UNIVERSITY OF OSLO

DEPARTMENT OF INFORMATICS

Challenges and Opportunities in the Integration of HIS: Case Study from Zanzibar

MASTER THESIS

EDWIN NYELLA

DEDICATION

To my God who is always there for me.
To Nyella's Family for their unconditional Love and Care

ABSTRACT

This thesis presents an in-depth theoretically underpinned empirical analysis of the challenges to integrate the fragmented health information systems within the Zanzibar health care system. The research is situated in the broader topic of health sector reforms, which advocate and implement a number of healthcare organizational changes in which decentralization and integration of the disparate health information systems is one of them. The study sought to meet three objectives: 1) to understand the challenges in the processes of achieving integration; 2) to study the challenges and opportunities emanating from the way users received and related to the newly integrated health information system and 3) to study the strategies used to curb the integration challenges.

In meeting the stated objectives, the research employed qualitative research methods namely, semi-structured interviews, participant observation in meetings and trainings, and document and software analysis, in an in-depth case study. Content analysis was drawn upon to write up and analyze the empirical materials.

Theoretically, the study drew on the concept of installed base from the socio-technical conceptualization of large, integrated systems called information infrastructures and the user enactment concept based on the human agency perspective to analyse the empirical materials. In addition, the analysis was informed by the literature from health information systems' discourse covering integration issues in developing countries.

The study identified challenges in two major integration processes as follows. The first is the standardization process, in which the installed base presented the following challenges: heterogeneity of interests among health care stakeholders, inadequate knowledge on indicators and public health issues, and use of multiple languages in the previous data sets and tools standards. The second process is institutionalization of the standards which also faced a number of challenges from the installed base, which included lack of clear management structure, inadequate skills in computer, inadequate human resources, institutionalized work practices hampering training initiatives and relatively low education levels of health workers at the health unit level of the health system.

The study found different ways in which users enacted the integrated health information system standards, which in turn presented both challenges and opportunities to the integration initiatives. The challenges came to play as some users such as vertical program managers, district officials and health unit staff enacted limited and non-use technologies in practice towards the new system. Conversely, the opportunities came as some users enacted different applications of the new standards, where some were able to reinvent different ways of using the standards as an attempt to workaround some misfits.

Cultivation strategies which advocate on a piecemeal incremental process in the change attempts, to give room for experimentation and revision of strategies were drawn upon to curb the challenges. Specifically, the cultivation strategies included use of participatory approaches and modularization. However, the study suggests the need to build and strengthen communication and collaboration linkages between the stakeholders in the attempt to curb the inertia of the vertical and parallel reporting systems.

Theoretically, the study contributes to information systems knowledge base on the use of the installed base and user enactment concepts to analyze the use of the integrated health information system. Furthermore, the research contributes through theoretical implications drawn from the use of the user enactment and user participation. The study shows that user participation does not always lead to compliance due to the power that users have to apply agency and enact different ways to respond to the new technology, irrespective of their participation.

Keywords: Information systems, integration, fragmentation, use enactment, information infrastructure, Health information systems, standards, cultivation, user participation

ACKNOWLEDGEMENTS

I wish to express my heartfelt gratitude to all those who made this thesis possible. First of all, thanks to my supervisors, Professor Margunn Aanestad, and Professor Jens Kaasbøl, without of whom this work would have not been possible. I am genuinely indebted to them for providing thoughtful guidelines and detailed comments on the drafts of this thesis.

I am deeply indebted to members of the HISP network in general and very specially those from Zanzibar, Tanzania. I specifically, extend my sincere gratitude to Faraja Igira (PHD) for her detailed and coherent comments on my thesis. I am deeply grateful to Mr. Yahya Hamad and Masoud Mahundi for their material and moral support. Also I am very thankful to Abuy Bakar, and Maryam Masoud for their inspiration and support in the field.

In the course my study, I have discussed and learned different issues related to information system theories with my fellow students. Specifically, I would like to thank Caroline Ngoma and Marlen Galimoto for their support on various parts of the thesis.

The fieldwork which forms the basis of this thesis was carried out in the Zanzibar health care system. I am thankful to health officials from the Ministry of Health and Social Welfare, specifically from vertical programs, and HMIS unit. I would like to thank Dr. Omari for his tireless effort in making sure that the fieldwork is successful. I specifically thank with much respect the health workers and district health officers, who gave their time for interviews.

I am grateful to the Department of Mathematics and Informatics, University of Eduardo Mondlane, for providing a well furnished room for writing this thesis. I thank Dr. Emilio Mosse for his material and moral support, without of which life would have been difficult.

The research has been generously funded by the NORAD Fellowship Programme, in which I'm very much indebted for the financial support. Last but not least, I am very thankful to the International Students Office, University of Oslo for their support; particularly I extend my sincere gratitude to Lynn Josephson.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ADB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
BPR	Business Process Reengineering
CRM	Customer Relationship Management
CORBA	Common Object Request Broker Architecture
CDC	Center for Disease Control
DANIDA	Danish International Development Agency
DHMT	District Health Management Team
DHO	District Health Officers
DHIS	District Health Software
DIP	District Implementation Plan
DMO	District Medical Officer
EDI	Electronic Data Interchange
EPI	Expanded Programme for Immunization
ERP	Enterprise Resource Planning
FHIMS	Family Health Information Monitoring System
FP	Family Planning
GFATM	Global Fund for AIDS, Tuberculosis and Malaria
HF	Health Facility
HIN	Health Information Network
HII	Health Information Infrastructure
HIS	Health Information Systems
HISP	Health Information Systems Programme
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
II	Information Infrastructures
IT	Information Technology
IPT	Intermittent Presumptive Treatment
IS	Information Systems

MDGs	Millennium Development Goals
MoHSW	Ministry of Health and Social Warfare
OPD	Outpatient Department
PHC	Primary Health Care
PHCC	Primary Health Care Center
PHCU	Primary Health Care Unit
PMTCT	Prevention of Mother to Child Transmissions
RCH	Reproductive and Child Health
RHIS	Routine Health Information Systems
RHINO	Routine Health Information Network
SOA	Service-oriented Architectures
STI	Sexually Transmitted Infections
STD	Sexually Transmitted Diseases
SP	Sulphadoxine-Pyrimethamine
SWAp	Sector Wide Approach
TB	Tuberculosis
ToT	Training of Trainers
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
VCT	Voluntary Counseling and Testing
VP	Vertical Program
WHO	World Health Organization
ZACP	Zanzibar AIDS Control Programme
ZHA	Zonal Health Administrator
ZHMT	Zonal Health Management Team
ZMCP	Zanzibar Malaria Control Program
ZMO	Zonal Medical Office

Chapter 1

1. INTRODUCTION

This chapter sets forth the purpose of the research, the rationale for choosing the study and generally orients the reader to the issues addressed in this study. Broadly, the study is concerned with understanding the challenges of integrating the health information systems in developing countries, and more specifically in the Zanzibar healthcare system. The study is in the context of health sector reforms, which advocate and implement numerous healthcare organizational changes in which decentralization and integration of the fragmented health information system is one of them.

The rest of this chapter is organized as follows: section 1.1 presents the study background where the rationale and the study objectives are given and followed with the research motivation in section 1.2. The theoretical overview is then presented in section 1.3 where the information infrastructure theory and user enactment based on human agency perspective are discussed in a nut shell and followed with section 1.4 which sets forth the study context and the research methods. Section 1.5 presents the study contributions and lastly, the chapter ends with section 1.6, which sets forth the organization of the thesis.

