/AIDS area, Prevention of Mother to Child Transmission, since 2008.

### **6.3.2 The way it started**

The implementation of the DHIS software, as has been described, started in Mtwara. Mtwara is one of Lindi’s neighboring regions and have several of the same donors working in both regions. Regional staff members in Lindi heard about the DHIS in a meeting in late 2009 where colleagues from Mtwara were

presenting their data. They were using tools from the DHIS software, and the regional health management team asked the country director of CHAI if they also could have it in their region. “They had so many interesting data, and told of the program”, is how one regional health manager remembers the meeting; a CHAI staff in Mtwara had prepared most of this data. Meetings were held with CHAI, which agreed to implement the DHIS in Lindi as well, due to mutual interest seeing that they also supported a health program there. The regional health management team in Lindi gathered resources in order to facilitate the first training in the DHIS software themselves, which was held in Lindi in February 2010. CHAI supported the regional and the district offices with computers and had a trainer from the HISP network at the University of Dar es Salaam come to perform the initial training for Lindi staff as well. CHAI also hired clerks to enter the backlog of data from 2008, so that the previous years data would be in the software, who worked with this for 3 months.

### **6.3.3 Training and skills**

The first training in the DHIS software was held for Lindi February 2010 by a trainer from the University of Dar es Salaam, the software was introduced in January 2010. A second training was held by CHAI in August 2010, referred to as refresher training, this training was held by a CHAI staff residing in Mtwara. The Regional Medical Officer picked everyone from the regional health management team for training, as well as having District Medical Officers participate in training, together with other district staff. Another regional health management member thinks that all those involved in data management must know how to use the DHIS.

Apart from three District Medical Officers, two of which were acting in their position, everyone that was interviewed at regional and district level in Lindi had participated in both trainings. One of the acting District Medical Officers that had not participated in both trainings had participated only in the first training, while the other acting District Medical Officer had not participated in any training. The third District Medical Officer had been away for further studies at the time of

both trainings. He had previously heard of the DHIS through the fieldwork for his thesis, conducted at the Ministry of Health, and thought he would be able to learn how to use the software on his own. He noted that those who were actually trained were not working with the DHIS software, and was wondering who should be trained “that will actually use it”. One person considered was his own personal secretary, who was a person likely to stay, interested and “knows about computers”. As for those who had been trained in the use of the DHIS he said that their knowledge of computers was very limited, and that making these people HMIS focal persons would not work.

One of the community volunteers from CHAI had participated in a separate training with two of her colleagues in February 2010, arranged by CHAI in data entry and export, and later together with the others from regional and district level in the refresher training held in August 2010. The community volunteer would like more training in backup, as they were not trained in that. She has herself trained one of the nurses “a little bit” on how to interact with the DHIS. Concerning other staff that had been trained in the district she said: “Others were trained but they are in the main office”, as the district office was divided in two buildings. The computer with the DHIS installed on it was located in another building than where the others who had been trained were placed.

One of the HMIS focal persons interviewed sees the training as sufficient, but that computer training is also needed; “I am already trained, but you know, technology is new to us, using the computer, it would be nice to have computer training also”. This same person had a computer training many years ago, but never had a computer to practice after the training. Computer training is something that is encouraged by CHAI, it is not arranged by them or by the regional or district offices. Another HMIS focal person says “training is not bad, practice is what is needed”. A problem regarding training that was mentioned by a regional CHAI staff was that “you might find that between the four we have trained, only one is competent”, which leads to the need for a lot of on the job training. A recommendation she gives for others regarding training is to first train everyone in the basics of computers, and then to train them in how to use

the DHIS software. The same person says that the computer illiteracy made the implementation process difficult, seeing that most of the district staff do not have computer skills, as it led to dependency on the few that had computer skills; “so we are depending on one person, let’s say that person is not around I think everything would collapse”. The CHAI staff emphasizes that there is always one person competent in computers in a district, which is not necessarily the HMIS focal person. As a result of the low level of computer skills CHAI has produced a booklet providing instructions for basic computer operations. Lacking computer skills are mentioned as a challenge by the regional health management as well.

In Lindi they are now saving for a third training for the regional health management team, the Regional Medical Officer puts it; “we have to know it”. One of the other members of the regional team also considered there to be a need for more training, and to have many people involved in the DHIS. At regional level one of the health managers say about the regional health management’s competency in the DHIS that “we are supposed to know it, we should be able to answer questions”.

The presence of the Regional Medical Officer in the Lindi training was commented on by one of the trainers as out of the ordinary. He came sharp and stayed, which meant that everyone else stayed to. The general tendency is that bosses come and go in trainings as they have meetings elsewhere and so on.

#### **6.3.4 Use of the DHIS**

##### ***Use and non-use of the software***

A regional health manager says that all districts are using the DHIS software, “because they have a computer, and a person assigned to that called coordinators”. Interviews with both other regional health staff as well as district staff nuances this statement a little. The acting District Medical Officer interviewed has not interacted with the DHIS software herself since the training she has had. The office has one computer, and it does not have DHIS installed, it is used for other administrative tasks. This district office is divided, and part of



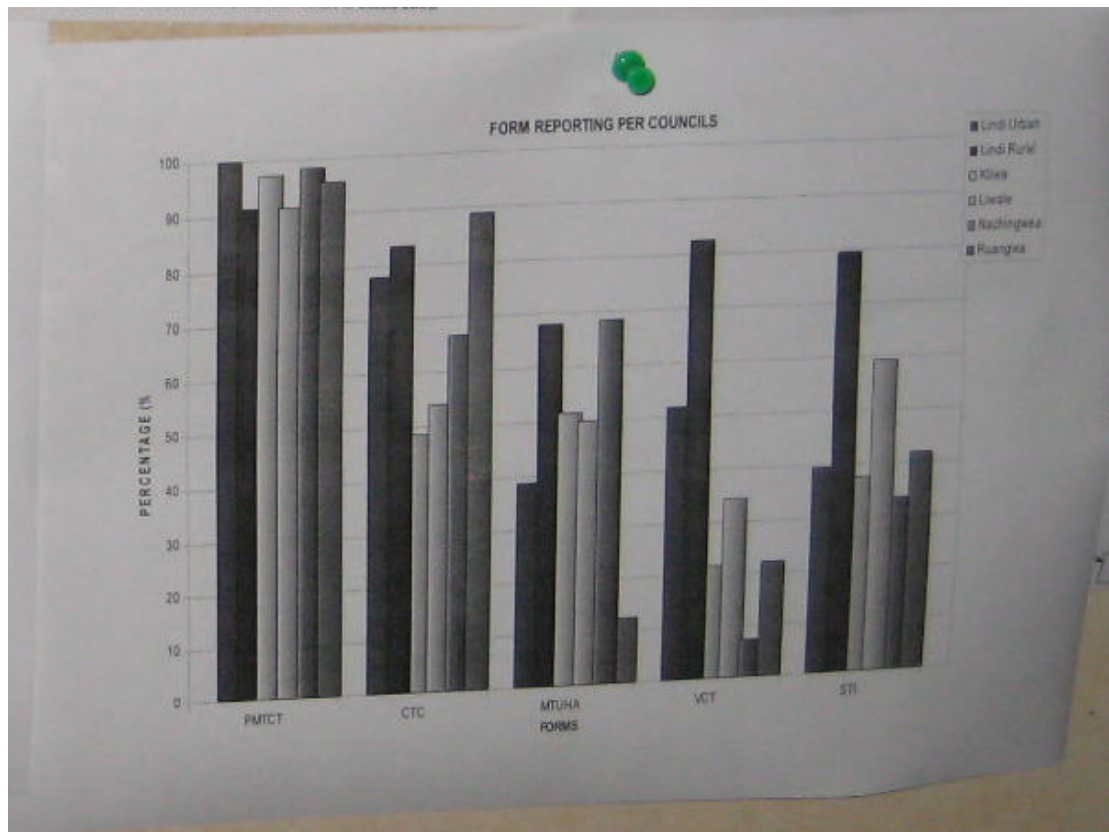
the office is located at a clinic nearby, where there is a computer with DHIS. There is a community volunteer sponsored by CHAI who works with the DHIS in this part of the district office. She enters data and makes reports monthly. Sometimes she is asked by the administrative staff to make a report, which she describes as happening about once a month. She sometimes prints reports and leaves it in a shelf so that a nurse in the adjacent clinic can see it. It is only her that uses the DHIS in the district, sometimes a nurse that she has trained a little bit by herself. Other district staff comes from the office to have a look if they need to know anything from the DHIS, “if someone wants to see, the data is stored”, and they come about two times quarterly. It takes her ½ day to enter all the reports from the health facilities, she export them via email or by external hard drive to the region. She does not find the software difficult to use. An HMIS focal person in another district says the software is helpful and saves him time. One report from one health facility takes 2 minutes to enter, which used to take ½ hour, and there are 50 health facilities in his district, so the time saved is substantial. After entering the data still has to be edited and corrected. Exporting (producing the report and sending it to regional level) is not experienced as difficult.

An HMIS focal person in another district describes his use as only data entry and exporting, “with practice I could do more”. He does not use the software to produce graphs, and says that “we started with DHIS this year, so I am not so familiar with it”. He would like to practice “everything, at any time”, which he thinks would be easier if he had his own computer. To enter a report from one health facility takes two minutes, “after that you have to edit and correct”. He does not see exporting data as difficult, and says that the program coordinators in the district also enter some data.

In the district where the District Medical Officer had been on study leave at the time of training he describes the DHIS software as used only by a “volunteer from CHAI that enters PMTCT (Prevention of Mother to Child Transmission) data”. They are currently using the manual system, MTUHA; the HMIS focal person compiles reports manually. At the end of the year the situation is

different, and the District Medical Officer says that “we all have to do it”, and that it takes long. Reports are currently sent to the region in Word processing, and some parts in Excel. He has a plan to start using the DHIS in January, “without the DHIS we do not know how we are doing, where we are, and cannot prioritize our activities”. He wants to “use the opportunities that are in the DHIS, creating reports as the year goes along”.

A community volunteer sponsored by CHAI responsible for entering data in one district describes her use of the DHIS as entering data and producing reports, which are given to the district focal person for HMIS. When that person is not there, she sends the report to the region herself. At the regional level the HMIS coordinator does not receive data from all districts. Sometimes reports are received in paper form, but the Prevention of Mother to Child Transmission reports are always in electronic form (has been entered in the DHIS). A local CHAI manager sees one of the most challenging parts of the implementation to be the commitment of the people, “the fact that there is not all the data in the DHIS is because people are not committed”. Prevention of Mother to Child Transmission is fully supported by CHAI, has top submission rates, and is followed up every month with calls and enquiries for reports. Figure 10 shows a bar chart with the report submission from all districts in Lindi for a given period of time, where the six leftmost bars indicates each district’s submission rates for Prevention of Mother to Child Transmission summary reports (the next six bars from the left is Care and Treatment, MTUHA forms, Voluntary Counseling and Testing, and Sexually Transmitted Infections):



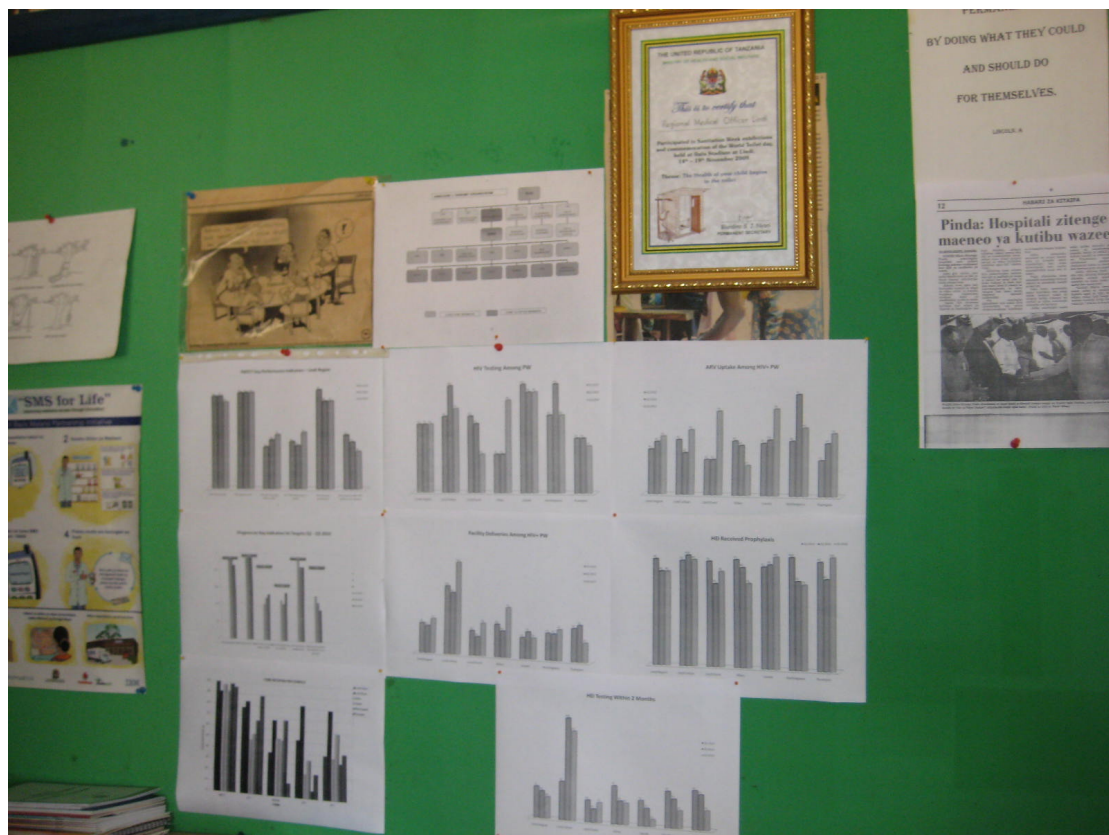
**Figure 10. Submission rates for DHIS Lindi, indicating high submission rates for the health program specifically supported by CHAI**

### ***Use of data from the software***

According to regional CHAI staff, the entering of data is not an issue, nor exporting data, it is the utilizing and analyzing of data that is the problem. Data completeness, accuracy and if the reports are received on time is monitored by the Regional HMIS coordinator. Printouts from the DHIS are not always brought when the regional team is planning with their resources, they mainly use the paper reports as a basis; “we know already where we have a problem, then we need to increase efforts to allocate our resources”. This information comes from the monthly reports from the districts. A CHAI volunteer comes to enter the electronic reports from the district on the computers of the regional staff, which he has received from the districts. Concerning this fact a regional health manager says jokingly, but also with sense of severity, that it makes the “matter worse” when you have someone to do it for you (referring to the CHAI staff entering data on their computers), then it is hard to see why one should bother training. There

is awareness around this, and it is parts of the reason why more training for the regional health management is planned.

About the use of information another regional health manager says “information is here to make me and everybody make the right decision”, and recommends that even more people in the region use the DHIS software. An example indicating use of data from the DHIS software is from the wall of the Regional Health Manager’s office in Lindi, where updated graphs on key indicators covers the wall, as seen in figure 11.