1.1 Study Background and Problem Domain

Health information systems (HIS) in developing countries have in recent years gained more and more attention as more effort by governments, international agencies, non governmental organizations, donors and other development partners seek to improve health care as a way to reverse disease trends in these countries. In the year 2000, the United Nations set aside ambitious quantifiable goals and targets against which to measure progress in health. One of them is that of national governments to set out strategies for attaining a universal goal (*health for all*) of health that was meant to mobilize political will and set in motion national health system reform processes to embrace the primary health care approach (WHO, 2003). Many developing countries including Zanzibar however, have adopted this care approach which according to Alma-Ata declaration (1978) seek to ensure:

- Essential health care based on practical, scientifically sound and socially acceptable methods and technology;
- Universal access to and coverage of health services based on health needs;
- Commitment, participation and individual and community self-reliance;
- Inter-sectoral action for health;
- Cost-effectiveness and appropriate technology, as the available resources permit;
- Health service provision and health promotion.

Hand in hand with the adoption of the PHC module, is the decentralization of the health systems to delegate authority and resources to the lower levels, especially districts to implement the PHC approach (Walt & Gilson, 1994). Whereas this has been realized to some degree, the issue of tracking progress towards the PHC approach has drawn attention to the underlying weaknesses of the countries' health information systems, especially at the local levels[1] (WHO, 2006a). Availability of reliable, relevant, comprehensive and timely health information is widely recognized and recounted as an essential foundation for any public health intervention at any level of the health system, but very few systems in developing countries meet that demand (WHO, 2006a; Lipeveld, 2000; Rubona, 2003). However, health information system in developing countries have been characterized as being predominantly ineffective, unreliable, irrelevant and therefore inadequate in providing the management with the needed information (Aanestad et al. 2005; Sauerbon and Lippeveld, 2000; Lungo, 2003; Mukama, 2003; Rubona, 2003).

As the result of disease burdens and administrative, economic and donor pressures these health information systems have evolved in a haphazard way and have been fragmented with multiple and very often overlapping demands of disease-focused and specific services programs (e.g. Malaria, HIV/AIDS, Tuberculosis, Family Planning) and heterogeneity of donors requirements and international initiatives (Chilundo et al. 2003; Braa et al. 2005, WHO, 2006a; RHINO, 2003). These programs usually maintain their own 'vertical' reporting systems existing side-by-side with the National health information system where

[1] Local levels in this thesis refer to the district and the health unit level of the health system.

the result emerging over time is disintegrated and heterogeneous collection of systems (Aanestad et al. 2005; RHINO, 2003).

Consequently, the capacity of countries' health information systems is overwhelmed by these multiple parallel demands for information where health workers are overburdened by excessive and often uncoordinated reporting demands. Adding more problems to this chaotic picture of the HIS is the lack of shared standard where same data is frequently reported separately through different structures, while at the same time leaving some gaps where the most important data is not reported (Braa et. al. 2005). As a caveat, in order to address the health system of a country in an integrated manner it becomes imperative to standardize the processes of data production and collection at the various levels, starting from the periphery to the national level. Standardizing the datasets and the corresponding tools and procedures for data collection will facilitate horizontal integration (RHINO, 2003), where various statistical analysis and comparisons between health facilities, districts, and regions becomes possible (Jaccuss et al. 2005).

Another blue print of the HIS is that in most countries they have been centrally planned and managed where Indicators, data collection instruments, and reporting forms usually have been designed by centrally located epidemiologists, statisticians, and program administrators, with minimal involvement of lower-level line managers (district managers) and providers of health services (Lippeveld, 2001; RHINO, 2003; Aanestad et al. 2005). This situation has led to these systems being regarded as a burden by district managers and health workers at the periphery level, rather than a management tool for planning and monitoring health care interventions. Ultimately, neither the national HIS nor the vertical programs HIS meet information needs of the local levels. The district managers lack a comprehensive picture of the health situation, resulting in poor use of information for planning, implementing, and monitoring primary health care interventions (RHINO, 2003).

The deployed picture of the health information system, call for an immediate action to integrate these highly fragmented systems, as an attempt to turn the system into a management tool to support health care planning and decision making processes at all levels

of the health system. The integration advocated here broadly refers to harmonization of various information systems, data elements, data tools, work routines and practices, organizational structures and procedures so that they can *speak to each other* via the standardized interfaces. Specifically, I argue for the use of data management integration method, where datasets from all or most health programs are combined and streamlined by sorting out overlaps, gaps and inconsistencies (WHO, 2006). The advantage for the stakeholders is that comprehensive health information is made available from a single source (ibid).

However, the district level being the hub of all the information from the periphery levels and the level of the health system which plan, implement, monitor and evaluate the primary health care interventions, I argue that it is also the most appropriate level where the integration of the HIS should mostly focus. Recent experiences have shown that *decentralization of information management toward the district level* is an effective strategy to improve the use of routine information (Lippeveld, 2001). As such the district is the level where an integrated data repository can be maintained which can give access of information to different stakeholders. Moreover, the district is also the most appropriate level to link routine and non-routine data collection methods (ibid). By providing the districts and the periphery levels with comprehensive information to plan and monitor the primary health care interventions is a crucial factor if the targets towards '*health for all*' slogan are to be realized.

Conversely, the challenges of integrating these disparate systems are not trivial (Aanestad et al. 2005), as they emanate from the intrinsic complexity of the multi-leveled structure and fragmented nature of health care system with multiple uncoordinated data needs and the deprived nature of both human and non-human resources, of the developing country settings. Nevertheless, the issue of integration in health care especially in developing countries context that is flooded with these multiple vertical programs leading to fragmentation is a major debate in the political, scientific and technical fora today. Major discussions being, the integration of the vertical health programs by way of pooling resources together into what is called Sector Wide Approach (SWAp) (Brown, 2001). Those who are in favor of integration in this debate argue that there is less fragmentation of health and management information

systems (HMIS) under integrated programs, leading to efficiency gains; whereas the proponents argue that the quality of monitoring and HMIS may drop when the general systems have to look after these tasks (ibid).

These debates however point to an important concept that integration process is a social, political and technical challenging *give and take* undertaking whose end result is not given but negotiated between major stakeholders with their own interests to continue with their old ways. At this juncture therefore, no one agency, including the national health authorities, is in 'control' of the integration process in any strict sense (Aanestad et al. 2005). The argument I pose therefore is that without proper understanding of the challenges and strategies of integrating these disparate and often overlapping systems, the chances to align and optimize them become very marginal.

Whereas fragmentation is the *buzzword* used to describe the sources of the ineffectiveness and inefficiencies of the overall health information system in developing countries settings, very few studies have delved into the challenges of integrating these disparate systems both in practical and analytical terms. For instance, Chilundo (2004) examined the potential and challenges of integrating the HIS of Malaria, Tuberculosis and HIV/AIDS programs and also integration of multiple reporting channels within each program. Another study looked at the challenges posed by the historicity (the conservative influence of historically accumulated and institutionalized practices, technologies and perceptions) and heterogeneity (lacking integration and increasing fragmentation across the collection of information systems) of information systems in the development and integration of the health information systems (Aanestad et al. 2005). Shidende (2005) looked on the problems of fragmentation and challenges of integration of the routine health information system and the prevention of mother to child transmission program.

The Zanzibar health information system for the public health sector was organized haphazardly and mainly shaped by the organization of fragmented vertical programs with their own information systems (Hamad, 2005). These vertical programs include the Family Planning (FP), Malaria, Tuberculosis and Leprosy, Nutrition, HIV/AIDS and Safe

Motherhood programs. Most of these programs are integrated at the point of service delivery, but maintain separate reporting systems. A research study was conducted by Hamad (2005) to serve dual purposes; first, to conduct situational analysis of the health information to uncover problems of the existing system and two, to initiate an intervention process of designing and implementing a district based health information system, as an attempt to standardize and integrate the fragmented systems.