**Figure 11. Monitoring indicators in the Regional Medical Officer’s office**

An aids coordinator interviewed in one district uses the DHIS for “planning and capacity, to evaluate programs, to see the magnitude of disease”. He gets his data from the CHAI community volunteer who enters the data, he reviews the data, but “she is the one who compiles”. An acting District Medical Officer interviewed would like to be able to do data entry and exporting, but is new to the position and has not had any training. He gets his data from the CHAI community

volunteer, who is in the office next door. The CHAI office in Lindi uses data from the DHIS extensively in order to monitor the health program they are supporting in the region. (Their office is only meters from the Regional Medical Officer's office).

### **6.3.5 Support and supervision**

#### ***Supervision, feedback and support to the districts***

In Lindi there was already a focus on supervision procedures from the regional health management and down to the lower levels, which the regional management sees as crucial in order to get proper reports. The regional health management team had a structure in place called supportive supervision, which is performed quarterly, and which they had started with before the DHIS was implemented. The Ministry of Health and Social Welfare has provided them with training in this form of supervision. The concept of supportive supervision can best be described by what it is not; an inspection, and "like the police", as how it used to be was described by a regional health manager. It involves routines like notifying those you are supervising that you are coming, and providing support and on the job training, instead of purely reviewing performance. After the experience that nothing changed in the performance of lower levels after previous supervision visits, the Ministry of Health and Social Welfare came up with the concept of supportive supervision, the performance of which is monitored by the national level. As a regional program, coordinator puts it "at times people from the national level come, and see whether I am really taking care and visiting the districts. At the time there is no way out, that is why we have to go". Supervision is performed across programs, the Regional Aids Coordinator for example, does supervision across several programs, both within the HIV/AIDS area, and for other areas. According to a CHAI representative the reason why the supervision cuts across programs is because of basket funding from donors.

In one district, the District Medical Officer makes use of support from the region through calling them regarding policy issues, clarification of standards, and for correction of quarterly and annual reports, and says “that’s what they are experts on”.

A CHAI IT staff comes with the region when performing support, as some of them do not know the DHIS. A plan spoken of in the Lindi CHAI office is to train the regional IT responsible in the DHIS, so he can take over some of the tasks of the CHAI IT staff. The IT staff from CHAI also receives calls for support apart from this. A community volunteer sponsored by CHAI in one district says she calls this CHAI IT staff about once a month for questions regarding the DHIS. The regional CHAI manager in Lindi says about their support to the region and district offices that “ it is good that they know we are here”, referring to the computerized part of MTUHA, which collapsed when the support for it left, and also adds that they are supporting the region on “little things”. Another CHAI manager emphasizes that after having implemented the DHIS only one year ago (at the time, in December 2010), the region still needs support, and cannot just be left after installation and training.

### ***Supervision, feedback and support to health facilities***

The regional health management team also performs supervision to health facilities in their quarterly supportive supervision visits, and focus on those with low performance. A regional program coordinator suggests that supervision is necessary, and they also provide supervision to the facilities: "To be sure what we get in the database is good, we have to do supportive supervision, even before this software we had supportive supervision based on register reports. So if you don't have a mechanism to go to the facilities to support them you cannot get a proper report". An HMIS focal person in one district describes how regional staff comes with them to the facilities and provides them feedback afterwards; they mention the challenges, and afterwards provide them with a report with their findings and suggestions. In another district a CHAI volunteer both responsible for entering data and working in a facility, describes what happens in the region's supervision visits (together with district staff) to be checking the

data of the facilities. They check that what are in the reports is what is actually done in the health facility, checking with the facility registers, and also commenting on the positive. Supportive supervision is also supposed to take place from the districts separately, and is in the annual plans of the district. This supervision does not always take place, sometimes for reasons as simple as dirt roads being impossible to travel on due to the rainy season, another reason being the lack of training in performing the supervision. A District Medical Officer also mentions the lack of funds being a reason for the district not performing supervision to facilities, and that the supervision they do perform on their own is “not so organized”, with no checklists or reports brought. In another district the HMIS focal person thinks supervision visits are necessary and takes place when the monthly submission deadline has passed and no report has been received. The facilities in question are then called, and sometimes visited to find out what the problem is, and which could be the solution. If there is a queue of patients waiting and the supervisor is a clinician, they help with attending patients, and after that discuss data problems. A CHAI volunteer responsible for data entering the DHIS in one district provide feedback to health facilities when their data is wrong. She does not bring any printouts from the DHIS, but brings their paper reports, where she has already made corrections, and provides feedback based on that. As for transport, CHAI vehicles are used in this case. In the same district, the acting District Medical Officer says about supervising the health facilities that it is the districts’ responsibility, but nonetheless a tough job. In this district they plan to see all of the facilities, and also regards their visits as motivation for health facility staff: "It is a tough job, but we have our people there, we have our health workers, and also when they see you going there it is a motivation".

From the health facilities’ point of view, one health facility staff in charge of a dispensary says about feedback that it is “fair enough, they come, fill in the correct.” In another health facility they used to receive graphs from one of the district program coordinators, but now, as she is on maternity leave, they do not know where they will get this feedback. Nurses interviewed in this health facility

says that after receiving feedback, changes are made, that it makes them more confident and that they improve when they are showed how they are doing.

### **6.3.6 Shortage of staff and turnover**

Members of the regional health management team describe scarcity of staff as being one reason for low competence in DHIS use. There is a shortage of staff in the districts, where they are given no time to practice using the DHIS software, often because of pressing clinical duties, as described in the next section. In one district office the staff interviewed described a situation where some of their health facilities have a medical attendant in charge, who also fills all reports, which is a person who has one year of medical training. The HMIS focal person in the district describes shortage of skilled personnel as a big problem. In another district the District Medical Officer says that “people are moved and transferred, that’s a problem”, which is why he would like to have person who is likely to stay in the district trained in the DHIS software. In one district there is an acting District Medical Officer because the District Medical Officer has gone to school, and in another district, the person who was actively using the DHIS, a District Reproductive and Child Health Coordinator, is now on maternity leave and is replaced by a person acting in her position. In the latter district, they were two active users of the DHIS, when one, as mentioned, went on maternity leave, and the other went on a study leave, a local CHAI manager describes the situation in these terms: "Everything was abandoned, when the two of them left, nothing was happening there". The CHAI volunteers responsible for entering data in some districts were community volunteers given to the districts, their stipends were covered by CHAI, and they are on one-year contracts. Because the district had a need in data entering, some of these community volunteers were set to the task of entering data, in the lack of other district staff to do so. A local CHAI manager says that one of problems with getting staff to the region is that people do not want to come there, and views the region as a rural area.



### **6.3.7 Two roles/ time**

There are several regional and district staff that hold more than one position. A district staff can for example be both a practicing clinician, and an HMIS focal person responsible for data in the routine health information system. A regional team member says that because many are clinicians as well as responsible for the DHIS they do not have time to practice, “it is an issue for all”. He himself is a clinician and works 50/50 as clinician and program coordinator, with the responsibilities that entails. In one district the HMIS focal person is also a health inspector and works with environmental health and sanitation amongst other responsibilities, and works extra hours in order to fill reports. In one of the districts visited there was a person working only with entering data in the DHIS, this was a community volunteer sponsored by CHAI.

A local CHAI manager thinks there should be one person responsible only for data in each district, who is really responsible for the DHIS, and not program managers with a lot of other duties: “we cannot depend on these program coordinators, they have a lot of things to do, meetings, clinical duties, travel a lot, they don’t have time to work on those computers”. A District Medical Officer in one district says about a program coordinator within reproductive and child health and the District Nursing Officer were trained in his district that they are “busy people who are not very interested in computers”.

### **6.3.8 Technical issues**

Both at regional and district levels computer viruses are a problem, and one of the most common reasons for the IT staff from CHAI to receive calls for. This can lead to data loss, as some of the district staff mention that they have not received training in how to do backup, and have to call the IT support person from CHAI in order to do the backup.

In one case the printer is located in the adjacent building of where the computer with DHIS installed is. In one of the districts there is no computer in the office

where the District Medical Office sits, there is a computer next door that does not have the DHIS software installed, and is there for “administrative use”. In this case the district office is separated between two different locations, and the computer with the DHIS installed is in the other part of the office. Another issue mentioned at both regional and district level is that it would be useful to have the DHIS software installed on more computers. It is most common that it is installed on one computer, and that many people need to use this computer, so to get the computer free is not easy. This leaves little time to practice the tools in the DHIS software. It is a problem also mentioned by regional health managers interviewed, they have had the DHIS installed on several computers, and thinks the same could be an idea for the districts to do.

Another technical issue mentioned in Lindi was the loss of electricity. During the visit to on e district a generator had to be found and used in order to get power for the computer to run and demonstrate the use of DHIS. A local CHAI staff as a reason to why some districts still report paper based mentions problems of electricity. When the power is out they cannot work with the DHIS, and the eight hours of electricity they have is used for performing clinical duties.

### **6.3.9 Not everything is in the system**

Staff at both regional and district level comment on some things not being in the DHIS software, and see this as a challenge. They would like to have the DHIS include data from more of the programs they work with, and have all data needed in order to produce reports to be in the same software. A District Medical Officer recently returned from a study leave, has several arguments for the inclusion of all data in one, centralized system. In his district the DHIS is only used by a CHAI volunteer entering data for the program CHAI supports, as those who were trained do not use it. He sees the need for a centralized system because of what he describes as an ad hoc nature of the current reporting system, “we deal with so many requirements on an ad hoc basis, there is no system, apart from the DHIS that is now coming”. He mentions examples like the Regional Medical Officer asking for a report, then, from the same office, the

Regional Health Secretary asks for the same report, but needs it from the district, making the district do “a very unnecessary job”. The loss of data is another reason for why he would like to have data available in a centralized system; “we send the report (to the regional level) once, then they lose it and need it again, we keep a copy, but sometimes that is misplaced also, so we have to make a new report. It consumes a lot of time.”

An expectation a local CHAI staff had before starting the implementation of the DHIS was to have all data in one place. She describes how district offices receives computers with different software installed, where there might also be differences in which operating system is installed, and thinks everything should be gathered in one comprehensive system, instead of having various software on various computers placed in the districts.

### **6.3.10 Budget**

The regional health management sees it as a key issue to have room for the DHIS in the district budget, to put it in the Council Comprehensive Health Plan (CCHP), as well as the “strengthening of the health management information system (HMIS) and monitoring and evaluation (M&E)”. The local CHAI manager is encouraging this as well, participating in planning meetings with the districts to oversee it. CHAI has given the districts modems, and every quarter gives them 90 000 Tanzanian Shilling (about 120 EUR annually), this is one of the things CHAI encourages to enter in the district budget.

In the districts those asked about DHIS being in the budget answer that there is currently no budget post for the DHIS. That which is needed for printing reports; paper and printer cartridges, comes from the stationary budget. One community volunteer says that it is in the plans for 2011 to make a budget for the DHIS. One District Medical Officer says that the district has stationary in the budget, has some computers from different programs as well as printers, so there are “not so many resources needed from our side – just innovation and commitment”.

### **6.3.11 Health facility reporting**

Reports from the health facilities are often received late in the districts and are often incomplete. A District Medical Officer says they sometimes have to go to the facilities and assist them in filling them, as is mentioned in the supervision section. The shortage of skilled staff in the health facilities is a problem mentioned by several of the interviewees, and often seen as the cause for poor performance in reporting. A medical attendant having one year of medical training might have problems in filling reports, or has too many reports to fill and leaving some of them incomplete. An HMIS focal person says about incomplete reports from these unskilled staff that "It is a headache when you see a report when there are left blanks". He then has to go to there, explain how to fill the report, and do on the job training. After having gone to the health facilities and explained, he has noted improvements. Another issue mentioned is that most reporting forms are in English, and most health workers are not fluent in English (register books are mainly in Kiswahili). An acting District Medical Officer describes reporting to happen the way that facilities hands over their reports to the program coordinators, if she needs data she has to go to them.

Sometimes the case is that the health facility staff have done the job, but reported it incorrectly, a regional program coordinator explains: "for example when they have reached more than target, because someone from outside their catchment population came to the facility". The Regional Medical Officer emphasizes the need for health facility staff to know what they are collecting and why: "we have to make sure they know what they are collecting and why, if not chances of doing the right job is minimal". He describes the situation of reporting for the health facilities saying that: "the facility is supposed to do everything", they would like to reduce this paperwork. He says about reporting that it: "tells us we have done our job at the health facilities [...] the primary task for us is quality of care, all this other business is just to support us". He points out that there are too many indicators, and worries that there has been a shift where more reports are now required on a monthly basis by the Ministry of Health and Social Welfare, which used to be required quarterly. With no reduction in

indicators, it utterly increases the workload of the health facility staff. The same regional health manager recommends that there should be more demands for donors and partners. About how it came to the current amount of indicators, he mentions how the donors are required to show results for what they have done: “When they write their proposal they say we will do this and this, so they need these indicators so that they can go back to the ones that gave them money and say look – we did this. This is the result.”

In some cases the health facilities do not have the register books they need for reporting, and that these books recently had not been received from the Ministry of Health as usual. In these cases they write on paper, or use the old books. A problem mentioned with the registers and summary forms are the forms needing change, like replacing drugs that are not in use anymore.

### **6.3.12View on report filling from health facilities**

A whole day is spent on reporting for only the Prevention of Mother to Child Transmission report in one of the facilities visited. To fill all the reports takes them two days, as it is done after hours. An example of a page from a register book used as basis for filling summary forms is shown in the picture below, this one is one of the few register books in English:

**PMTCT ANC Register**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Date Started ANC (dd/mm/yy)	ANC Card No. (act/ facility code if referred)	Gestation Age (in wks)	Known HIV status	Date of Pre-test counselling (dd/mm/yy)	Date of test	HIV Test results	Date of Post-test counselling (dd/mm/yy)	Date of Partner Test at ANC (dd/mm/yy)	HIV Test Result of Partner at ANC
<input checked="" type="checkbox"/> Tick if same as date as start ANC (col. 1)									
06/11/08	041/08	28	P N U	✓	✓	P (N) U	✓		P N U
06/11/08	035/08	8	P N U	✓	✓	P (N) U	✓		P N U
14/11/08	009/08	32	P (N) U	✓	✓	P (N) U	✓		P N U
17/11/08	058/08	28	P N U	✓	✓	P (N) U	✓		P N U
17/11/08	059/08	20	P N U	✓	✓	P (N) U	✓		P N U
17/11/08	060/08	18	P N U	✓	✓	P (N) U	✓	17/11/08	P (N) U
18/11/08	061/08	16	P N U	✓	✓	P (N) U	✓		P N U
18/11/08	051/08	24	P N U	✓	✓	P (N) U	✓		P N U
18/11/08	062/08	16	P N U	✓	✓	P (N) U	✓		P N U
18/11/08	061/08	30	P N U	✓	✓	P (N) U	✓		P N U

**Figure 12. An example of a health facility register book, the basis for summary forms**

Some on the job training on health facilities has been performed by CHAI on account of their support of the specific health program Prevention of Mother to Child Transmission, after this, the register and summary forms for this program are not considered a problem anymore by nurses interviewed in one health facility. What they also would like training in is filling the report for vaccination, due to its complicated calculations (a picture of vaccination report is found a few paragraphs below, in figure 13).

To fill the different summary forms, that are to be submitted to the districts, the facility workers use various registers. Sometimes they fill the reports together, this depends on the time available. The medical staff in charge at this facility says there are a few things missing in the summary forms, and that she sometimes has to add columns. She also notes that there is some duplication in the registers. In this health facility they use their own reports to see progress, how many they are serving, and e. g how many are tested positive for HIV to see how many in the community that are infected.

In another health facility visited in Lindi they used the same amount of time to fill the reports (summary forms). It took the nurses there two days to finish everything, about three hours were used after work those two days, and three persons were working on it. The report they thought was the most difficult one to fill was the vaccination report, because of the calculations it requires, and they would like this report to be changed. The figure below shows a vaccination report that has been filled, and indicates that they have to perform at least 11 calculations:

**TAARIFA ZA CHANJO KATIKA NGAZI YA MITUO**

1. Utambulisho: Mwezi 2010 Mwaka 2010  
 Jina la kituo WCSA Wilaya Lindi Lengo la Watoto 30 WCSA 30 Mama Wajawazito 30

2. Ufuatiliaji wa Magonjwa  
 2.1 Wagonjwa waliojitokeza mwezi huu  
 2.2 Jumla ya wagonjwa (tangu Januari mosi mwaka huu)  
 2.3 Vifo vilivyotokea kwa mwezi huu  
 2.4 Jumla ya vifo (tangu Januari mosi mwaka huu)  
 2.5 Tafadhali andika idadi ya wagonjwa waliotolewa taarifa Wilayani kwa Mwezi huu

Surua	Pepopunda wachanga	Ulemavu wa Ghaffa
0	0	0
0	0	0
0	0	0

Wagonjwa wa surua 0 Ulemavu wa ghaffa 0 Pepopunda-Wachanga 0

3. Kiwango cha Uchanjaji  
 Lengo kwa mwezi  
 Umri Miezi 0-11 30 Akina mama Wajawazito 30  
 Lengo kwa miezi yote ya nyuma  
 Umri miezi 0-11 30 Akina mama Wajawazito 30

3.1 Idadi ya watoto waliochanjwa kwa mwezi huu  
 DPTH 1 % DPT HB 2 % DPTH 3 % TTI % TTD %  
20 100 25 83 30 100 29 97 78 260

3.2 Jumla ya watoto wote waliochanjwa tangu mwezi Januari mwaka huu  
 BCG % SURUA % OPV 0 % OPV 1 % OPV 2 % OPV 3 %  
241 246 107 15 50 30 100 25 83 30 100

3.3 Idadi ya watoto waliochanjwa kwa mwezi huu  
 DPT HB 1/DPT HB 3 BCG/SURUA

3.4 Jumla ya watoto wote waliochanjwa tangu mwezi Januari mwaka huu  
 DPT HB 1/DPT HB 3 BCG/SURUA

3.5 Kiwango cha kuasi chanzo  
 DPT HB 1/DPT HB 3 BCG/SURUA

3.6 Ufanisi wa chanzo katika kituo kwa mwezi huu  
 50 < DPT HB3 > 79% DPT HB3 > 79%

4. Dawa za chanzo, Uchanjaji na vitamini A

Dawa	KWA CHANJO ZA KAWAIDA TU		Watoto/Akina mama waliochanjwa		Hali ya dawa za chanzo kitooni	
	Jumla ya dozi walizopewa wa watoto mwezi huu	Jumla ya dozi walizopewa (tangu mwezi Jani mosi)	Jumla ya dozi zilizotokea mwezi huu	Jumla ya dozi zilizotokea mwezi huu	Kiasi cha dozi zilizobaki mwishoni mwa mwezi	Kiasi cha dozi zilizobaki mwishoni mwa mwezi
BCG	30	221	21	180		
OPV	100	857	100	800		
DPT HB	85	667	85	57		
SURUA	22	246	22	20		
Pepopunda ya wachanga	107	755	107	780		

Figure 13. Example of summary form for vaccination/ immunization

The nurses interviewed at this facility says that many things are filled in several times, in many summary forms, and that the District Medical Officer knew about this, but that it had not been changed. Complicated Kiswahili was a problem mentioned for filling another report; “it should be easier, in a simpler form, so everyone can understand it and fill it”. Comparative data is something they thought would be useful to have, so that they and other health facilities could

compete between themselves. Both comparative data, overtime payment, and a higher salary is something they would find motivating.

### **6.3.13 Summary of the findings from Lindi**

In Lindi the regional health management, represented by the Regional Medical Officer specifically asked for the implementation of the DHIS software in the region. After having seen presentations of data through the DHIS by their neighboring region, Mtwara, they also wanted to have the system. They approached CHAI, who were also present in this region supporting a specific health program; Prevention of Mother to Child Transmission. Due to their mutual interest in data from the region, CHAI also supported the implementation of the DHIS in Lindi region, which started in February 2010. They provided computers and modems, hired expertise from the University of Dar es Salaam to perform the initial training, and had a CHAI staff from Mtwara perform a second DHIS training in August the same year. The facilitation of the first training was covered by the regional health management's own funds. An issue mentioned concerning training was the lack of computer literacy among those who were trained in the use of the DHIS, a regional CHAI manager recommended that computer literacy should be held beforehand. Findings from Lindi also showed that the DHIS was not in use in some districts due to lack of electricity, and in some cases it was used only by volunteers sponsored by CHAI, as the district staff that had been trained in DHIS use did not use it, but had gone back to paper reports from the data included in the DHIS. Problems of electricity were mentioned as one reason why some districts still reported paper based. Technical issues such as computers being infected by viruses were also a problem. The health program supported by CHAI in the region has top submission rates in the DHIS, and is also subject to particular follow-up from the CHAI office. A concern mentioned in Lindi was the dependency on a few persons that the scarce computer literacy led to, and how this left the implementation vulnerable, as people are moved and transferred. As in Mtwara, the need for practice is also mentioned in Lindi. CHAI staff is assisting and playing a large role in DHIS use. As a consequence to this at the regional level, the regional health



management team was planning a third DHIS training, for its team. In Lindi, members of the regional health management team specifically mentioned the importance of supervision to districts and health facilities. A focus on this supervision was there from before the DHIS was introduced. Shortage of staff is an issue mentioned also in Lindi, and many have two roles, both district and regional staff. In some cases the person responsible for entering data in the DHIS were also clinicians. There was expressed concern that they did not have time to work with the DHIS because of their clinical duties. Shortage of staff and adequate skills at the health facility level was another issue mentioned. Reports did not always arrive from the facilities, and often they were incomplete, and require follow up and visits. On the part of the health facility staff interviewed, they would like training in filling some of the forms (or reports) they considered to be particularly challenging that they have to fill, and that supervision in the past has led to improvements in their report filling. The report filling was, as in Mtwara, mainly performed after hours, which the health facility staff was not paid for.

## **6.4 Differences between Mtwara and Lindi**

The main differences between the findings from Mtwara and Lindi lie in the project's initiation, presence of District Medical Officers in training, as well as the Regional Medical Officer, and the level of initiative that could be traced in the regional health management. In the case of Mtwara, as described, the initial discussions and the decision to implement the DHIS took place between CHAI and the Ministry of Health and Social Welfare. In Lindi, the regional health management was exposed to data that had been entered and presented using the DHIS in Mtwara (mainly performed by a local CHAI staff there). Seeing the results of use of the software, they wanted to have this tool themselves. CHAI was approached in order to assist in the process, resources to be able to facilitate a training in the DHIS was gathered within the regional health management themselves. CHAI got the expertise from University of Dar es Salaam to perform the first training, and provided computers and made support staff available, and facilitated the second, refresher training as in Mtwara.

The regional health management in Lindi aired several initiatives during interviews. Another training in the DHIS for the regional health management was under planning in December 2010, the rationale being that “we are supposed to know it, we should be able to answer questions”. Other initiatives were to have an arrangement where the health facility staff comes to the district office once per quarter to have a meeting with discussion on their data. The Regional Medical Officer sees it as “very crucial, that they can help increase the awareness of information, the use and also the quality of data”. This is something that will be discussed in a meeting with CHAI that was to be coming up soon in Lindi, and was something the regional health management team in Lindi had asked for themselves. The presence of the Regional Medical Officer in the Lindi training was commented on by one of the trainers as out of the ordinary. He came sharp and stayed, which meant that everyone else stayed too. The general tendency described by a trainer and implementer from the University of Dar es Salaam is that bosses come and go in trainings as they have meetings elsewhere and so on. In the case of the Lindi training the trainer from the University of Dar es Salaam saw a difference from the training sessions in Mtwara, regarding attendance. In the Lindi training the District Medical Officers were also trained, which was not the case in Mtwara.

Due to what is described as strong leadership, a top CHAI manager finds it easier to work with the regional team in Lindi; “the team is always under the strict leadership of the Regional Medical Officer”. The same CHAI manager describes the regional team in Mtwara as “a bit broken”. He mentions reasons like the previous Regional Medical Officer being moved, and having one year without someone in this position, there was an acting Regional Medical Officer.

## **7 Analysis and discussion**

The idea behind entering into a project, collecting data, and studying theories and results of other studies is to engage in an ongoing process to find what works, what does not, and why, in order to refine theories and create even better practice. In this chapter theories and practice come together in order to analyze and discuss data, and find the points worth bringing back to the field. These points will be summarized in chapter 8.

In the following chapter I will use the ITPOSMO model in order to make an assessment of which gaps were found between the design conceptions of the DHIS and realities in Lindi and Mtwara. I will look at what has already been done in order to reduce gaps along the seven dimensions, to see which gaps are still open. I will describe what explanations viewing health information systems as social systems can provide for certain aspects of the process. And then how viewing the project through a conflict perspective can provide both explanations for the current situation, and suggest approaches for this and similar processes in the future.

### **7.1 Assessing the gap between design conceptions and realities in Mtwara and Lindi**

The health information system needs to be adapted to the environment in which it is to be implemented and used. This adaptation is not purely between and within technical factors, but also including social and organizational factors. According to Heeks (2002) success and failure depends on the amount of change between the current situation and “where the design wants to get us”. The amount of change, or the gap between the design conceptions of the health information system and the realities where the system is to be implemented, will in this section be assessed based on my findings using the ITPOSMO model. The fact that the DHIS is a free and open source software, open for customization,

means that its design is partially up to the stakeholders involved in the process of customization and implementation. In the case of the implementation of the DHIS in Mtwara and Lindi, the stakeholders involved in this process were CHAI, University of Dar es Salaam and the Ministry of Health and Social Welfare. In the following analysis I will use the ITPOSMO model's seven dimensions to describe the design conceptions of the DHIS and the realities of the organization where the software has been implemented.

At the time of my fieldwork it was approximately 15 and 11 months since the DHIS had been implemented in respectively Mtwara and Lindi. This means that actions to reduce gaps had already been taken along the seven dimensions. What is referred to in this analysis as current realities in Mtwara and Lindi is then what were the realities approximately one year after implementation, and include actions that have been taken to reduce them. I will on each dimension describe the gaps that still exist according to my findings.

### **7.1.1 Information**

*(The formal information held by the digital system and the informal information used by the people involved with the system)*

#### ***Design conceptions:***

The software is as described in section 4.2.1 a tool for collecting, validating, analyzing and presenting of aggregate statistical data. It is meant to provide a basis for decision-making, supporting local action. In order to perform any of the latter functions, information must reach those who are to enter it in the software, and it must be entered in the software.

CHAI was interested in getting data to monitor the health program they were supporting in Mtwara, and according to one of the top CHAI managers to “revive the availability of data”. Through the DHIS more information can be gathered in one place. As much of the information (datasets) that was currently available was included in the DHIS.

### ***Realities in Mtwara and Lindi:***

There were several challenges already existing regarding information in the health sector in Lindi and Mtwara. The data that decisions are to be based on are in many cases not arriving on time from the health facilities. When it does arrive it often needs to be followed up and corrected due to incompleteness and incorrectness. Data is not always entered in the DHIS and received in electronic form at the regional level. My findings indicate several reasons for this, which I will get back to on the other dimensions. In Lindi the data from the health program specifically supported by CHAI had top submission rates. In this case the data is subject to particular supervision in the form of calls and visits in order to reduce gaps between conceptions of having data available in the DHIS, and the reality of data not always arriving in time nor being complete.

Information has to be gathered from many sources in order to create reports; this was the case at both regional and district level. Some of the information required by districts and regions in order to report upwards is still outside the DHIS. Several of the interviewees mentioned that they would like to have all data needed to meet their reporting requirements in the DHIS, especially due to time limitations and shortage of staff. One District Medical Officer in Mtwara expressed what he thought should be done about it:

*"[...] at least broaden it so as to include anything necessary for the district to produce the reports. You know, even the MTUHA does not comprise of everything that is needed in the report. So the software, slowly, slowly it has to incorporate other reports so as to have something that is a bit comprehensive, enough for the council (district) to produce any report that is needed"*

The fact that as much data as possible was included in the DHIS, not only adding the data for the programs CHAI were supporting, reduces the gap between the conception of data being gathered in one place, and the reality of data being held by many sources and mainly being accessible on paper.

Information in reports created from the DHIS is not necessarily tailored for managerial needs, as was stated in the report from Lindi and Mtwara found in appendix 3. Although the DHIS has possibilities to present data in different ways, such as histograms, pie charts and so on, these options were described mainly as not being used, apart from in the CHAI offices.

***Information gaps:***

While the general fragmentation in the Tanzanian health information system and duplication in data collection are issues that are not dealt with, more information is gathered in one place with the DHIS.

Due to several reasons, not all information that is supposed to be entered is actually entered in the system. The data for the programs supported by CHAI are always submitted electronically (facility reports are entered by district staff in the DHIS, district reports are generated through the software and exported via memory sticks or by e-mail) and is available in the DHIS (in a few cases reports for the programs CHAI support are received in paper forms due to electricity problems). Because the health program CHAI supports is being followed up with telephone calls and visits, these programs have top submission rates, meaning that information is held by the DHIS. For most of the other health programs included in the DHIS, reporting is still problematic, and the same measures not applied, meaning that the information in the DHIS becomes incomplete and of low quality as well. This presents a gap along the information dimension; there is still an amount of change needed to reduce it.

To summarize; there is a considerable gap along the information dimension, not only because information supposed to be entered is not always entered in the system, the information realities the district and regional staff in Lindi and Mtwara have to relate to are more extensive than what is included in the DHIS.

### **7.1.2 Technology**

*(Mainly focuses on digital IT, but can also cover other information-handling technologies such as paper or analogue telephones)*

#### ***Design conceptions:***

The DHIS software requires computerization down to the district level, and it requires customization and installation. Computers also require electrical power in order to run. The software can be run both on- and offline.