The study disclosed plethora of problems which included scarcity of resources, gaps in data collection tools, poor analysis of data, fragmentation of the higher levels, poor feedback and lack of motivation and limited information use (Hamad, 2005). As an attempt to improve the situation, a strategic plan ("roadmap") was drafted by a joint team of stakeholders; comprising both scientific and organizational researchers, major Ministry of Health and Social Welfare (MoHSW) donors (DANIDA and WHO), University of Oslo and some officials from the MoHSW (ibid). The roadmap detailed the agreed upon major activities to be undertaken where DANIDA agreed to fund the project. The University of Oslo under its action research program called Health Information System Program (HISP), was contracted to undertake the task of integrating the highly fragmented HIS.

Based on the background given and as an attempt to contribute to the deprived body of knowledge of IS integration, analytically and practically, this study seeks to meet the following objectives:

1. To study the challenges in the processes of integrating the HIS in the context of developing countries broadly, and specifically in Zanzibar.
2. To explore the challenges emanating from the way users received and related to the newly integrated HIS.
3. To explore approaches and strategies used/to be used to address the challenges generally and very specifically within Zanzibar health sector context.

1.2 Research Motivation

Implementation of information systems (IS) transcends diffusion of artifacts to include social, economic and political issues which emanate from contextual particularities which

impact the implementation processes positively or negatively. Failure to recognize these facts have been cited by researchers as a major bottleneck to successful implementation of IS (Braa et al. 2004; Heeks, 2002; Heeks, 1999; Higgo, 2003; Krishna and Walsham, 2005).

In my undergraduate studies, the social-technical thinking which transcends 'nice codes and nice little software' in the implementation of information systems was non-existent or very marginal, as so to speak. By joining in the master programme in IS opened the door for me to learn organizational issues like institutionalized practices, procedures and work routines which impinge on IS implementations. This has been one of the triggers which shaped my ambition to do my study in IS and very specifically in HIS in developing countries.

The study was also motivated by the eagerness to learn the dynamics of IS implementation by specifically looking at the challenges of integrating the IS in a highly fragmented healthcare setting. The process which included issues like work practices, procedures, data elements, data sets and data tools standardization and integration, adoption and adaptation of a software standard and institutionalization of these standards in the multileveled healthcare system provided the opportunity to appreciate the social technical dynamics involved in the process.

1.3 Theoretical Overview

1.3.1 Information Infrastructure (II) theory

As described in the above sections the HIS in the settings of developing countries is highly fragmented due to existence of disparate overlapping vertical systems, which lead to ineffectiveness and inefficiencies in the entire health system. Taking these systems as a point of departure in the integration process is considered an important step towards the goal of achieving an integrated HIS (Aanestad et al. 2005; Shidende, 2005; Lagebo et al. 2005; Braa et al. 2002). This view is also underscored by WHO (2004) as an underlining principle in HIS restructuring in developing countries by arguing that "Do not destroy existing systems; build on the strengths and learn from the weaknesses of what already exists" (WHO, 2004, page 5).

Information infrastructure (II) theory with its concept of installed base fit very well with this kind of thinking towards system development. According to Hanseth (2002), II are characterized by the following: they evolve over a long period of time where the existing infrastructure - installed base, strongly influences how the II can be changed or designed; II is part of an open large heterogeneous socio-technical network, encompassing humans, technological artefacts and institutions; II supports information sharing among a large community of different users and needs; II are not developed from scratch, but rather evolve incrementally over time and depends heavily on standards for its development and evolution.

By drawing on the II perspective, studies on the HIS in developing countries (Shidende, 2005; Lewis, 2005; Hamad, 2005; Lagebo et al. 2005) argued for the conceptualization of the HIS as Health Information Infrastructure (HII) by strongly asserting that the HIS in those countries possess the characteristics elucidated above and therefore attempts to change them should take that kind of thinking as a point of departure. I underscore this kind of thinking to study the challenges posed by the existing systems – the installed base in the integration of the HII in the developing country context.

The social-technical nature of an HII warrant the installed base not to consists of only technical components like computer systems, data elements standards, data formats, etc but also the social components which includes things like existing work practices, work procedures, behaviours of the people, different organizational arrangements, etc. Due to this social-technical complexity of the installed base radical approaches in the change process are described as ineffective (Aanestad et al. 2005; Shidende, 2005, Lagebo et al. 2005). Use of cultivation that advocates the need for incremental or small step change process is viewed as an important strategy to deal with the inertia of the existing systems. Rather than plan, prescribe and construct growth, cultivation seeks to strengthen and nurture growth, through constant care, continuous assessment and a commitment to revise strategies that do not work (Aanestad et al. 2005).

Installed base cultivation strategies includes use of participatory approaches (e.g. meetings, workshops, training and evolutionary prototyping) and modularization approach, which

advocates the need to break the HII in smaller modules and link them by using gateways (standards) (Hanseth et al. 1998; Lagebo et al. 2005). Participatory approaches helps to improve the knowledge of users and developers upon which systems are built, enables the stakeholders to develop realistic expectations and reduce resistance to change (Bjerknes et al. 1995). In this study I discuss how cultivation strategies have been used in my case study to approach the challenges presented by the installed base in the integration of the HII.

1.3.2 User Enactment: Human Agency Perspective

A human agency position suggests that humans are relatively free to enact technologies in different ways, where, they can use them minimally, invoke them individually or collaboratively and improvise in ways that produce novel and unanticipated consequences (Boudreau and Robey, 2005). Technologies are considered to consist of emergent structures, which normally come to play as people draw on their beliefs, experiences, knowledge and skills as they interact with the technologies and thereby leading to different uses of the technology being enacted in practice (Orlikowski, 2000).

In this study I draw on this concept of user enactment to discuss the challenges and opportunities emanating from the integrated HII. Whereas the II concept is used to analyze the challenges in achieving the Integrated HII, user enactment concept helps me to go further and analyze how different user groups have applied agency and enact different ways of responding to the newly integrated HII.

1.4 Study Context and Research Approach

The research was conducted in Zanzibar, a semi-autonomous region within the United Republic of Tanzania. Zanzibar maintains its own health system that is administrated by the MoHSW. Specifically, this research study was undertaken within the MoHSW under the Health Management Information (HMIS) unit.

This study was done as part of an ongoing action research of health information system structuring process that is undertaken by the Health Information System Program (HISP) in collaboration with the MoHSW and other development partners. The HISP action research

project is involved also in other developing countries such as South Africa, Ethiopia, Vietnam, India, Botswana, Tanzania Mainland, Malawi and Nigeria. In all these countries, the primary goal of HISP is to design, implement, and sustain health information system through participatory approaches to support local management of health care delivery and information flows (Braa et al. 2004a).

Getting at the middle of this action research in Zanzibar to study the HIS integration challenges whose some of its initial activities were already implemented by other HISP team members, use of in-depth case studies and engagement in the on-going actions on the ground was deemed important. Case study is an appropriate approach for bringing an understanding of a complex issue, which could be a program, event, an activity or a process involving one or more individuals and using a variety of data collection procedures over sustained period of time (Cresswell, 2003). Since the aim was to develop a comprehensive understanding of the challenges encountered in the processes of integrating the HIS, case study proved to be a feasible approach.

However, actual engagement in the on-going actions taking place on the ground which included activities like institutionalization of standards and customization of reporting tools, created an opportunity to understand the challenges in the process of HIS integration. According to Dick (2002) as cited by Lungo (2003), actions in a research bring about change in some community or organization and increase understanding on the part of the researcher or the client. For instance, in understanding the challenges of institutionalizing the standards at the periphery and district levels, I engaged in actual training in twelve health units and three districts situated in various settings.

Qualitative data collection techniques employed in this study ranged from semi-structured interviews, document analysis, observation, analysis of computer systems to attending meetings and formal and informal focus group discussions with health workers, district managers and other HISP team members.