Another design conception is the presence of paper tools for data collection, so that data can be provided and entered into the software.

#### ***Realities in Mtwara and Lindi:***

At district level there were not many computers available. CHAI gave computers to regional and district level, and hired expertise from the University of Dar es Salaam to do the customization and installation. Internet access was covered by CHAI through providing modems, and vouchers (credit) for using the devices. Several of the district staff interviewed that were responsible for entering data did not always have access to the computers. They are also used for other tasks, and in most cases the district HMIS focal person does not have a computer. This was mostly mentioned as a problem related to not getting to practice what they had learned in the DHIS trainings. Some districts still did not have a printer, which meant they could not print reports or graphs from the DHIS.

The technical solution recommended by the University of Dar es Salaam and the University of Oslo is to have the DHIS database installed on a server computer running Ubuntu Linux as the operating system. In Lindi and Mtwara the DHIS database is installed on computers running Windows as the operating system, which are vulnerable to viruses. Viruses are common, and often cause loss of data. CHAI IT staff in both regions describe telephone calls from districts because of viruses to come often.

Electrical power in order to keep the computers running was a scarcity several places in Lindi and Mtwara, this was especially mentioned in Lindi. Generator use could be limited to eight hours, during which clinical work was prioritized.

At health facility level the design of the summary forms (paper tools) was one of the causes for incorrect and incomplete filling, the amount of forms also being mentioned as a problematic issue. The forms are written in English, in some cases complicated Swahili, while some forms also contain complicated calculations. The blank MTUHA forms that are to be filled by health facility staff have in some cases not been received from the Ministry of Health and Social Welfare, and were out of stock at some health facilities.

***Technology gaps:***

Providing the district with computers reduced the gap along the technology dimension. Computers were provided, these were not always available for the district staff responsible for entering data, and seem to generally not be available for practicing the use of the DHIS. In order to deal with the technical issue of viruses, CHAI IT staff was made available to handle it. The issue of electrical power, making computer use complicated at times, is not addressed by CHAI. This means that there is still an amount of change needed along the technology dimension, representing a gap here.

There are no changes done to the numerous paper tools of the existing and fragmented information system, one of the reasons described why data in general is of poor quality. What the DHIS as a technical tool is able to do, cannot be fully taken advantage of, partly because of the realities of problematic paper tools.



### 7.1.3 Processes

*(The activities undertaken by the relevant stakeholders for whom the information system operates, both information-related processes and broader business processes)*

#### ***Design conceptions:***

The DHIS automates the compilation process. This aggregation is done on the basis of data, and as mentioned in the information dimension, this data needs to be entered into the system. The information of a routine health information system is based on data from health facilities, which is the point where care is provided and patients meet the health system. This means that in order for the DHIS to be useful, data needs to be collected at health facility level, and reported upwards.

#### ***Realities in Mtwara and Lindi:***

At both regional and district levels work processes related to the health information system is monitoring the health situation in the region/ district, to gather reports from lower levels, compile them and report to higher levels. With the health reforms described in chapter 4, the decentralization it included gave the districts responsibility for service provision. The districts also have to produce an annual plan based on information from their health facilities. There are various vertical health programs, which have coordinators on both national, regional and district level, as described in the literature review in section 2.2.1 on fragmentation.

The aggregation process was previously done manually and was a time consuming process. A regional health manager in Mtwara described the paperwork and the time it consumed as:

*“all the time, because there was no system for data or collection or storing, so you just depend on the paperwork [...] all hours just working with paper”*

For those interviewed using the DHIS they did not find it difficult to enter data in the DHIS, nor exporting. The time saving aspect of the DHIS when it came to reporting was mentioned by several of the interviewed. As mentioned in section 6.3.4 an HMIS focal person said to now use 2 minutes on processing one report from a health facility, which used to take 30 minutes. When having 50 health facilities to compile reports from, this presents a substantial reduction of time spent on compiling reports. Still, far from all data in the regions are entered in the DHIS. One reason indicated by my findings is district staff having two roles. Of the regional staff interviewed several have two roles, which means they perform activities for two health programs, or they might be both health program coordinators and clinicians, meaning that they have clinical duties as well as activities such as reporting. An HMIS focal person who was also clinician expresses his situation like this in section 6.2.8:

*“I am supposed to work at the OPD (outpatient department), also I am supposed to work with the DHIS [...] we have found that the DHIS, it needs more time”.*

Regional health managers in both regions acknowledge the situation of the staff dealing with data at the district level, and also at facility level. In many cases reporting was described to take place after hours and not being paid for. Although stating that they have too little time to work with data, a regional health manager in Mtwara suggests that for the DHIS to be useful, it requires that:

*“there’s commitment for those who are involved in the health and in the DHIS [...] at all levels, because at the health facility level someone needs to fill the data, later send the report to the district, and there’s a time limit for exporting the data form the district to the regional level, and even from the regional level there is a time to send to national level. So, to make these time limits, commitment is needed”*

and specifies that:

*“when I say commitment it is when someone uses his own time to make these things complete”*

Problems are also described of both reports arriving from the health facilities in time, and the completeness and correctness of the reports that do arrive. The main task or work process for health sector staff is the provision of health services. One regional health manager put it:

*“Reporting tells us we have done our job at the facilities, the primary task is quality of care, all this other business is just to support us”.*

The activities of health facility workers form the basis of any health information system in the country, seeing that it is where the data comes from. Health facility activities consist of providing health services for their catchment area, and reporting on these activities as well as inventory. A health facility can be a dispensary or health center with down to three health staff, it can also be a hospital. During their health facility staff's contact with patients they fill information in registers, and monthly or quarterly fill summary forms based on data from various registers. These summary forms are submitted to district level. Reports are filled after hours and in weekends for health facility workers as well, and they are not paid for these extra hours either. In order to submit the reports, personal or public transportation is used. The money spent on this was not in all cases reimbursed to the health facility staff. A clinical officer in charge of a dispensary, saying that she feels that she is sending data into a “black box”, can illustrate experiences regarding submitting reports. The data sent from the health facilities is not returned in analyzed form. The effect of supervision visits depends on who are performing supervision that day, and if they can help with specific problems.

***Processes gap:***

The collation process at district and regional level is automated with the DHIS software. At district level most of the interviewed mentioned that the DHIS saved them time, as the data collation into reports used to be a time-consuming and tiresome process. Although the software contains functions for validating data, much of this validation is still done on the paper forms coming from the facilities.

Following up and checking the data still needs to be done, and is one of the activities that takes a lot of time. If reports from the facilities do not arrive, the DHIS software in itself cannot help the situation much, apart from presenting the fact that data has not been received in the presentation of submission rates. Although time is saved when entering data and collating, a computer is now needed in order to do this job, and a computer is not always available. Several district staff mentioned that if they had had more time to practice, they would be able to use more of the functions of the DHIS.

Information is still needed from several sources in order to create reports, and other information systems are still in use. The district staff would like to have all information needed in order to create a report in one system. They still have to enter data in other systems, mostly paper based. That has not changed with the DHIS. Work that has previously been manual is now automated, but due to the nature of the district and health facility staff's activities, much of the data is still not entered in the system. This represents a change needed on the processes dimensions in order to get reality to where the design of the DHIS wants to get it, and means there is still a gap along the processes dimension.

#### **7.1.4 Objectives and values**

*(Often the most important dimension since the objectives component covers issues of self-interest and organizational politics, can even be seen to incorporate formal organizational strategies; the values components is not covered in this thesis)*

##### ***Design conceptions:***

The goals of HISP, who is the network behind the development of the DHIS states goals with the DHIS to be:

*"[...] to support health workers and managers at all administrative levels through a balance between flexibility and standardization, and with a strong emphasis on using information for local action." (www.hisp.org)*

CHAI's objectives with introducing the DHIS were varied. One goal was to get data for the health program they supported in Mtwara, in the HIV/AIDS area, and later also for the program they supported in Lindi. Doing so, the organization did not wish to "reinvent the wheel", and as they had some experience with the DHIS from before, they asked permission to introduce it in Lindi and Mtwara. Other goals were to revive the availability of data, and build a culture for feedback. The central CHAI management also has a long-term goal of wanting the summary reports to be based on a few comprehensive registers and forms that do not make the "health workers jump around from register to register".

Another one of CHAI's goals is to have data entered regularly and timely, data utilized as a routine. They would also like to be able to recommend the DHIS to others, and in order to do so the quality of the data in the DHIS must be good. The central CHAI management sees a long-term goal to be eliminating the parallel systems working in the country.

The trainer and implementer from the University of Dar es Salaam interviewed, also a HISP-member, added that the DHIS created awareness and a forum for discussion on what data is collected and what tools are used

### ***Realities in Mtwara and Lindi:***

The reality of the health sector environment in Tanzania is that many actors are involved, each with their own set of objectives. There are the vertical health programs with their own coordinators at the different levels, which might have their own data collection tools and reporting systems. There are donor organizations supporting various areas across health programs, or supporting a specific health program. There are regional and district managers trying to keep track of what is happening in their regions/ districts, there is staff at all levels trying to fulfill the demands of their respective positions. There is the Ministry of Health and Social Welfare trying to keep track of the health situation in the whole country, as well as providing health care for all of its citizens, and coordinating the various efforts in the health sector. The Ministry of Health and Social Welfare relates to data coming from many sources. So far, only 3 of the 21

regions in Tanzania Mainland are using the DHIS. It is still possible to print the old version of how the reports sent to the Ministry used to look. A problem mentioned by the top CHAI management is that some of the staff in the regions still see data as “data for CHAI”, as they were the ones who implemented it.

In Lindi, different from Mtwara, the regional management asked to have the DHIS implemented themselves, and gathered funds in order to have it, as well as approaching CHAI for assistance. In the Lindi regional management, those interviewed expressed own objectives related to the DHIS, for example the need for all of them to know it. Acknowledging that they did not know it well enough, and that they should be able to answer questions when district staff asks, a third training for the regional health management team was being planned.

***Objectives gap:***

Seeing that the DHIS is an “open box”, as it was described by a HISP member, and being a software that can be customized and adapted, its design conceptions mainly spring out of the goals and objectives of the main stakeholders in the process of acquisition and implementation. CHAI has had strong interests in the implementation of the DHIS software, and have obvious interests in the DHIS functioning well. Since CHAI were the ones that introduced the DHIS in Mtwara and partially Lindi, a problem mentioned is that people in the regions see the data as “data for CHAI”. A central CHAI manager sees the roles of CHAI and the University of Dar es Salaam to be transient. CHAI will not be present forever, and is planning to not be responsible for the DHIS in the nearest future, but will use the information the system contains. In Mtwara those whom the DHIS will be left to, did not ask for it in the first place. In Lindi the DHIS will be left with a regional health team that asked to have the system themselves, spent own resources on it, and is planning more training supported by own means.

In all answers regarding the objectives of the health workers at district level, what has been mentioned are the time factors and availability of data in order to meet reporting requirements, not objectives regarding the use of information.

The whole system seems to be geared towards reporting upwards, the implementation of the DHIS does not immediately change this fact. Data collection tools are not changed, and there are no changes to the health facility level, where the data originates.

The Ministry of Health and Social Welfare has accepted the introduction of a health information system that does not necessarily have to interfere with the reporting routines at their level, they still do not require data to be arriving through the DHIS, and the vertical health programs still get their data through their own reporting systems.

The goal of CHAI having data entered as regularly and timely still represents a gap when looking at realities in Lindi and Mtwara. In order to make design conceptions along the objectives dimension meet the realities of objectives in the health sector in Lindi and Mtwara, there is still an amount of change required, representing a gap on this dimension.

### **7.1.5 Staffing and skills**

*(Covers the number of staff involved with the information system, and the competencies of those staff and other users)*

#### ***Design conceptions:***

First of all, skills in customizing and installing are needed to get the software and hardware in place. The DHIS software requires a basic understanding of computers, as well as skills in how to use the specific software. In order to make full use of the system, skills in analysis of data is required, and communicating it to others. To have one person responsible for the health information system, not doing anything else is recommended by CHAI, the University of Dar es Salaam, and the University of Oslo.

Other staff involved in the information system are those who collect the data that is to be entered, and those who perform the services the software is to provide data on.

A certain amount of IT support is required in order to handle problems with both hardware and software.

***Realities in Lindi and Mtwara:***

CHAI hired expertise from the HISP network at the University of Dar es Salaam for the initial training in both regions, and had own staff trained as well. The CHAI member of staff that was trained had also been sent to various pilot sites to learn about the DHIS, held a second training session in both regions, and performed on the job training. In this way CHAI gained expertise within the organization, which was present locally where the software is used.

There is no formal ICT training for health sector staff, some have had training prior to starting in their positions, some have attended training in different software installed by development partners. For the initial training, ½ day was spent on establishing computer literacy. Several of the interviewed mentioned that the level of computer literacy was a problem. A regional CHAI manager recommended after the experiences they had had in Lindi, that a course in computer literacy should be held before training in how to use the software.

To participate in the training two-three persons from each district were selected, in order to be sure that at least one would be active. The DHIS trainer interviewed spoke of this as being a “matter of chances”. It turned out that in several districts the use of the DHIS had been left to community volunteers sponsored by CHAI, and none of those who had been trained used the DHIS. In most cases those who had attended the trainings in the regions and were using the DHIS had gained a sufficient level of skills in entering data during the training. There were few traces of use of the DHIS in the districts for presenting their data in other ways than the compiled reports mimicking the regular paper reports that were to be reported on upwards. Because of the acknowledgement



that there is not much computer expertise in the district offices, CHAI wanted the forms to be like they are in the field. The way a report looks on the computer screen mimics the way it looks as a paper report, which the health staff is used too.

Volunteers from the CHAI office were assigned to do support for the DHIS. These volunteers were on one-year contracts. This staff was providing both technical support, and follow up and supervision of the health programs supported in each region. Their one-year contracts will eventually expire. A plan mentioned by local CHAI staff is to provide training in the DHIS to the person responsible for IT in the region.

The staffing and skills situation makes the use of the DHIS vulnerable to one person leaving. A regional CHAI manager in Lindi describes the situation in one district in 6.3.6, where there was a district having two staff actively using the DHIS. They both left, one due to a maternity leave, the other due to a study leave, and when they left the regional manager describes the situation as:

*“everything was abandoned, when the two of them left, nothing was happening there”*

A community volunteer sponsored by CHAI is now responsible for entering data in the district. When computer literacy is limited, it creates a dependency on the few persons that are computer literate, leaving the continued use of the DHIS. The CHAI management are discussing with the health administration the possibility of having some of these volunteers hired by the district after their one-year contracts expires.

Overall there is a severe shortage of staff both at regional, district and health facility in all of Tanzania. This is even more so the case in the two regions Lindi and Mtwara, as was described in chapter 4. In both regional and district level staff often have two roles, being coordinator for two programs, or being both clinician and program coordinator, as was mentioned in the previous dimension. A District Nursing Officer and HMIS focal person in a Mtwara district put it:

*“There are few nurses, I cannot be specific for the DHIS”*

In the health facilities there is a shortage of skilled staff, where in some cases a health worker with only one year of training might be in charge of a dispensary, and also for the reporting from that dispensary. This was mentioned at both regional and district level to be a reason why data was not arriving, and thus could not be entered in the DHIS, or arrived, but required follow up and visits to the health facilities the reports came from.