1.5 Contribution to Knowledge

This study contributes theoretical and practical knowledge to the healthcare information systems designers and workers, researchers in IS and anyone with interest in HIS in general and very specifically in developing countries.

Specifically, the study contributes theoretically by developing detailed understanding and implications of the challenges and opportunities in the integration of the district health information systems. By drawing on the installed base concept from II theory and on the concept of user enactment based on human agency perspective, the study makes contributions on the use of both concepts to corroborate each other to highlight the challenges emanating from the use of the integrated HIS. Implications from the use of the user enactment and user participation in this study are also drawn as theoretical contributions. Moreover, this research contributes to IS development by studying the strategies used to address the challenges in the integration of the HIS.

As a participant observer, I made some practical contributions by participating in most of the activities of implementing and institutionalizing the district based health information systems. Specifically, I have played the role of change agent by engaging in the interventions of training and supporting the periphery and district levels of the HIS. Furthermore, I engaged in the implementation of the software standard and the reporting tool in the vertical programs which opened the door for me to learn more on the challenges in the HIS integration processes, which resulted from the heterogeneity of the stakeholders.

The study further contributes lessons from the integration processes in Zanzibar, which I believe can be applied in other contexts with more or less similar characteristics.

1.6 Thesis Organization

The rest of this thesis is organized as follows: chapter 2 presents the literature review and the theoretical framework which I have drawn upon in understanding and discussing the HIS integration issues addressed in the Zanzibar case study. Chapter 3 sets forth the description of the research settings and followed up by chapter 4, where I present the research methodology

followed in this study. Chapter 5 presents the empirical materials, which are analysed and discussed in chapter 6. The thesis then ends up with the conclusions, which are presented in chapter 7.

Chapter 2

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

As stated earlier, this study aims to develop in-depth understanding of the health information system integration challenges in developing countries in general and very specifically in the Zanzibar healthcare system. To achieve this goal, understanding of the current debate in the health information systems' discourse in developing countries in general and its connection with the broader topic of integration is cardinal. Moreover, choice of theoretical focus to be used as a sensitizing device in the process of data collection and analysis was important. Information infrastructure with its core concept of installed base and user enactment concept based on the human agency perspective were viewed significant in that respect.

The chapter is organized as follows: section 2.1 presents the literature on health information systems and in section 2.2 the literature on integration of information systems is set forth, covering relevant contemporary debate on integration and the challenges of attaining it. Section 2.3 presents the theoretical framework, where information infrastructure theory is presented in subsection 2.3.1, followed by subsection 2.3.2 presenting the theory on user participation covering the information systems' discourse describing its application in different context. Last but not least, subsection 2.3.3 presents literature on user enactment based on the human agency perspective.

2.1 Health Information Systems (HIS)

Information systems (IS) can be defined as systems that provide specific information support to the decision-making processes at each level of an organization (Lippeveld, 2001). In the healthcare domain, the goal of IS is to improve the health of individuals and populations through the appropriate application of knowledge created through organized information systems (PAHO, 1999). Application of IS in health care leads to what is referred to as Health Information Systems (HIS) which is defined as sets of components and procedures organized with the objective of generating information to improve health care management decisions at all levels of the health system (WHO, 2000). Good management of health care interventions largely depends on the availability and use of comprehensive and quality health information. To ensure effective management of polio vaccines for instance, availability of correct

information about age of the children and accurate record of their attendances for vaccination to help ensure continuity of care is important. For information to influence management in an optimal way it has to be used by decision makers at each point of the management spiral for patient/client management, health unit management and for health system management (WHO, 2000). Therefore, availability of a well functioning, HIS which integrate data collection, processing and use of health information necessary for improving health service effectiveness and efficiency through better management at all levels of the health system, is indispensable (ibid).

Information for the HIS is generated through routine or non-routine methods of data collection. Routine health information is defined as information that is derived at regular intervals through mechanisms designed to meet predictable information needs (Lippeveld, 2001). Routine method involves collection and reporting of data from the basic health services at community level, health centers, dispensaries, first-level hospitals, referral hospitals, and special and tertiary hospitals (Shidende, 2005). The individual health unit is the most common source of routine data, which is recorded by the health staff within the facility while performing their regular daily health care activities on various health programs such as Malaria, Mother and Child Health, Family planning, Immunization and HIV/AIDS (Lippeveld, 2000). Use of various tools are employed in the collection of the routine data at the health facility ranging from paper based tools such as registers, tally sheets and forms to computerized tools such as spreadsheets and use of electronic patient records. However in low resource countries routine data at the health unit is commonly collected using paper based tools.

For the HIS to address information needs of a country in a comprehensive way, application of both, routine and nonroutine methods for data collection is essential. Lippeveld (2000) argues that no single source can provide all the information required for planning and managing the health services. Nonroutine methods include surveys, qualitative and quantitative rapid assessment methods and other special studies (ibid). Nonetheless, routine health data is the major focus in this study. Lippeveld (2001) argues that routine health information systems (RHIS) have the potential to play a major role in facilitating integration

between individual health and public health interventions. Since both individual health care services and public health functions are being carried out within the health services system, the routine health unit based health information system is the main information source for both types of interventions (Lippeveld, 2001; page 1).

Whereas the significance of RHIS in improving the effectiveness and efficiency of health care services is generally accepted in both low and high income countries, Lippeveld (2001) argue that

> "Experts agree that routine RHIS in most countries, industrialized as well as third world countries are woefully inadequate to provide the necessary information support to individual care and public health activities" (Lippeveld ,2001; page 1).

In most developing countries the RHIS are inadequate in providing the management with the needed information (WHO, 2000). The information gathered from those systems is characterised as being of poor quality, incomplete, irrelevant, untimely, redundant and therefore unreliable for sound decision making.

Furthermore, as the result of disease burdens and administrative, economic and donor pressures the RHIS in developing countries have evolved in a haphazard way. They are fragmented due to multiple and very often overlapping demands of disease-focused and specific services health programs such as Malaria, HIV/AIDS, Tuberculosis, Family Planning (Chilundo et al. 2003; Braa et al. 2005; WHO, 2006a; RHINO, 2003). These programs usually maintain their own 'vertical' reporting systems, which exists side-by-side with the national routine health information system where the result emerging over time is disintegrated, and heterogeneous collection of systems (Aanestad et al. 2005; RHINO, 2003). What adds more pressure and complexity to the fragmented RHIS is its heterogeneity in the technical, political and institutional sense. Technically there is use of different software applications, data collection tools, data standards, platforms, protocols, languages and when it comes to funding there are governmental/ national institutions, donor agencies, universities, World Bank, local municipality (Sahay et al. 2006). Institutional wise however, we have central ministries, district administration, local health clinics and vertical programs (ibid).

For instance in Zanzibar health care system which is the setting for this research, has multiple vertical programs (e.g. Malaria, Family Planning, HIV/AIDS, Nutrition, EPI), each one being funded by more than one donor agency and partly by the government, and almost each one maintains its own information system characterized by the use of different technical solutions (e.g. Epi info, Spreadsheets, paper based systems).

Consequently, the capacity of countries' routine health information systems is overwhelmed by these multiple parallel demands for information (RHINO, 2003). Health workers are overburdened by excessive and often uncoordinated reporting demands (RHINO, 2003; Lippeveld, 2000). Adding more problems to this chaotic picture of the RHIS is the lack of shared standard where the same data is frequently reported separately through different structures, while at the same time leaving some gaps where the most important data is not reported (Braa et al. 2005). As a caveat, in order to address the health system of a country in an integrated manner it becomes imperative to standardize the processes of data production and collection at the various levels, starting from the periphery to the National level. Standardizing the datasets and the corresponding tools and procedures for data collection will facilitate horizontal integration (RHINO, 2003) and various statistical analysis and comparisons between health facilities, districts, and regions becomes possible (Jaccuss et al. 2005).