***Staffing and skills gap:***

To have one person responsible for the health information system, not doing anything else is recommended by CHAI, the University of Dar es Salaam, and the University of Oslo. This job is currently done by staff that also has clinical duties, or at the same time is the coordinator for another health program. In some cases the responsibility of entering data in the DHIS is divided between several of these coordinators and clinicians. The staff that is to enter the data have other responsibilities that have higher priorities than working with the DHIS.

There appears to be a dependency on one or two persons in a system where people often are transferred or leaves for studies, there seems to be no mechanism in place to make sure that someone else takes over when those responsible leaves. The community volunteers that CHAI “gave” to the districts were meant to be working in the communities, but many have been pulled into the offices in order to enter data in the DHIS. In some districts these CHAI volunteers were the only ones entering data into the DHIS. These volunteers are on a contract with CHAI for one year, which means this is not a permanent solution. CHAI is working on getting approval for the district to hire some of the volunteers so that they can keep doing the work. This could reduce some of the gap along the staffing dimension.

Data entering and exporting is not found difficult among those interviewed who works with the DHIS. Training and the design of the DHIS seem to have closed a gap on skills here. Analyzing the data and presenting it in different ways were among the issues that were found difficult. Presenting data in graphs or histograms is a feature that is not used among the interviewed district staff, but which most of the interviewed mentioned they would like to have more training in. Most of the interviewed felt they could have done more if they had time to practice, which they currently do not have.

Concerning skills at health facility level nothing has been done here as a result of the implementation of the DHIS software by CHAI. This is up to supervision and local procedures. Computerization stops at district level, are not used at health facilities, and thus they are not involved in the implementation activities. Seeing that the health facility is where the basis of information comes from; the contents of the DHIS, and what decisions as well as reports are to be based on, there is an amount of change needed in order to meet the design conceptions of the DHIS.

Training has led to a reduction of the gap along this dimension when it comes to entering data in the DHIS. A gap is still left when it comes to using the data for analysis, and particularly when it comes staffing ad skills in order to have data entered, and to have data arrive timely and being correct and complete.

### **7.1.6 Management system and structures**

*(The overall management systems required to organize operation and use of the information system, plus the way in which stakeholders agencies/ groups are structured, both formally and informally)*

#### ***Design conceptions:***

The system needs customization and installation, after this a certain amount of local support is needed for hardware and software. Seeing that CHAI sees both

their own and the University of Dar es Salaam's role as being transient, such responsibilities would have to be transferred the regions themselves.

In order for data to be arriving in at the point of entry, transport and fuel is needed. A functioning reporting system is also needed in order to have a functional routine health information system working, as the DHIS is meant to be.

***Realities in Lindi and Mtwara:***

CHAI already had an office in each region, and were cooperating with the regional and district teams working with HIV/AIDS related programs. CHAI had staff performing activities such as follow-up, trainings and supervision specifically for the programs supported, and supported the regions with transport and fuel, as well as staff. This has been continued. CHAI has provided local staff for supervision of the DHIS, and its community volunteers "given" to the district have in some cases ended up assisting districts with the entering of data, as mentioned in staffing. In getting data for the health programs they are supporting, there is a lot of supervision and follow-up being performed by local CHAI staff. CHAI is also providing support in the form of transport and fuel. Seeing that CHAI was already present in the two regions and already supporting health programs there, they integrated the supervision required for the DHIS with the supervision they were already performing and supporting. In this way they ensured the supervision of DHIS being a part of the regions' plans. When introducing the DHIS in Mtwara CHAI had a member of staff move there, who worked specifically with the entering and presentation of data, in order to demonstrate the use of the software, and who worked extensively with the DHIS in the region.

CHAI are planning to reduce support by 2012, and wants the regions' handling of the DHIS to be self-sustaining by then. Although their support might be little compared to other donor organizations, their support is still significant. Some efforts are made in order for this to happen; plans on training local IT staff to be able to do support for the DHIS software and for the hardware, and participation

of CHAI staff in meetings regarding the Council Comprehensive Health Plan making sure that the DHIS is in the districts' budgets.

The reporting structure in both Lindi and Mtwara has not been well functioning. Expressions like “a scramble for data”, “there is no system”, and that a lot of reporting is done on an “ad hoc basis” were of those used by several of the interviewed health workers in describing the situation as it was. In order to get the information needed the districts in many cases had to use the telephone or visits to follow up. Also in order to provide corrections to reports submitted calls and visits had to be performed. As a regional health manager put it in Lindi:

*“To be sure that what we get in the data base is good, we have to do supportive supervision. Even before this software we had supportive supervision based on register reports. So if you don't have a mechanism to go to the facilities to support them, you cannot get a proper report”*

The reporting system has not been altered; a part of it has become computerized with the DHIS.

***Management system and structures gaps:***

As hardware is involved, maintenance and IT support is required, which is performed by CHAI staff, or supported by CHAI. For the moment a lot of the work in operating and supporting the DHIS seems to be done by CHAI. CHAI is not a permanent solution, which the organization is aware of. Plans are to transfer responsibilities and ownership to each of the regions, and to the districts. In these plans are training the regional IT responsible person to be able to do support for the DHIS, to have some of the CHAI volunteers hired in the districts as permanent staff, and making sure that costs around sustaining the DHIS in the districts are in their budgets. This could reduce the gap between conceptions of having the responsibility for the DHIS management transferred to the regions themselves, but seeing that they were still only plans, there still exists a gap here at the time of study.

For a health information system to function, it is necessary for this reporting structure to be functioning. Here, there seems to be a large amount of change needed in order to reach the design conceptions of the DHIS.

### **7.1.7 Other resources**

*(Principally, the time and money required to implement and operate the information system)*

#### ***Design conceptions:***

The DHIS is a free and open source software, which anyone in theory can download and use. Resources in order to hold trainings in the use of the DHIS is required, as well as computers for it to run on. A certain amount of maintenance and local support staff is also required. If there is no donor present, these are costs that need to be included in the HMIS strengthening budget.

#### ***Realities in Lindi and Mtwara:***

CHAI was already present in Mtwara and Lindi supporting a different health program, both related to HIV/AIDS, in each of the regions. They were present with staff, transport, fuel and own equipment. Because they were already providing funding in the HIV/AIDS area, the DHIS was included as a part of their funding in this area, making it possible to better monitor their efforts. Among the costs were providing the districts and regional offices with computers, and hiring expertise from the University of Dar es Salaam to conduct initial training and have the DHIS software installed. After the initial 5-day training in each region, a CHAI staff conducted a 5-day refresher training within a year after the software was taken into use. Operative costs are support staff and the mentioned transport.

#### ***Other resources gaps:***

CHAI was already present with staff and a support structure in both Lindi and Mtwara, so the cost of getting this in place was minimal. One of CHAI's staff was sent to pilot sites other places in the country in order to gain experience with the

DHIS software, and was also trained by the trainers hired from the University of Dar es Salaam, and conducted training sessions on her own after this. These actions reduced the gap along this dimension.

The DHIS is a free and open source software that anyone can download, and those with skills in programming can customize. Acquiring the software had no cost, apart from the customization done by the University of Dar es Salaam. In order to use the software, a certain amount of computer literacy is required. Training in the use of the software was provided by CHAI, but computer literacy was left to ½ day of training. Time has been allocated by CHAI staff in order to perform support to the regions in several ways. As mentioned, this was covered by CHAI, reducing gaps here.

Although Mtwara did not gather own resources to have the DHIS implemented and operated in the region, Lindi was another case. In Lindi the regional health management team asked to have the system themselves, and gathered funds themselves in order to facilitate the initial DHIS training session. This seems to be a unique case. This opens up the possibilities for other regions to allocate funds from their own budgets in order to invest in the acquisition of the DHIS in their regions. Support from CHAI regarding trainers and computers took place in Lindi also.

The fact that CHAI was already present and supported with finances in order to have the DHIS implemented and training conducted, there is little gap on this dimension for the moment. This is likely to change if CHAI left.

### 7.1.8 Summary of the design-reality gaps

<b>Design conceptions of the DHIS</b>	<b>GAP</b> ↓	<b>Current realities for the health sector in Mtwara and Lindi</b>
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<b>Information</b>	<p>The software is a tool for collecting, validating, analyzing and presenting of aggregate statistical data.</p> <p>This information is meant to provide a basis for decision-making, especially for local action. Both data from vertical health programs available and data from the MTUHA was included</p>	↔	<p>The information to be entered and provide the base of evidence in the DHIS software is based on data that is in many cases described as being of low quality; inconsistent, incomplete, incorrect, and not delivered in a timely fashion. Nothing has been done concerning the quality of information. The DHIS allows for data entered to be presented in various forms. Few of these opportunities are used.</p> <p>Information is not necessarily designed for managerial needs</p>
<b>Technology</b>	<p>The software requires computers to run on, computers require electrical power. The software can be used both on- and offline. Paper tools are required in order to collect the data going into the software</p>	↔	<p>CHAI gave the regions computers. Computers are few and used by several people for various tasks. Electrical power is not in all cases stable nor present. Several of the existing paper tools are complicated to use, in some cases the paper tools are out of stock in health facilities</p>
<b>Processes</b>	<p>The DHIS automates the aggregation process. Aggregation is done on the basis of data, which needs to be arriving from the health facilities to districts, and from districts to the regional level, and further up. It is a tool for processing data, presenting it in graphs or tables, and to analyze the various data. In order for these activities to be performed, data needs to be reported.</p> <p>In order for an information system to be running a certain level of support is needed.</p>	↔	<p>This aggregation process was previously done manually and required a lot of time. The reporting of data is problematic at all levels. The use of data presented in graphs or tables for analyzing is individual, and sporadic. As health staff at district and regional level have more than one area of responsibility, much of the work with reporting is done after hours. These hours are not paid.</p>
<b>Objectives and values</b>	<p>The objectives and values of HISP, which has developed the DHIS, is for it to be a tool as mentioned in <i>information</i>, CHAI wanted to implement it in order to get data for the programs they support, and not “reinvent the wheel”, in Lindi they saw a monitoring system presented by their neighboring region and wanted the same.</p> <p>CHAI has other goals with the implementation as well: to have data entered regularly and timely, data utilized as a routine are among them</p>	↔	<p>Objectives of district level staff is to receive data and create reports to be sent to regional level, objectives are also to perform their other duties. For regional staff the objectives are to receive reports to be sent further up in the system, and to perform their other duties, like monitoring the health situation in the region.</p> <p>There are many actors involved in the health sector in Tanzania, vertical health programs, donor organizations, the Ministry of Health and Social Welfare – all with own sets of objectives</p>
<b>Staffing and</b>	<p>It is recommended that the there</p>	↔	<p>The staff responsible for data</p>



<b>skills</b>	is a person permanently employed only working with the data. It is a computer software, which means that it requires at least a basic level of computer literacy Technology requires support staff		entry do in many cases have other responsibilities as well. Entering data is described by some as an extra duty, and does not have priority. The level of computer literacy is low. CHAI is present with support staff in both regions. This is a temporary solution.
<b>Management system and structures</b>	The system needs customization, to be installed, and a certain amount of local support staff. Transport and fuel in order to perform supervision is also needed. A functioning reporting system is required in order to have a functioning health information system.	↔	The structures for support and supervision, and the management of these are fragmented. CHAI is already present in both regions with staff and a support structure aimed at the health programs they are supporting.
<b>Other resources</b>	DHIS is a free and open source software which anyone in theory can download and use. Time is needed for training, as well as funds. Support staff is necessary for maintaining support for both hardware and software. If no donor is present, this needs to be included in the HMIS strengthening budget.	↔	In both Mtwara and Lindi a CHAI was present and covered the costs of implementation and initial operation.

**Table 1. Summary of design conceptions and reality along the seven ITPOSMO dimensions**

Although actions have been taken during the course of the implementation project that have reduced gaps along the seven ITPOSMO dimensions, my findings indicate gaps of variable size along most dimensions still.

## **7.2 Health information systems as social systems**

As mentioned in chapter 3, Kling (2000, 2007) refers to how information and communication technologies are often viewed as tools and simple appliances, even when referring to complex arrangements of varied equipment, rules, roles, and resources, and actual organizational practices. An understanding of specific information technologies as complex socio-technical systems, comprising of various interdependent elements was introduced. Some of these elements were software and hardware, other elements were people in various roles and relationships with each other and other system elements, support structures and

information structures (Kling, 2007). The DHIS may seem a rationally better solution, and make reporting and use of data more efficient, but still, this has not seemed to happen. Here it is relevant to bring in the concept of the productivity paradox, illustrating how computerization does not necessarily lead to higher productivity or output. Kling (2007) provided several social explanations for the productivity paradox, one of them being that how much skilled work is needed in order to extract value from computerized systems is significantly underestimated. To a certain extent this seems to have been the case when implementing the DHIS in Lindi and Mtwara. A regional health manager in Lindi suggested that all districts were using the DHIS because:

*"[...] they have a computer and a person assigned that called coordinators"*

Both findings and theory suggest that this kind of technological determinism provides a poor description of the actual situation (Kling, 2007). The technology is placed into an organizational context where practices and amount of skilled staff may not sufficiently support the use of the DHIS. The lack of computer literacy was a challenge that the project faced. The findings suggest that the first part of the initial training in the DHIS to overcome computer literacy was not sufficient. This has led to a strong dependency on a few persons that use the DHIS actively. When these persons left for various reasons, the situation was described as "everything being abandoned".

The view of a health information system like the DHIS as a socio-technical system, also provides a framework for addressing the role of the information structure for the use of the software. There is still a lack of qualified staff, content providers, to be collecting the data (in the health facilities) that forms the basis of any health information system. Problems described in my findings were that reports received from health facilities were often not received in time, were incomplete and needed follow-up and correction. Reasons for this were described as the lack of qualified staff at health facilities, and most of the summary reports being in English, which was not a language mastered by all health workers. There is a clear link between the quality of the information

structure and input of data in the software, and the quality of the reports or analyses that can be extracted from the system. As is mentioned in the quote from a regional health manager in Mtwara in section 7.2.3, timely reporting is needed at all levels in order for the DHIS to be useful.

The health program CHAI is supporting in Lindi has top submission rates. In the case of this health program specific efforts are made in the form of supervision structures like using telephone calls and visits as well as the activities for improving the functioning and service of this health program in the region. These efforts seem to have led to these high submission rates, while other health programs included in the DHIS have considerably lower submission rates.