Nevertheless, the global shift from curative to preventive care, from hospital care to community and public health care, from centralized to decentralized health care, from specific project to a comprehensive sectoral approach, has necessitated the restructuring of the fragmented health information systems into a single comprehensive health and management information systems (Chaulagai et al. 2005). This is exemplified by ongoing efforts in different developing countries which seek to harmonize and integrate the fragmented HIS. A good example is the ongoing Health Information System Program (HISP) initiatives in different developing countries (South Africa, India, Vietnam, Nigeria, Tanzania, Botswana, Mozambique) which seeks to design, implement, and sustain Health Information System following a participatory approach to support local management of health care delivery and information flows in selected health facilities, districts, and provinces, and its

further spread within and across developing countries (Braa et al. 2004). According to Sahay et al. (2006), the core practical issue of HISP is the question of how viable and sustainable strategies of integration be crafted, taking into consideration the deployed picture of the HIS in developing countries.

In the subsequent sections I present relevant literature discussing the need, strategies and challenges of integrating the disparate information systems in general and very specifically in developing countries.

2.2 Integration of Information Systems (IS)

The fragmented nature of information systems in organizations which result partly from organizational and technological changes call for a pragmatic approach to address them. Integration has been considered as the obvious solution to the fragmentation problem. This is exemplified by the very well known approaches such as Business Process Reengineering (BPR), Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and technologies for data warehousing and e-commerce. All of these approaches seek to rationalize the organizations with an espoused aim of enhancing quality and speed of services, avoiding fragmented and redundant work processes, and minimizing waste (Chilundo et al. 2004).

However, in the health care domain the need for integration is justified in that it facilitates sharing of information between systems and across care organizations of the health system (Grimson and Hasselbring, 2000). Braa et al. (2005) underscore this argument by noting that integration of information systems enables smoother coordination and control of organizational processes and health care delivery. Jæger, and Monteiro (2005) argue that integration of health information systems is currently something of a truism, a taken for granted ambition. The pressure for tighter integration in the health care sector results from existence of abundance of different IS which is the mirror image of the enormous variation in the healthcare work along several dimensions: level (hierarchically organized spanning from primary healthcare to large hospitals), geography (municipalities, counties, districts, nations and regions), professional groups (nurses, secretaries, physicians and physiotherapists to

mention a few), agencies (patients, health providers, public health authorities and insurance companies) and specialization (for instance, cardiology, neurology, radiology and immunology together with service functions such as laboratories) (ibid.). PAHO (1999) presents some of the relevant aspects that pushed the evolution of information systems and relevant technologies in order to appropriately support healthcare organizations to include the following:

- The need for integration of information systems within healthcare organizations, which are also organized as networks.
- Technological advances in systems structure and communications, facilitating the implementation of integrated healthcare networks.

As the result, different approaches and technologies supporting healthcare IS integration exist, ranging from those aiming at tight to loose integration of the health information systems. The integration approaches are exemplified by the use of integrated electronic patient record (EPR) which aims at streamlining processes in the entire hospital, use of portal technologies which give common access to the various fragmented information systems (Hanseth et al. 2006), use of Electronic Data Interchange (EDI) technologies for inter-organizational communications e.g. use of EDI to exchange lab test results between laboratories and hospitals (Hanseth et al. 1998) and the use of integrated HIS which bring together information from different sources to form one data repository at the district and/or national levels of the health system (WHO, 2006). The pressure for more and more integration in the healthcare, especially in the western world is the push towards what is called Health Information Network (HIN).

> "HIN can provide the electronic framework to share information and business processes among providers, payers, employers, government agencies, and others touched by the health delivery system, even patients themselves. HIN applications allow integrated delivery networks formed of partners in contracting relationships to manage this "virtual institution" without compromise of data and information availability" (PAHO, 1999; page 3).

Albeit, the existence of the different IS integration approaches should not suggest that integration is always an achievable goal. As argued by researchers, "tighter couplings of

information systems increase the complexity of the systems and with it the likelihood for unintended effects of any action taken. As a result of these unintended effects, the wished-for integration may not emerge, and the attempt to increase control over fragmented systems may be more or less unsuccessful" (Sahay et al. 2006). This leads to an important question, as to what is integration?

2.2.1. What is Integration?

Integration in general can be viewed as a process of bringing together things such as services, people, data collection tools, data sets, institutions, information systems etc. For instance, integration of the primary health care services has been defined as a variety of managerial or operational changes to health systems to bring together inputs, organization, management and delivery of particular service functions which aims to improve the services in relation to efficiency and quality (Briggs et al. 2002). The traditional definition of information systems integration emphasize on interoperability and interconnection between systems in terms of programs reading and writing on the same file and the use of standards such as protocols for communication (Aanestad et al. 2005; Sahay et al. 2006; Shidende, 2005), making standardization an important strategy for this to happen (Luiæ. et al. 2006).

Aanestad et al. (2005) presents a continuum of integration approaches and technologies as varying from those which aim at tight integration to those aiming at loose integration which advocate on accepting a certain level of fragmentation. Tight integration is a more radical approach that is exemplified by the use of Enterprise Resource Planning (ERP) system to replace disparate systems in an organization and fully integrate all processes. Using portal solutions is a typical example of loose integration, where the disparate systems still exist behind the scene. At the middle of the continuum is the standard-based integration that relies on use of standards like gateways, brokers, integration engines etc. Standard-based integration is at the heart of this study where standardization is considered as a strategy to facilitate both horizontal and vertical integration of the health information systems. PAHO (1999) stress that data processing, technical, and electronic standards are essential if equipment is to be able to interconnect, and that data definitions (standards) and

terminologies will be essential if health professionals across different organizations are to communicate.

However the traditional thinking towards integration of IS has been criticized by contemporary researchers as being too technical in orientation. For instance, most of the proposed traditional mechanisms for IS integration were technical in orientation ranging from low-level (e.g. database schema integration), middle-level (e.g. middle-ware like CORBA, Web services), to high-level (e.g. Service-oriented Architectures (SOA)) solutions (Aanestad et al. 2005; Shidende, 2005).

The current literatures advocate the need to conceptualize integration as consisting of both technical and non-technical issues contributing to the challenges of integrating information systems (Aanestad et al. 2005; Shidende, 2005; Chilundo and Aanestad, 2004.). To backup this claim, Chilundo (2004) presented from previous researches summary of some of the conditions contributing to the challenges of IS integration as ranging from tension between standards and local adaptation, asymmetric inter-organizational power relations, divergent agenda and interests of multiple actors to intra-organizational conditions including a blend of institutional, technological, social-economic and cultural factors. Other studies, Sahay et al. (2006) and Aanestad et al. (2005) report the process of integrating Family Health Information Monitoring System (FHIMS) and routine HIS in India, as deeply involved with political processes of negotiation between multiple actors including HISP members, World Bank and health officials in the state. Anderson (1997) as cited by Heeks (1999) argue more explicitly and emphatically that experience suggests that efforts to introduce clinical information systems into practice settings will results into failures and unanticipated consequences if their technical aspects are emphasized and their social and organizational factors are overlooked.

As for the purpose of this study, I draw on this social-technical conceptualization of IS integration through an empirical study to underscore the importance of this kind of thinking. This is especially the case when integrating health information systems in a developing country whose context is characterized by poverty, disease burdens and often, the ensued multiple and highly fragmented ‘vertical’ programs supported by different donors with

heterogeneous data requirements. In the next section I present the literature covering integration of health information systems in developing countries with an emphasis on the challenges encountered in those contexts.

2.2.2 HIS Integration in Developing Countries

Health information systems integration in developing countries is considered as an approach towards the rationalization and unification of the disparate systems in those countries. The objective of integrated HIS is to provide easy and equal access to relevant information for all stakeholders (RHINO, 2003). According to WHO (2006), implementation of HIS integration can be carried out using two common methods namely 1) use of minimum data set and 2) integration through data management.