Leavitt (1964) suggested that the entry point for effecting organizational change reveals underlying beliefs and prejudices about the important dimensions of organizations. In this case the entry point is technology. According to Leavitt, the view of the technological approaches to organizational change, was that people must be teased or educated into greater logic and rationality, and that the failure of human beings to search for and use more efficient solutions is a sign of human weakness and inadequacy. Comments from a regional CHAI manager saying that

*“the fact that there is not all the data in the DHIS is because people are not committed”*

provides an indication towards such a view. Leavitt (1964) found that many technological innovations proved to fall short because they ignored the human side of the organization. My findings indicate that the human side of the organization, the health administration and management, as well as health facilities in Lindi and Mtwara, has not been sufficiently addressed. Leavitt (1964) suggested that most efforts to effect change, whether they took of from people, technology, structure or task (which he suggested were interdependent variables of an organization), soon would have to deal with the others. I will get back to this in the next section.

## **7.3 Looking at the project through a conflict perspective**

The conflict theory presented in chapter 3 defines a conflict not as violence or war, but as incompatible goals; a contradiction (Galtung, 2000). During my research and literature review, the amount of goals found in the health sector in Tanzania was striking. Several of these were obviously incompatible, presenting contradictions. This was also the case for the implementation project in Lindi and Mtwara. It is thus found useful to view the project through a conflict perspective.

There are several actors found in the health sector, and it is not necessarily so that all of these actors share the same goals as the initiators of the project. The project of implementation of the DHIS in Mtwara was initiated in order to get data on the specific health program CHAI was supporting in the region. Other goals, as mentioned in section 7.2.4 assessing the objectives dimension, were reviving the availability of data, build a culture for feedback, to have data entered regularly and timely, and data utilized as a routine. Long-term goals of the CHAI management were wanting summary reports used at health facilities to be based on a few comprehensive register and forms, in order to reduce the workload of the health workers. Other goals were performing clinical duties and program activities before entering data in the DHIS, wanting more time to practice and access to the computer, health workers not wanting to use own means for transportation when submitting reports, wanting to be paid for overtime work for filling reports, lack of funds for doing so, lack of feedback and incentives for reporting, lack of time for providing it, other donor agencies which are likely to have their own goals, vertical health program reporting requirements, and probably many more within the organizations and in individuals. Some of these goals are clearly incompatible and represents contradictions. There seems to be a contradiction in goals of reporting and the health service provision itself, especially considering that the health sector according to the WHO, is running with half of the required workforce ([www.who.int](http://www.who.int)). When viewing the project

through a conflict perspective based on incompatibility or contradicting goals, this project's situation is that of a perfectly normal conflict:

*"The normal conflict has many actors, many goals and many issues, is complex, not easily mapped, yet that mapping is essential" (Galtung, 2000: 14)*

The focus in Galtung's conflict theories is to map these parties and their goals, in order to find, and acknowledge valid goals in all parties and their situation (Galtung, 2000). Although this might seem a time consuming process of looking for even more challenges, this conflict perspective suggests that the process of doing so will increase the likelihood of consensus around the long-term goals. It also suggests that parties whose goals have not been seen or acknowledged, are likely to experience ignorance and frustration that might lead to aggression. Instead of trying to convince everyone to see the common goals of the project, this perspective provides a theoretical basis for the need to start with the different parties own situation first, and identify valid goals. Valid goals can be found in not wanting to work overtime for filling reports, health workers not seeing the importance of reporting when reporting is something they see no immediate results from and instead focusing on care provision, and district staff not having time for entering data nor practicing the tool because of clinical duties. At the same time it is a valid goal to try to improve the routine health information system by computerization. These goals all need to be acknowledged. According to this conflict perspective, in order to agree on any joint solution, all parties need to be seen and heard. In the process in Lindi and Mtwara this has not seemed to happen. An important party that seems to have been left out of the process is the health facility staff. Even though the DHIS does not yet have any implications or bring any immediate benefits for the health facilities, this is still where its content comes from, as mentioned in the above section. In order for the goals of CHAI for the DHIS are to be reached, they are dependent on the health facility staff as content providers for the DHIS.

Acknowledging the situation of the health facility staff, and identifying their valid goals would then seem to be an approach in order to gain consensus around

long-term goals that might be common, such as improvement of the health service. One practical way to do this is to include some form of “reality-check” in every meeting, workshop, training or encounter with the different parties involved, directly or indirectly, particularly those who do the work of supplying the information system with information without seeing any immediate benefits or results of this work. When the objectives, framework and benefits of the implementing the DHIS is explained - so should also the foreseen consequences for the ones involved be, especially the possible negative consequences. Establishing such an open and realistic attitude will according to this conflict perspective help reduce frustration and ignorance, and also create motivation to participate in efforts to reach the common, long-term goals of a project (Galtung, 2000). Through acknowledging these consequences, and the situation of those affected, commitment and ownership can possibly be created, which would improve the quality of data fed into the system. This theory suggests that acknowledging the downsides are also necessary for motivation, together with presenting the obvious benefits and potential that the implementation of the software has.

Since CHAI were the ones that introduced the DHIS in Mtwara and partially Lindi, a problem mentioned was that people in the regions see the data as “data for CHAI”. A central CHAI manager sees the roles of CHAI and the University of Dar es Salaam to be transient. CHAI will not be present forever, and is planning to leave the responsibility for the DHIS in the nearest future, but will still make use the information the system contains. Even more so, it is important to gain consensus around long-term goals of the implementation of the DHIS, which according to this conflict perspective will not happen until all involved parties’ situations are recognized. In Mtwara those whom the DHIS will be left to, did not ask for it in the first place. In Lindi the DHIS will be left with a regional health team that asked to have the system themselves, spent own resources on it, and is planning more training supported by own means. Heeks et al. (1999) suggest that mapping and legitimizing organizational reality is a gap closing technique that can increase the success of health information system implementation.

## 8 Conclusion

- ***What is the current situation of the implementation of the District Health Information System in Mtwara and Lindi regions?***

The findings of this study suggest that the implementation of the DHIS in Mtwara and Lindi has come a long way, and represents both opportunities and potential. They also suggest that there still are challenges left, requiring even more effort in order to turn the implementation into a success.

The DHIS was installed on computers in all districts in Lindi and Mtwara. At the time of study, December 2010, approximately one year after implementation of the DHIS in the regions, it was in use in many districts, but not in all of them, and not completely. In some districts one could characterize the use as partial, as some data was entered, while other data, also included in the DHIS, was not entered. The data most often entered in the DHIS and with the highest submission rate were data for the programs specifically supported by CHAI. In some cases data was not entered because of lack of electricity in some districts, this was especially the case in Lindi. Among district staff, none of the interviewed found entering data difficult. Using the data for analysis was a different matter. CHAI has done, and appears to be doing a lot of the job when it comes to the use of the DHIS, such as use of the functions for analyzing and presenting data in various ways, and CHAI were sometimes approached by district and regional staff when they needed data presented in various ways before for example meetings.

Although staff from all districts were trained, not all of them became active users. Some reasons were lack of computer skills, others were the lack of time to use the DHIS because of those trained having other roles and duties. In some cases, more than one of the district staff that had received training were using the

DHIS. In other cases the persons who had been trained and used the DHIS actively left, for various legitimate reasons, and the use of the DHIS had been abandoned. Use of the DHIS was then taken over by a community volunteer sponsored by CHAI. In other cases, those who had been trained were still in office, but none of them used the DHIS, also in these cases use was taken over by community volunteers sponsored by CHAI. In several districts the person entering data was a community volunteer sponsored by CHAI. These were meant to work in the communities, but as the need for data entry was decided more important, they were pulled back into the district offices.

Computer viruses are still rife, and lead to both some loss of data, and data not being entered in the DHIS while the computer is infected and the district is waiting for support.

In the following section I will provide some factors that according to my findings have contributed to this situation.

- ***What are the main conditions and actions taken contributing to the current situation?***

My findings have indicated the importance of the social context for the use of information technologies. They suggest that both pre-existing conditions, conditions in the implementation process, and actions taken by CHAI have contributed to the current situation of the implementation of the DHIS in Lindi and Mtwara. They also imply that some critical actions in order for success and sustainability of the project are yet to be taken. One of the main pre-existing conditions was the nature of the routine health information system, which the DHIS computerizes parts of. The reporting system already in place had several fundamental problems that have not been rectified by the project, although awareness of the problems exists. Based on my findings, the answer to this



research question will based on my findings be divided into three parts; *practical issues, ownership, and a focus on the health facility workers.*

### ***Practical issues***

To computerize parts of the routine health information system does not immediately or in itself lead to higher productivity or output. A certain amount of computer skills, as well as analytical skills are required to make use of the system. So does the willingness and commitment to prioritize. Computer skills do not yet seem to be entirely in place, nor have been sufficiently provided by the DHIS training that has taken place.

Some actions that could be taken are even more training. Those responsible for entering data do in most cases have other responsibilities as well. In several cases other responsibilities are clinical duties that for many health workers have priority over entering data in the DHIS. This, together with a low level of computer literacy and time for practicing DHIS use, are conditions this study implies causes low use of the DHIS. In several districts community volunteers supported by CHAI have become the ones responsible for entering data. These staff are on one year contracts. At the time of study there were ongoing discussions between CHAI and the Ministry of Health to have some of these community volunteers permanently hired by the district. If this does happen, it could resolve an issue of lack of time and staff at the district to have one person only responsible for data. Most of these community volunteers seemed to have sufficient levels of computer skills, but needing more training in the DHIS, which could be provided by local CHAI staff.

Electricity was not in all cases available for computers to run on, this was a problem described to hamper the entering of data in several districts. As far as my findings show, these are issues not handled by the project. One suggestion found in the report in appendix 3 is to provide the districts that face poor electricity supply with solar power and batteries. Everything the district needs in order to create its reports is not included in the DHIS, and several information sources still have to be used. All though CHAI included all data that was available

at the time, to have even more data included in the DHIS was viewed as an important matter several of the interviewed mentioned, that they thought would greatly facilitate reporting.

### ***Ownership***

Of the data that was entered into the DHIS, the health programs supported by CHAI were the ones who had the highest submission rates in the DHIS. In the case of these programs, CHAI has a support structure in place in order to get this information into the system. They also provide staff that performs supervision, visiting and calling districts and facilities, constantly following up these health programs. It seems that currently, what it takes in order to get data into the DHIS is the large amount of effort CHAI performs for the health programs they support. This means following up every month with calls and visits if needed. In the case of CHAI, they were the ones who asked for the DHIS to be implemented in Mtwara, they have also invested in the implementation of the DHIS in Lindi, and have interests in getting data due to the health programs they are supporting there. This underlines the importance of commitment to the goals of the project, and also a sense of ownership. For CHAI, some of the benefits of the project might be obvious, it is not necessarily so that the benefits are that obvious to other to all the other involved parties.

CHAI has done a lot to support the DHIS, supplying equipment, supporting training, gaining competency within their own organization, incorporating supervision with their already existing support for particular programs, and making support staff available locally. This has been done at a cost the organization themselves describe as low. The question is what will happen when their project ends, and their support is withdrawn. CHAI are operating with plans of reducing support by 2012, that their role is transient, and that the regions will be taking over the responsibility of the DHIS, operating it self-sustainably. In Lindi, CHAI were at the time of study making efforts to transfer some responsibilities such as putting costs for DHIS into the districts' annual plans, and having plans to train the region's IT responsible staff, a permanently hired regional staff, to be able to do supervision for the DHIS. When CHAI

withdraws their support, the question is if the current levels of commitment to the goals of the project will be sufficient to keep the DHIS running. When the donor organization withdraws their support, ownership to the process and project will play an important role.

Here, there are differences between Mtwara and Lindi. It did not spring out of the needs of regional or district health workers in Mtwara. Although they did see problematic sides of both the level of data quality and how the reporting system worked, and did not work; the DHIS was introduced by CHAI. In Lindi there is a very different condition at the base of the implementation of the DHIS; in Lindi they asked for the DHIS themselves. Since they initiated the project, the level of ownership is therefore very different. They gathered funds in order to facilitate the initial training, and CHAI assisted with providing computers and installation like in Mtwara. There is a substantial difference at regional level in the sense of ownership that can be traced in the two regions. This was not seen to have spread down to the district levels. At district levels there was not much feeling of ownership that could be traced. Although the regional health team in Lindi seem to feel a lot more ownership and understanding for the DHIS software, they still require extensive help from CHAI staff, which is located just a few doors away, in order to get the data into the DHIS software on their computers. As a consequence of this, they are planning a new training for the regional health management team, because they see it the way that they “have to know it”, and they have to be the experts when the districts come with their questions. This is a very promising sign.

The DHIS is suggested as the way forward in the operational plan of the Consortium in Tanzania mentioned in the introduction of this thesis, to strengthen the health management information system in the country, partly because it is free, flexible and scalable, and has the capacity to integrate several information systems (Consortium, 2009). Still, only 3 out of 21 regions in Tanzania Mainland were at the time of study using the DHIS, and the Ministry of Health and Social Welfare does not require forms to be exported from the DHIS. These means that requirements for using the DHIS will for the moment not come

from higher authorities. When CHAI withdraws their support, the continuation of the project stands and falls on the level of commitment to common goals of the project that can be created. When the objectives, framework and benefits of implementing the DHIS is explained - so should also the foreseen consequences for the ones involved be, especially the possible negative consequences. Not because the implementation of the DHIS is not a good idea – CHAI seem to have put a lot of effort into a project that can also have many potential benefits for others than themselves, it also complies with the overall plan in the country for strengthening the health management information system. But in order for people on the ground level to stay committed, the initial extra workload to also learn how to use the system and its functions, and the workload of reporting in itself, are immediate negative consequences need to be acknowledged, without making the goal of implementing the DHIS any less valid.

#### ***A focus on the health facility workers***

The health facilities are as mentioned where the data for any health information system comes from. What is needed from them is in short the skills in how, and the willingness to prioritize reporting. Suggestions exist from the CHAI management to create more awareness around data, where they would like to have an arrangement for health facility staff to come to the district office once per quarter to have a discussion on their data. At the time of study, the DHIS had led to no change at the health facility level apart from a few exceptions, but the DHIS is still completely dependent on reporting from this level in order to be useful. This is a party that does not seem to have been involved in the process. It seems that throughout the implementation project no effort to create ownership at this level has taken place, apart from the supervision provided for the health programs specifically supported by CHAI. Health facility workers are lacking in number and adequate training, they are filling numerous registers, and numerous register reports to be submitted, that they hardly ever receive any feedback on, unless they are incorrect or incomplete. The reports are filled after hours and in weekends, and it is generally unpaid work. It has been suggested that in order for efforts to be made by different parties towards common, long-term goals of a project, their own situation has to be acknowledged first. Seeing

that the health facility workers are the content providers, it makes it even more important that they experience commitment to common goals of the projects. This implies that it is even more important to acknowledge their situation, and further implies that actions still need to be taken by the project at this level.