Use of minimum data set method is based on the identification of essential information needed by health managers and health workers to carry out their functions. The concept of essential datasets contains the concept of integration (WHO, 2006). In a typical case, an essential set of indicators or dataset is agreed upon at national level for reporting by all facilities which is then implemented with the provision that additional indicators useful for management at each level (provincial, district and facility) can be added (Braa et al. 2002; WHO, 2006; Braa, 2005a)

The WHO (2006) identified the benefits resulting from integrating HIS using the minimum data set approach as being the following: first, the use of the minimum dataset/indicator reduces the burden in data collection and reporting, which has an impact on the quality of the data; second, the use of standardized reports and indicators allows the comparison of information across provinces, districts and health facilities and third, the process of getting many health programs to discuss the essential dataset creates a platform for discussions on integrating HIS.

Integration through data management, datasets from all or most programmes are combined and streamlined by sorting out overlaps, gaps and inconsistencies. The advantage for the users is that the information is then made available from a single source, e.g. the district

health information system. Programme-specific software applications are linked electronically to the district health information system, thus providing a shared data repository. Application of these two methods of integration put emphasis on the standardization of data sets, data collection and data management tools as a key strategy towards HIS integration. However, WHO (2006) argue that integration of HIS can apply one of the two methods or both. Application of the minimum data set and the use of data repository for data management have been applied in South Africa, where the use of what was dubbed as the 'hierarchy of standards' facilitated the attainment of an integrated HIS (Braa et al. 2002; Braa, 2005a).

The HIS integration methods described above, can be applied to achieve horizontal and vertical integration of the HIS (RHNO, 2003). In terms of health services, horizontal integration refers to the integration of services provided at the same level such as integrating family planning, antenatal and post natal services at the health facility level or at the district hospital level and vertical integration refers to integration of services provided at different levels such as a hospital consultant providing primary care (Briggs et al. 2002). Similarly, horizontal integration of HIS refers to the integration of information sources, tools and functions at a particular level of the health system such as at the health facility, district, regional or national level. Conversely, vertical integration of HIS refers to the integration of health information across the different levels of the health system. In addition, RHINO (2003) argue that the quality and continuity of care can greatly be enhanced at the periphery level by integrating data collection and reporting systems which can be achieved say by integrated exchange of information among various programs (e.g. HIV/AIDS, Tuberculosis, Leprosy, Malaria) and among types of services (e.g., clinic and lab, transport, PHC and hospitals).

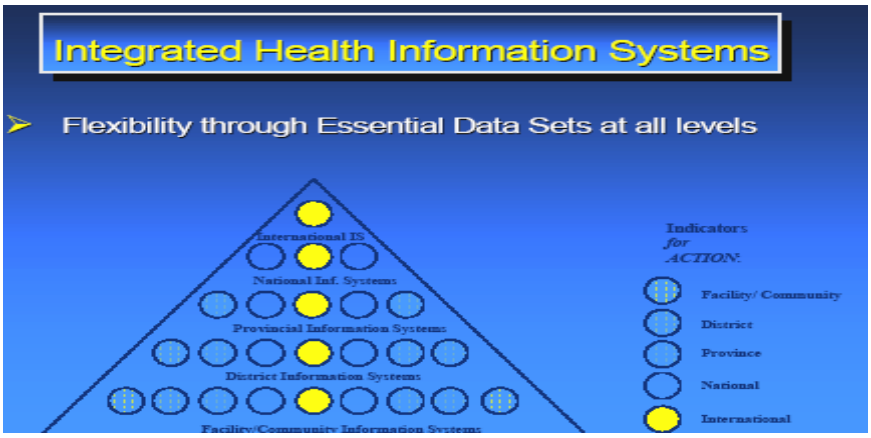


Figure 2.1: Vertical integration of HIS based on a flexible essential data set. (Source: RHINO, 2003)

The use of essential data sets in South Africa facilitated vertical integration (see figure. 2.1) of the health information of the entire country, where the use of computerized systems facilitated the ability to aggregate or disaggregate data across the hierarchy. The flexibility of the standards gave the possibility for additional data at each level to be collected and transmitted only if it is necessary at that level (Braa et al. 2002; RHINO, 2003; Braa, 2005a).

For the purpose of this study and as it has been shown on the literature above, standardization of data sets, tools, work practices and procedures and transmission protocols is considered an important strategy towards HIS integration..

2.2.2.1 Challenges of HIS Integration in Developing Countries

The challenges of HIS integration as any other IS integration emanate from both social and technical factors (WHO, 2006) surrounding the integration processes. It is argued that it is more so in developing countries due to contextual particularities related to politics, institutional conditions, high resource constraints (infrastructure, human resources, financial resources), high disease burdens and the particularities of the diseases, in which all together challenge the process of integrating the HIS (Sahay et al. 2006; Chilundo, 2004). Most of these countries are funded by international donor agencies such as the World Bank, Global fund, and the Clinton Foundation, in order to support provision of health services (such as Family Planning, Immunization and VCT) to the population. However, donor policies tend to

support implementation of vertical programs which maintain their own management structures and information systems (Chilundo and Aanestad, 2003), which are often in conflict with the primary health care goals of integrated district based health information systems.

In a study on HIS of the disease specific programs in Mozambique, a low income country, Chilundo (2004) identified major challenges related to the integration of the HIS to include dearth of qualified staff; heterogeneity of interests among donors, managers and health reformers; multiplicity of reporting systems even within an individual program and high disease burden. Mosse and Sahay (2003) discussed how poor infrastructural conditions and lack of transport challenge the flow of health information from the district to the provincial levels of the health administration hierarchy. Low or lack of computer skills have also been quoted as one of the factors contributing to the challenges to attain an integrated district based HIS, especially in the rural context of most developing countries (Aanestad et al. 2005, Lungo, 2003).

Furthermore, lack of uniform infrastructure development and uneven distribution of resources (e.g. humans, computers) in most developing countries, challenge the efforts to attain comprehensive integrated health information system (Lagebo et al. 2005; Braa et al. 2004a). For instance, the uneven distribution of human and technical infrastructure in Mozambique was reported as being problematic to the effort of scaling up the district-based health information systems because some of the remote districts do not have electricity. Similar problems of uneven infrastructure development was experienced in Ethiopia, where according to Lagebo et al. (2005), use of standardized data formats served as gateways between the paper based systems at the periphery levels and computer software at the higher levels of the health system hierarchy.

Braa et al. (2007) alluded to some of the challenges faced by most developing countries in achieving essential indicator and data set standards to include: conflicting interests between health programs which make it difficult to reach a “final” agreement; changes being the only

constant, where new needs keep popping up (e.g. HIV/AIDS); and multiple software and paper tools which are difficult to coordinate and change.

Institutionalized routines, beliefs and work practices are considered to present challenges in the integration processes of the health information systems. Braa et al. (2002) presented an example where health workers attribute institutional trust to the existing routine reporting systems and see them as means to confirm social contracts. And the consequence of this was the tendency of the health workers to resist the new 'improved' standards. As argued below, the embedded nature of these work practices into the local context and their connection with other local work practices under the context of HIS integration are not easily harmonized and integrated and, they can lead to unintended consequences of workarounds and adaptations.

> "As local work practices relate to the local context, they are not always easily standardized, streamlined and integrated. However, through the new integration they should become connected and related to other local work practices (at other sites) and there is a nonnegotiable demand for standardization. This may lead to workarounds and adaptations that are necessary to get the work performed at the local site. Seemingly minor technicalities required in order to integrate systems solutions, may demand ad hoc and improvised solutions" (Chilundo and Aanestad, 2005; page 4).