- ***How do these conditions and actions compare with previous studies?***

Other studies have, as mentioned in the introduction and literature review, illustrated some of the challenges in implementing a health information system, in Tanzania specifically. Failure of the routine health management systems of catering to emerging information needs, leading to some developing partners developing their own information systems has been described (Mahundi et al., 2011, Shidende, 2005, Lungo, 2003). Previous studies have illustrated a high level of fragmentation in the health sector, partly caused by the many actors involved, such as vertical health programs and donor organizations (Nyella, 2007, Mahundi, 2010, Lungo, 2003). They have also shown that many parallel reporting systems exist, with a lack of coordination between them, and have argued for integration, through various perspectives (Lungo, 2003, Mahundi, 2010). Previous studies have also depicted a lack of a sustainable strategy for when donors withdrew their support the in previous information systems (Mahundi et al., 2011, Shidende, 2005).

A study from Zanzibar illustrated some of the problems seen in those attending DHIS training not necessarily becoming users of the DHIS, and how this has partly been rectified with on the job training of those who have become users (Nyella, 2007). This phenomenon, and the kinds of efforts needed to rectify it is something that was also seen in this study. Experience from Zanzibar suggested that with efficient and extensive supervision, timeliness and completeness of reporting could reach an acceptable level (Nyella, 2007). This effort seems to also have been applied by CHAI to the health programs are supporting, and

seems to be what is necessary to reach an acceptable level of reporting for the time being. This implies that in the kind of conditions found in the health sector in Tanzania when it comes to reporting, requires projects of implementing the DHIS to take this into consideration; do they have the resources for it, and how do they plan on transferring ownership when they leave the scene and the responsibilities to those who will keep living with the system.

These conditions are still in place, and several actions are required to overcome them in order to make a project like that of this thesis to be successful. The project described in this thesis is in itself also a contribution to overcome some of them. It follows the suggestions for the way forward on strengthening the Tanzanian health management information system, which is based on implementing the DHIS, as agreed by the Consortium of partners for this strengthening (Consortium for strengthening the HMIS in Tanzania, 2009). The need to improve the current health situation in Tanzania is evident and it is urgent. As is mentioned in the introduction, the WHO has long acknowledged electronic health information systems to be a central contribution to the work of improving people's health situation (Sauerborn and Lippeveld, 2000). With the urgency of this matter, it is even more important to use previous studies, and also what can be learned from this study, about what has worked and not in the past, and applying it realistically to future projects in order reach goals of improving the health situation for all Tanzanians, as rapidly as possible.

#### **Suggestions for future research:**

After having performed a study in the health sector, some suggestions for future research has appeared as interesting. I think the change history of each district staff would be interesting to look into. With the amount of actors and projects that seem to be involved, and are still involved as well as researchers as myself, in the health sector in Tanzania, it could be interesting for further research to look into some of the following questions: How many different interventions has the particular staff in the health sector been introduced to, involving

computerization and not? How many of these interventions have led to improvement for the situation of the particular staff, and what have possibly been negative consequences? How this experience affect the way health sector staff view new interventions fronted by donors would be interesting to look at in future research.

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## Appendix 1 – Interviews, conversations and visits

<b>ROLE</b>	<b>TYPE OF CONVERSATION</b>	<b>WHEN</b>
<b>Project staff, stakeholders</b>		
Manager I, Clinton Health Access Initiative	Formal interview	17 December 2010
Manager II, Clinton Health Access Initiative	Informal conversations	2-3 December 2010
Regional manager, Clinton Health Access Initiative	Formal interview	10 December 2010
Project member and trainer, University of Dar es Salaam	Formal interview	16 December 2010
Participants in a workshop for strengthening the HMIS and its training in Tanzania; participants from the Ministry of health, University of Dar es Salaam, members from HISP India, Ethiopia, South Africa, Malawi, Norway, Tanzania	Participation in group discussions, informal conversations, workshop report	5 – 15 January 2010
<b>Regional health staff - Mtwara</b>		
Acting Regional Medical Officer	Formal interview	14 December 2010
Regional Aids Coordinator	Formal interview	8 December 2010
Regional HMIS coordinator	Formal interview	7 December 2010
<b>District health staff - Mtwara</b>		
District Medical Officer, Mtwara rural	Formal interview	14 December 2010
Acting District Medical Officer, Mtwara rural	Formal interview	8 December 2010
District Cold Chain Officer/ Extended Program on Immunization Coordinator, Mtwara rural	Formal interview	14 December 2010
HMIS focal person, Tandahimba	Formal interview	6 December 2010
HMIS focal person, Nanyumbu	Formal interview	7 December 2010
HMIS focal person, Mtwara municipal	Formal interview	7 December 2010
Various district health staff, Newala	Visit with HISP team	3 December 2010
<b>Health facility level staff - Mtwara</b>		
Medical staff, Likombe health center, Mtwara municipal	Formal interview	3 December 2010
Medical staff, Mpapura dispensary, Mtwara rural	Formal interview	14 December 2010
<b>Regional health staff - Lindi</b>		
Regional Medical Officer,	Formal interview	10 December 2010

Regional Aids Coordinator	Formal interview and informal conversations	10 December, 2 December 2010
Regional HMIS coordinator	Formal interview	13 December 2010
<b>District health staff - Lindi</b>		
District Medical Officer, Liwale	Formal interview	13 December 2010
Acting District Medical Officer, Lindi rural	Visit with HISP team	2 December 2010
CHAI volunteer, Lindi rural	Visit with HISP team	2 December 2010
District staff, Kilwa district hospital	Visit with HISP team	2 December 2010
HMIS focal person, Kilwa	Formal interview	13 December 2010
Acting District Medical Officer, Lindi urban	Formal interview	10 December 2010
CHAI volunteer, Lindi urban	Formal interview	10 December 2010
Municipal Aids Coordinator, Lindi urban	Informal conversation	10 December 2010
<b>Health facility level staff - Lindi</b>		
Medical staff, Ng'apa health dispensary, Lindi rural	Visit with HISP team	2 December 2010
Medical staff, Town clinic health center	Formal interview	10 December 2010

## Appendix 2 – Interview guides

### Question for Clinton Health Access Initiative staff:

- Which is your formal role in the Clinton Health Access Initiative?
- For how long have you been working in the organization?
- 
- For how long have you been working with the implementation of DHIS2 in Tanzania?
- Could you mention some activities that were part of the implementation project? (*Your participation in these*)?
- Could you give me an example of what have been some of your tasks in the implementation project?
- Can you remember a particular thing you thought went very well in the implementation?
- Can you remember a particular thing you thought did not go so well in the implementation?
- Which were your expectations to the DHIS2 software before starting the work with implementation?
- How do you view CHAI's role in this process of implementing the DHIS2 software? (*What responsibilities, what not responsible for?*)
- How do you view the role of UDSM?
- How do you view the role of the ministry of health?
- What is the current status of
  - Computers
    - Where are they placed?
    - What software do they have installed?

- Do they function?
  - Training
    - Who have received training?
    - What form of training have been given? (*On what topics*)
  - Data
    - Are there any changes in data collected?
    - Are there any changes in data reported?
      - Districts?
      - Facilities?
  - Paper forms
    - Are there any paper forms where there have been done changes?
    - Have any paper forms been replaced?
      - Was this a consequence of using the new software, or for other reasons?
- Which are your possibilities for transportation to districts? (for support, etc)
- Which are the possibilities for data to be transported? (*on a regular basis*)
- At what time would you see the implementation of the DHIS2 software as completed?
- Under what conditions?
- How do you see CHAI's role in the future of this project?
- What would you say are CHAI's goals with supporting the implementation of the DHIS2 software?
- What does an ideal HMIS look like to you?
- What functions does it have?
  - In what way does it assist you in your work, with what tasks?
  - What does it change?
- Is CHAI involved any other places than in Mtwara and Lindi (*with similar projects*)?

- What recommendations would you give to other districts/ regions embarking on this implementation process?

### **Questions for regional health management staff:**

- For how long have you worked in this office?
- Which is your formal role?
- Can you mention a few of your tasks?
  
- Do you use any parts of the DHIS2 software package?
- What parts of it do you use?
- How often do you use the DHIS2 software?
  - Daily?
  - Weekly?
  - Monthly?
  - Not at all?
- 
- Can you give me an example of when you use it? Could you show me how you generate a report (or how you use it for planning)?
  - Do you think it makes your tasks any harder or easier? (*Giving support to districts?*)
  
- Do you see any of your colleagues using the DHIS software?
  - What types of tasks do you see them using it for?
  
- Which were your expectations for the new systems?
  
- Have any of your tasks changed as a consequence to the new DHIS software package?
  - How were they done before?
  
- Do you report to the same persons?
  
- Do you receive all the information required for you to make a report? (If not, how do you resolve it? What action do you take?)
  
- Do you see any disadvantages with using the DHIS software?
  - For what particular tasks/ activities?
    - Do you have any suggestions for improvements of the software
    - How would this change your tasks?

- If you have any technical questions about the DHIS, where do you go for help? (*Maintenance?*)
  - Have you been given any instructions for where to get support?
  
- On what issues do you collaborate with others within the regional office? (*vertical programmes managers, others, HMIS focal person?*)
  - Are there any changes in this collaboration after starting to use the DHIS2 software?
  
- Do you see any advantages with using the DHIS software?
  - For what particular tasks/ activities?
  - *Support to districts?*
  - *Provide feedback downwards?*
  - *Data analysis?*
  
- What does an ideal HMIS look like to you?
  - What functions does it have?
  - In what way does it assist you in your work, with what tasks?
  - What does it change?
  
- In your opinion, why was this new system implemented?
  - Did you see a need for it?
    - What were the needs?
  
- Could you mention any activities that were part of the implementation of the DHIS software? (*Your participation in these?*)
  
- Did you receive any training in the DHIS2 software?
  - How much training? Days?
  - At what time?
  
- Do you feel comfortable using the new software?
  - Do you feel like you would need more training?
  - What parts would you want training in?
  
- On what issues do you collaborate with the districts? (*When you talk to them, what do you talk to them about? When you work with them what do you work with? Differences between districts?*)
  - Have the use of DHIS2 changed this collaboration in any way?

- Are there any new or changed demands for the districts as a consequence to the new software? (*From you? Passed on from the Ministry of health? From someone else, through the regional office?*)
- On what issues do you collaborate with other regions? (Which regions)
  - Do you exchange any data with them?
- Are there any changed demands for you as a consequence to the new software?
- On what issues do you collaborate with the Ministry of Health?
  - What form of collaboration? (Meetings, seminars, workshops)
- Are there anyone else in particular that you collaborate with? (*Other organizations*)
- What recommendations would you give to other regions embarking on the implementation of the DHIS software?

### **Questions for district health management staff:**

- For how long have you worked in this office?
- Which is your formal role?
  - *Vertical programmes?*
- Can you mention a few of your tasks?
  - *Vertical programmes?*
- Do you use the DHIS2 software package?
- What parts of it do you use?
- How often do you use the DHIS2 software?
  - Daily?
  - Weekly?
  - Monthly?
  - Not at all?



- Can you give me an example of when you use it? Could you show me how you generate a report?
- Do you think it makes your tasks any harder or easier? (How?)
- What kind of data do you work with? (*Where/ how is it collected*)
- Do you see any of your colleagues using the DHIS software?
  - What types of tasks do you see them using it for?
- Have any of your tasks changed as a consequence to the new DHIS software package?
  - *Type of forms, type of forms collected from districts?*
  - How were they done before?
- Do you report to the same persons?
- Do you receive all the information required for you to make a report? (If not, how do you resolve it? What action do you take?)
- Do you see any advantages with using the DHIS software?
- Do you see any disadvantages with using the DHIS software?
  - For what task specifically?
    - Do you have any suggestions for improvements of the software?
    - How would this change your tasks?
- If you have any technical questions about the DHIS, where do you go for help? (*maintenance?*)
  - Have you been given any instructions for where to get support?
- On what issues do you collaborate with others within the district office? (*vertical programme managers, others*)
  - Are there any changes in this collaboration after starting to use the DHIS2 software?
- Could you mention any activities that were part of the implementation of the DHIS software? (*Your participation in these*)?
- Did you receive any training in the DHIS2 software?
  - How much training? Days?
  - At what time?

- Do you feel comfortable using the new software?
  - Do you feel like you would need more training?
  - What parts would you want training in?
  
- In your opinion, why was this new system implemented?
  - Did you see a need for it?
    - What were the needs?
  
- On what issues do you collaborate with the regional office? (*When you talk to them, what do you talk to them about? When you work with them what do you work with?*)
  - Are there any changed demands for you as a consequence to the DHIS2 software?
  - Do they provide you with any feedback from the data you submit to them? (*Changes after DHIS2?*)
  
- On what issues do you collaborate with the different facilities? (*When you talk to them, what do you talk to them about? When you work with them what do you work with?*)
  - Are there any new routines for the facilities due to the DHIS2?
  
  - Have they given you received any comments concerning new routines? (*If any?*)
  
  - Are there any differences between facilities? (*Reporting, response to changes*)
  
  - Do you receive the data you need? (*In order to do own job, create reports*)
    - *What other data would you need?*
  
  - In what way is feedback provided to the facilities for data they submit? (*Have using DHIS2 changed this in any way?*)
  
  - In what way is support provided to the facilities? (*technical, with forms*)

- What does an ideal HMIS look like to you?
  - What functions does it have?
  - In what way does it assist you in your work, with what tasks?
  - What does it change?
- On what issues do you collaborate with other districts? (*Which districts*)
  - Do you receive any data from them?
- Are there any issues you collaborate with the Ministry of Health on?
  - What form of collaboration? (*Meetings, seminars, workshops, malaria?*)
- On what issues do you collaborate with others? (Other institutions)
- What recommendations would you give to other districts embarking on the implementation of the DHIS software? (*Recommendations to others?*)

### **Questions for health facility staff:**

- For how long have you worked in this office?
- Which is your formal role?
- Could you mention a few of your tasks?
- When you compile reports to be submitted, what kind of tools do you use?
  - Could you show me?
- Have you received any information about the DHIS2 software that has been taken into use at district and regional level? (*if found used*)
  - Did you feel there was enough information given?
  - What information did you miss?

- Have any of your tasks changed as after the DHIS2 software package started being used?
  
- Have you received any new forms to be filled out?
  - Any alterations in the old ones?
  - How were they done before?
  - Have you received any training concerning the changes? *(If any)*
  
- Have there been any changes in the amount of data needed to be collected?
  - More/ less?
  
- Have you been given any feedback on how you perform with new routines? *(If any?)*
  - Have this feedback been useful?
  - How could it be improved/ be made more useful?
  
- Did you use to receive feedback on data you had handed in to the district office before?
  - What kind of feedback?
  - How was it received? (In person, reports/ graphs sent/ by mail)
  
- How do you deliver your reports/ hand over data collected? *(Transport by car, send by mail)*
  
- On what issues do you collaborate with the district office? *(When you talk to them, what do you talk to them about? When you work with them what do you work with?)*
  - *Would you want more collaboration?*
  - *What kind?*
  
- On what issues do you collaborate with other facilities, if there is such collaboration? *(When you talk to them, what do you talk to them about? When you work with them what do you work with?)*
  - *Would you want more collaboration?*
  - *What kind?*

## Questions for University of Dar es Salaam project team

- Could you tell me about your background?
- For how long have you been working with the implementation of DHIS in Tanzania?
  - For how long have you been working specifically in Lindi and/ or Mtwara regions?
- Could you mention some of your tasks?
- Could you give me an example of some of the activities in this process?  
*(That you have participated in and not)*
  - *Training*
  - *Installation*
  - *Support*
- Could you say something about the impact these activities have had? *(On what level? What specifically)*
- Are there any implementation activities you wish there were more of?
- Are there any implementation activities you think should be done differently?
- What do you see as the most complicated part of the implementation of the DHIS2 software?
- What do you see as the least complicated part of the implementation?
- What do you see as the biggest change when starting to use the new software?
  - *in Government*
  - *In region*
  - *In district*
  - *In facilities*
- What are your thoughts about duplication of data?