Contributing to the challenges of HIS integration is the multiplicity of levels of the health system hierarchy (sub-district, districts, province and national), each with their own needs regarding data and reports which entail creation of a uniform system while at the same time requiring respecting the particularities of individual level. This problem according to Braa et al. (2002) may be analyzed in terms of the tension between standardization (attempts to attain uniform system) and flexibility for local adaptation. While standards are cardinal for coordinating activities across the entire hierarchy of the health systems, flexibility is necessary if the activities are to be locally grounded. For instance, while a data set standard entails collection of data for monitoring and evaluating the entire health system, the same standard should be flexible enough to allow collection of data for monitoring and evaluating activities at the local level (health facility, district etc). Hanseth (1996) argue that standards

and flexibility are interdependent and both necessary for changes to occur. In addition, Timmermans and Berg (1997) argue that there is always local universality and that achievement of the local universality depends on how standards manage the tension involved in transforming work practices while simultaneously being grounded in the local practices.
While flexibility in HIS standards is cardinal for adaptation to take place at the local level, more research is needed to unpack the conditions under which this phenomenon takes place, especially at the health unit level which according to RHINO (2003) is characterized by health workers with inadequate knowledge and skill levels.

As described in the above sections, South Africa used what was dubbed as 'hierarchy of standards' to achieve what was described as flexible standards (Braa et al. 2002; RHINO, 2003; Braa et al. 2005). By using the hierarchy of standards, every level collected or received data for the level above with the periphery level collecting larger or extended data sets or standards due to the level of details of the information required at this level of the health system (Braa et al. 2002). However, the system was created by following a bottom up incremental process, starting from one district and spread to cover the whole country in a period of more than eight years (1994 -2002) (Shaw, 2005). Creating such a system entailed massive negotiations and agreements of different entities (e.g. health units, districts, provinces, national authorities, private ICT institutions, Universities, health program managers, and international donor agencies) (Braa et al. 2005), which rendered the whole process to be a politically, economically and technically charged one.

In the subsequent section, I present the theoretical perspectives drawn upon in this study. The following is covered: information infrastructure perspective, user participation and human agency perspective represented by the user enactment concept.

2.3 Theoretical Perspectives:

2.3.1 Information Infrastructures (II) Perspective:

Traditional IS design strategy, assumes that systems can be developed from scratch, as isolated and stand-alone applications with defined goals, start and ending times: as events rather than as ongoing processes (Orlikowski, 1996). Such a perspective is limited in the

present context where organizations seek to integrate multiple systems across organizational and geographical borders, for example Enterprise Resource Planning systems (Hanseth, 2002). Some researchers have advocated the need for the modern thinking in IS research to analyze design and change not as IS but as Information Infrastructures (Hanseth et al. 1996). An II perspective looks at systems as inter-connected socio-technical networks. This kind of thinking towards IS as II is more appropriate approach in this study, where I seek to develop understanding of the challenges of introducing change in a context with multiple IS already in place entrenched in a heterogeneous social and political structures, requiring integration.

According to Hanseth (2002), II are characterized by the following: they evolve over a long period of time where the existing infrastructure - installed base, strongly influences how the II can be changed or designed; II is part of an open large heterogeneous socio-technical network, encompassing humans, technological artifacts and institutions; II supports information sharing among a large community of different users and needs; II are not developed from scratch, but rather evolve incrementally over time and II depends heavily on standards for its development and evolution. To underscore the importance standards in II development Hanseth (2002) puts it this way;

> "A large infrastructure involves many users and designers. All of them cannot come together and agree upon the requirements or design of the whole infrastructure. To make the whole enterprise manageable, they have to identify the minimum set of functionality that all of them have to conform to make the infrastructure work" (Hanseth, 2002; page 8)

Star and Ruhleder (1996) presented some of the dimensions which characterize infrastructure to include: *Embeddedness* meaning that the infrastructure sinks inside other structures, social arrangements and technologies; l*earned as part of membership* signifying that new participants acquire a naturalized familiarity with its objects as they become members; and *links with conventions of practice* meaning that infrastructure both shapes and is shaped by the conventions of a community of practice. This social-technical nature of infrastructure warrants the installed base not to consist of only technical components like computer systems, data elements standards and data collection tools, but also the social components

which includes things like existing work practices, work procedures, behaviors of the people and organizational arrangements.

By drawing on the II perspective, studies on the HIS in developing countries (Shidende, 2005; Lewis, 2005; Hamad, 2005; Lagebo et al. 2005) argued for the conceptualization of the HIS as Health Information Infrastructure (HII) by strongly asserting that the HIS in those countries possess the characteristics elucidated above and therefore attempts to change them should take that kind of thinking as a point of departure. This study underscore their claim, and further I see that the characteristics of II development as being heavily dependent on the identification of minimum functionality (standard) by the involved users and designers, all of them drawing up on the installed base warrant the conceptualization of the integration of the fragmented HIS in developing countries as HII development. This is reinforced by the state of the HIS in these countries as dysfunctional, fragmented both from the social and technical sense, involving many institutions which are local, national and some international and the presence of multiple donors on the ground (Aanestad et al. 2005; Chilundo et al. 2004; RHINO, 2003). All of these 'designers' need to be involved in the identification of the minimum functionalities, which in my case is the minimum data sets, tools and work practices. The argument I pose based on this, is that the attainment of the minimum functionalities is a significant step in achieving integrated HII. In that regard, the challenges emanating from that process of attaining the functionalities are not trivial but an integral part of the HII integration process, which also determine the end results.

2.3.1.1 Institutionalization of Information Infrastructure Standards

Institutionalization is the process through which a social order or pattern becomes accepted as a social fact (Avgerou, 2000). Information infrastructure standards become accepted through socio-technical processes as social facts and are maintained because of legitimacy regardless of the evidence of their technical value. Legitimacy as one central concept of institutional theory is defined as a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995, cited by Colyvas et al. 2006). In terms of information infrastructure standards though, they become socially constructed and

appropriated within the social system of norms, beliefs and definitions through the process of institutionalization.

Institutionalization is thus about making steady and gradual changes in people's belief, understanding and acceptance of the new technology (Kimaro et al. 2004) or social order. This makes training one of the basic institutionalization strategies. The basic approach being to build incrementally upon partial achievements and make them part of the routine organizational activities. Changes in the way of doing things takes time to be understood, accepted, and routinely applied, for they are expected to change the way institutions operate and how decisions are made (ibid).

Nonetheless, information infrastructures and institutions share structural properties (of enabling and constraining at the same time) making them hard to change separately as well as when they are considered a single unit (Hanseth, 1998a). Based on the institutional theory, organizations are made up by institutions, in that, changes in the organization always leads to changes in the institutions. The change effort may lead to establishment or diffusion of the institutions and sometimes the change effort may fail due to clashes with the existing institutions. For instance, planned organizational changes often fail as they may require changes of institutionalised practices (ibid).

The installed base of the fragmented health information system infrastructure in developing countries consists of strongly institutionalized practices, procedures, data standards, data tools and technologies. Integration of the HIS will undoubtedly involve establishment and diffusion of some of the existing institutions. To establish new ones require a process to institutionalize them say through training, workshops, meetings, and in-service supports. The challenges in diffusing and establishing new institutions are however not trivial, as they may hamper the change process (ibid). This study draws on the institutional concept to analyse and discuss challenges of institutionalizing the health infrastructure standards both at the periphery and district levels of the health system.

2.3.1.2 Cultivating the Installed base

Successful development of infrastructures requires the creation of self-reinforcing processes and management of its direction. Strategies for creating and managing such processes are here called cultivation (Hanseth, 2002). The notion of cultivation as opposed to design or construction fits very well the idea that II are developed as improvements or extensions of the existing once – the installed base. The Installed base metaphor underscores important concept that IIs should not be designed *de novo*; but wrestles with the inertia of the installed base (Hanseth and Monteiro, 1998) and therefore inherits strengths and limitations from that base. The new version however must be developed in a way making the installed base and the new linked together making them "interoperable".