- What changes do you think eliminating duplication elicits for reporting? (On which level?)
- Who do you see as parties in this issue? (Who is affected, vertical programmes, regions/ districts, facilities, patients)
- How do you view your role in this implementation/ change process?
- What do you see as the main goal of implementing the DHIS2 software in Tanzania?
- How do you think that this health information system fits, or do not, for Tanzanian conditions?
  - For which reasons does it fit/ not?
  - What do you think needs to be changed? (*System? Infrastructure? Health system? Power structure?*)
- At what time would you see the implementation of the DHIS2 software as completed?
  - Under what conditions?

What does an ideal HMIS look like to you?

- What functions does it have?
- What does an ideal implementation process look like to you?
- How do you see the ideal results of this implementation process?
- Which recommendations would you give to those starting the implementation of the DHIS2 software or similar software in other countries?

## **Appendix 3 – Report: Lessons from strengthening the HMIS in Lindi and Mtwara regions**

### **Lessons from strengthening the HMIS in Lindi and Mtwara regions**

By Faraja Igira, Jens Kaasbøll, Ingeborg Marie Klungland and Louisa Williamson  
Mtwara, 4th December, 2010

A team from the University of Dar Es Salaam (UDSM) and University of Oslo (UiO) are engaged by the Ministry of Health and Social Welfare (MoHSW) in Tanzania to strengthen the HMIS in the country. So far, this project has worked in the Pwani region, and it has also assisted Lindi and Mtwara regions to set up software and train users on the DHIS software package. So far, Lindi and Mtwara are using the software for HIV/AIDS related data and some HMIS data from MTUHA. Lindi and Mtwara are supported by CHAI in their efforts to strengthen the system. It is therefore important to collect the experiences from these regions, so that the remaining regions can learn from the successful endeavours carried out in Lindi and Mtwara. Lessons learned and good practices can be replicated throughout the country.

A group of four people from the UDSM/UiO team visited the Lindi and Mtwara regions during 2-3 December, 2010 to learn from their experience. The team had approached CHAI to get access to the regions, and CHAI set up meetings with their own staff and with representatives from the following units:

1. Lindi Region
  - a. Lindi Regional Office
  - b. Kilwa District Hospital
  - c. Lindi Rural District Office
  - d. Ngapa Dispensary – Lindi Rural
2. Mtwara Region
  - a. Mtwara Regional Office
  - b. Newala District Office
  - c. Mtwara Urban District Office
  - d. Likombe Health Centre

This report is based on the discussions that took place during these visits. It aims first of all to recommend actions for the HMIS strengthening project in Tanzania, and it also includes some recommendations for the regions visited.

### **Implementation history**

## **Mtwara**

CHAI asked for the DHIS to be implemented in the districts specifically for supporting CTC data collection and reporting activities. In this case they identified the people who should be trained on its use. Three people from the regional and districts offices were trained in a one week basic DHIS course in September, 2009. Post training, the DHIS was installed and Data Clerks employed, temporarily, to capture the 2008 and 2009 backlog data. Ongoing technical support was provided by CHAI. A DHIS refresher course was held later. Due to Mtwara rural also being a district supported by Ifakara, the staff there attended an additional third DHIS training course at the UDSM in August, 2010.

## **Lindi**

The Regional Health team in collaboration with the District team became aware of the existence of the DHIS and the implementation process that was taking place in Mtwara region and requested for the same to be done in Lindi. With the support from CHAI, the DHIS package was implemented in Lindi region in February 2010, and a one week introductory course was given. Different from Mtwara, the RMO and DMO's were also trained. CHAI has provided technical support thereafter. Those who attended the introductory course provides training to others on the need basis.

## **Organisation culture and management**

It must be said that the team we met from the different offices on our visit seemed very enthusiastic, proactive and hard working. There seemed to be a pre-existing culture for cooperation and support, with institutionalized structures to support this, as will be mentioned below. They patiently demonstrated their use of the DHIS2, and were most welcoming towards the HISP team and all questions we would have as well as the suggestions we would give.

### **Management in Lindi**

“Management by walking around” seems to be the preferred style within the HIV/AIDS related programmes, in the sense that managers follow up, both on a detailed and overall level, all activities in the clinics and districts, through personal integrated supportive supervision visits. Such visits from high level officials would normally motivate the clinical workers. According to management, the supervision had improved data quality. Also the managers used the reported data to find good and bad performing facilities. Based on this knowledge, they prioritized those clinics which were in most need of supervision. Better data quality would thus provide managers with improved knowledge for doing their jobs, which again would improve the data quality, so there seems to be a positive circle of reinforcement between data quality, management and supportive supervision.

The most serious problem in the health sector is lack of qualified staff. The team displays enthusiasm and engagement, which easily spills over to overstretched health workers.



### **Lessons for other regions**

While personality and enthusiasm are difficult to transfer, managing the health sector, including the HMIS, through frequent visits to those facilities which need more attention is attainable. A condition will be that management has some insight into the performance of the clinics, which can be found through the DHIS reports.

## **Resources**

### **Funding**

The regional and district teams working with the HIV/AIDS related programmes are collaborating with CHAI, which supports training, equipment, personnel, fuel and transport, and also buildings. With the exception of the latter, all these areas are important for a functional HMIS. Fuel and transport is often mentioned as bottlenecks in provision of supportive supervision to facilities and districts in other regions and countries, while this is no problem in Lindi.

The Newala district in Mtwara had supplied cell phones and credit to all facilities through their district budget; this enabled quick communication to sort out localized technical and related data handling issues.

### **Lessons for other regions**

If the region has no donor which funds fuel and transport, this should be included in the HMIS strengthening budget. Also funding for cell phones should be included in the district budgets.

## **Personnel**

### **HMIS personnel**

Lindi rural had designated HMIS clerks who did not have clinical duties. In other districts, the HMIS was covered by 2-3 staff who did the data entry and report production after they had covered their clinical work. Leaving the HMIS function to a side duty for already stressed personnel will have negative effects in the longer run. Also, health personnel is frequently transferred, so even if the district has two competent DHIS users, both of these can quickly disappear due to transfer or other reasons.

### **Recommendation to the MoHSW, regions and districts**

A full time person working with HMIS will be the sustainable solution. In order to reduce the possibility for transfers and to reduce the tapping of skilled health personnel, a clerk should be trained to do the data entry and operation of the system, since clerks seem to be more stable. A clerk will not have the same ability to interpret data as a trained health staff, but through initial training and frequent interaction with the programme coordinators, they will pick up the health issues over time. Such clerks would need two basic qualifications. First, they should be familiar with numbers, percentages and if possible also graphs. Second, they need to have communicating skills, so that they can persuade clinic

staff to send reports, provide them with feedback, and also communicate frequently with programme managers.

## **DHIS use and user competence**

On site visits were conducted to four groups of DHIS users. Technical management of the DHIS and computer skill demonstrated that users were comfortable and confident. When asked, users stated that they were computer literate prior to training, having undergone literacy training independent of prospective DHIS use.

Users were requested to navigate around various DHIS features, specifically, the Dashboard graphs, Data Entry, Data sets, Validation, data export and Reports. Most staff that used the system regularly were quite skilled in the basics such as data entry and data exports, navigating functions with ease. Technical aspects which they did not do well or were uncertain how to use included:

- Opening multiple windows to the data base,
- Generating and using min-max ranges to guide identification of outliers during data entry,
- Using the comments field,
- Running data validation regularly - and knowing how to address identified errors,
- Using and customising reports,
- Manipulating data in pivot tables,
- Making graphs in spreadsheet,
- Interpretation of reports generated,
- Tidying up errors in the facility structure, specifically, marking facilities as closed or reopened,
- Generating data completeness reports showing percentages,

Health managers in both regions expressed that all health data was available through the DHIS. Data for home based care, tuberculosis, provider initiated testing and counseling and malaria were mentioned to be missing due to the fact that the current DHIS does not contain all forms that are reported from the health facilities.

## **Lessons for the HMIS strengthening project**

Post training support interventions provide a useful forum for facilitators to both identify and address identified design, technical and, or skills gaps. A mix of formal refresher courses and informal technical support visits, on-line, email and telephone support is advisable.

## **Specific lessons for the HMIS strengthening project concerning Lindi and Mtwara**

The DHIS is appreciated, and once getting started, people want more. The deployment teams should therefore upgrade Lindi and Mtwara databases during the first quarter of 2011 to include all data sets.

## **Technology – status and recommendations**

Stable power is a major problem in many places in Lindi, including district offices. Generators are used to cope with the most urgent problems, but diesel is an expensive solution. The HMIS team should install solar power and batteries for district offices which face poor electricity supply.

The DHIS is currently run on computers with Windows operating system installed. These are vulnerable to virus. The technical solution which is recommended by the UDSM/UiO team consists of a server computer which runs Ubuntu Linux as the operating system, and onto which the DHIS database is installed. These computers are hardly ever virus infected. With such an installation, all other computers in the district or regional office can access the database, also if these computers are running Windows.

Hard disk crash is another serious threat to the data. The Lindi districts currently do a data backup once a month. In order to avoid risking losing a month's work, daily backups when data is updated are advisable, by copying the DHIS files onto a external hard drive or a memory stick.

If computers in hospitals or other facilities are used for patient information systems, the computer system should be up and running in five minutes after a possible breakdown. This can only be achieved by a more comprehensive backup solution, where the data entry is continuously duplicated on two database servers placed in different buildings. This solution is more costly and would only apply when computer systems have replaced paper systems in hospitals and health centres.

## **DHIS software – recommendations to the HMIS software team**

A number of design issues to be addressed by the UDSM-UiO project team were identified.

1. User name and password – users are entering data under admin-district. This should be disabled; rather only allow data entry and modifications to data to be made under a specific user name
2. Dashboard graph designs –enable automatic updating and modification of layout
3. Activate comments field in all datasets with line listing data entry screens
4. Activate min max ranges to appear in all line listing data entry screens
5. Enable data entry from either a line listing format or a tool mimic format - enable switching between both formats
6. Review naming convention of data elements – standardize with international and data dictionary conventions. Possibly use this for the long name and local modifications with the short name

7. Reports
  - a. Layout reviewed and adapted to suit user needs
  - b. Review technical handling of report set up – not user friendly
  - c. Review layout of data completeness report – to reflect closed facilities as well as percentage submitted. Also, determine if it is possible to indicate 'late' forms
8. Export of data from CTC2 to DHIS did not work after a new version of CTC had been installed.
9. Pivot tables
  - a. Review layout – to enable drill down and manipulation across data sets and org unit levels and administrative structures
  - b. Data element numbers as well as name to appear – possibly in different columns

These issues could be mended when installing a new version of the DHIS software in the Lindi and Mtwara regions during the next six months.

## **Feedback and supervision**

There seems to be several institutionalized support mechanisms.

“Supportive supervision” was mentioned, which is a routine where the vertical programme managers visit the districts quarterly. Five days was set aside for this, and transport was not an issue. A vertical programme manager said that this was something that was followed up from above, and something that one has to do, and they delegated or set aside other tasks in this period. The usefulness of these visits was recognized. Further, they had decided to improve the supervision by bringing graphs and other reports from the DHIS to facilities during supervision. A reason for the need to improve was that some vertical programs were performing poorly, and that improved feedback could motivate them and create more ownership of the program and the health information. “Mentoring” was another support mechanism that was mentioned, where a specialist from regional or district level goes to train facilities and/ or districts on particular topics.

The districts in Lindi have very dedicated community based volunteers who enter the data from facilities and vertical programmes. The volunteers take calls from facilities to give support via phone, and do also visit the facilities when needed. The hard copies that have been submitted from the facilities and need correction are what is brought in for this support. The volunteers correct the errors together with health facility staff. Printed reports were not brought on these support visits. Again, transport was not an issue.

On the quarterly meetings between facility and district staff, these reports are brought, and the facilities are shown their progress, and comparison between facilities takes place.

We met three support staff in each region, which were all designated to an area of support. There was a computer technician working on hardware support, and two staff working on software support at different places within the regions. These were often called for both telephone and support on-the-job to resolve different problems, one of which was restarting the DHIS.

## **Recommendations**

It could be useful to make some explicit aims for the support visits made by district and technical staff, for instance saying that after support, the user would be able to handle the problem her or himself the next time it appeared.

Also, collating common errors with solutions would make life easier for the supporters, both when helping users and for distributing to users so that they can help themselves.

Distributing tutorials and having more context-sensitive help facilities in the software may also make users more self-reliant.

Even though the need for support could be reduced, both technical support and support for the health information related issues will prevail. The level of support in Lindi and Mtwara and the funding which enables travel should be replicated countrywide. Also, the suggestion for bringing printed graphs and other reports from DHIS to the facilities, and use these as a basis for the supervision, could improve the understanding of health data and the importance of managing the services based on indicators on performance.

## **Information handling**

### **Data handling at facility level**

Few problems were experienced by facility staff in using the daily data collection tools. Font size and volume of data on a single sheet were identified as problematic aspects. The monthly data collation process was another matter.

Data was collated monthly by a designated facility staff member who would spend a day on the HIV related records and another on the other forms. Collation often required the efforts of two or more persons, specifically with regard to STI and EPI forms. The numeric calculation of indicators in the EPI form was also identified as a problem area. This process is automated in the DHIS. As the time needed for collation activities was not ring-fenced, and clinical demands had priority, it was often done after hours.

Health facility staff receive feedback mainly on incorrectness and incompleteness in their reporting. They say they would find it motivating to also receive feedback on what they do well.

### **Recommendations**

In alignment with common knowledge of feedback as well as the experience from the facility people, feedback should emphasize positive aspects of performance and not only aim at correcting mistakes.

## **Tailored management reports**

The HIV/AIDS coordinator is using 15-20 indicators in assessing needs for action in clinics and districts. These indicators can be found through the DHIS, but they are not compiled and presented in ways which support local managers in

particular. Correspondingly, the District Medical Officer needs indicators for the priority areas of reproductive health, HIV/AIDS and malaria.

### **Lesson for the UDSM/UiO software developers**

The team should design reports tailored to the different manager groups. Line graphs showing time trends and GIS reports comparing neighbouring districts would be good starting points. In any case, such reports need to be designed in close collaboration with the users, and tested and revised several times. The most important subset of these reports should be displayed on the DHIS dashboard, again tailored to the specific management group. Correspondingly, the HMIS focal persons and data clerks could benefit from data completion reports presented at the dashboard.