In this case, the installed base is treated as a living organism. The living organism metaphor suggests a slow incremental process of transformation of the existing systems (Braa and Hedberg, 2002). Rather than plan, prescribe and construct growth, cultivation seeks to strengthen and nurture growth, through constant care, continuous assessment and a commitment to revise strategies that do not work (Aanestad et al. 2005).

In cultivation, the installed base is seen as an actor involved in every II development activity shaping its direction, and more importantly playing a crucial role as mediator and coordinator between the independent non-technological actors and development activities. According to (Hanseth, 2002) every actor plays a crucial role in the process of II cultivation, and may include individual users, organizations, managers, technologies, standardization bodies and vendors. All of them taken together are considered as designers shaping the direction of the II. To emphasize the role of end users as designers Hanseth (2002) puts it as follows:

> "Normally, a piece of technology or a product is improved when a new feature is added or an existing one is improved. In the case of infrastructures, however, its value is to a large extent determined by its number of users. Accordingly, a user is improving (i.e. changing - i.e. designing) it just by using it. This makes users designers as well. In fact, a user cannot avoid being a designer. Similarly, if designers (i.e. the kind of people we normally denote by this term) want to design infrastructures being useful and having value for users, they have to

> make users use it - they have to "design" and "build" a community user which is using the technology just as much as the pure *technology itself"*(Hanseth, 2002; page 16).

This kind of philosophy underscores the importance of participatory approaches in any attempt of II development. Precisely, it emphasizes the link between cultivation and user participation. In their study of II development in the heath care setting, Lagebo et al. (2005) describe how they used participatory approach as a cultivation strategy to deal with the challenges of scaling and standardizing the health information systems in Ethiopia. In this study I underscore the significance of conceptualizing participatory approach as a cultivation strategy to curb the challenges presented by the installed base in the integration of HIS.

Modularization is another strategy which can be used to cultivate an II (Hanseth, 1996; Lagebo et al. 2006; Shidende, 2005; Lewis, 2005). According to Hanseth and Monteiro (1998), modularization involves dividing an infrastructure into smaller modules or units based on use or user groups and linking them up using gateways. The internet is a typical example of a large infrastructure which consists of different layers of infrastructures and modules linked together by using gateways (Hanseth, 2002a). The never ending incremental and piecemeal fashion which the internet infrastructure is following in its evolution, where different new functionalities are innovated and linked up; exemplify why use of gateways is considered a cultivation strategy in infrastructure development. Gateways can also be used to sidestep a confrontation between two different Infrastructure standards. This is exemplified by the use of a *converter* (gateway) between devices which use alternative or direct current. In this study however, I will discuss how standards were used as gateways to attain integrated HII in the face of uneven infrastructure development.

The subsequent section presents the literature on user participation where I also give some studies where this concept has been applied in different contexts.

2.3.2 Participatory Design in IS

Participatory design in IS implementation finds its root from the Scandinavian research which aimed at empowering workers to question issues regarding technological changes and

threats to the workplace (Byrne et al. 2003). Participatory Design is a methodology in which representative end users provide continual feedback to computer systems designers during the development of IS. By bringing all the stakeholders together, a vital link is established where users interact directly with designers in the development process, with their suggestions for product improvements before those suggestions are codified in the new system. According to Bjerknes et al. (1995) user participation helps:

- To ameliorate the knowledge upon which systems are built
- Enables people to develop realistic expectations and reduce resistance to change and
- It increases workplace democracy by giving the members of an organization the right to participate in decisions that are likely to affect their work.

Studies have cited lack of participation of all the necessary stakeholders in the implementation process of the HIS, as one of the factors leading to failure or non-working of the systems (Braa et al. 2004; Byrne et al. 2003). Experience suggests that systems that are designed by a team of "information experts" without adequate involvement of key stakeholders usually fails to reflect the needs and practical reality of service providers and managers, and does not encourage the ownership of systems (RHINO, 2003; page 3).

A number of participatory approaches have been used by researchers, which include evolutionary prototyping, workshops, meetings, formal and informal discussions and training (Byrne, 2004; Braa et al. 2004; Lagebo et al. 2005). In their study on participatory approaches in HIS development in South Africa, Mozambique and India, Puri et al. (2004) underscore the importance of context when it comes to the methods for user participation. In South Africa methods based on existing traditions and customs were used, whereas in Mozambique use of mediating agencies was cardinal and in India use of the existing hierarchies to create space for local participation was found to be important. The method that was found to be common across all the three sites was by developing the capacity of the users to enable participation. However, by using human rights perspective, Byrne et al. (2003) underscored the significance of developing capacity to participate and to make decisions.

Braa et al. (2002) describe the use of informal methods to enable participation where any interested or innovative user regardless of her place in the hierarchy of the health system was given access to the development team either direct or indirect via the trainers or facilitators of the software system. This method, which Braa et al. (2002) dubbed 'guided user participation,' involved guiding users in understanding their requests and how they could be implemented in practice. The method was described as an appropriate in the developing countries context but it is time consuming requiring only limited number of users.

Whereas participatory approaches are very well argued as being one of the strategies in ensuring the likelihood of a 'successful' implementation of information systems in organizations, the literature confirms that no single algorithm of methods exist to be used across sites (Braa et al. 2004; Puri et al. 2004; Byrne, 2004). The organizational structure as one of the intrinsic contextual characteristic of most health systems can either hinder or facilitate use of participatory approaches in information systems development. This is exemplified by the failure of the use of participatory approaches in one of the HISP sites whose health system organizational setting is heavily centralized.

> "It has proven to be more difficult to apply participatory approaches and a local focus in the centralized and politically controlled organizational setting in Cuba, with poor tradition for local improvisation than in the other countries in the HISP network" (Braa et al. 2004; page 53).

From the cited literature above, I can deduce that for all the countries where the participatory approaches in some degree worked, use of various methods along a continuum ranging from formal to the informal methods was pertinent. While the use of the terms formal and informal may trigger some questions due to their intrinsic characteristic of being subjective, informal methods here refers to the methods which do not use defined procedures unlike for instance meetings and workshops which are more formalized. As for the purpose of this study, I find use of user participation pertinent, as a cultivation strategy to go about the HIS integration challenges. As Puri et al. (2004) argues, reaching common understanding between the users and providers of the health services is impossible without their joint participation. Integration

of the HIS as I argued before does not only aim to look for ways to align artefacts together but also institutions, people and intangible things like perceptions, behaviours and practices. The challenges emanating from these processes will require some form of give and take negotiations and agreements. This being the case, the use of the participatory approaches in the process is deemed cardinal as a strategy to approach the challenges.

The next section presents a theoretical concept of user enactment that will help in analyzing and discussing the effect (outcome) of the integration process, by specifically looking at the level of use and how users have invoked the newly integrated system as far as the old systems are concerned.

2.3.3 User Enactment: Human Agency Perspective

Traditional thinking towards the role of technology in organizational transformation was that of treating technology as the core determinant of social transformation (Orlikowski, 2000; Boudreau and Robey, 2005). The mere assumption towards this way of thinking is that when technologies such IS are installed in organizations people will un-problematically appropriate them. Orlikowski and Barley (2001) argue that technology is implicated in social change at the discretion of human agents, even with automated manufacturing technologies and especially with computer-based information systems. A human agency position suggests that humans are relatively free to enact technologies in different ways, where, they can use them minimally, invoke them individually or collaboratively and improvise in ways that produce novel and unanticipated consequences (Boudreau and Robey, 2005).

The idea of technology enactment is different from that of technology appropriation. Structurational models of technology considered technology as embodying structures (that is built in by designers during technology development), which are then appropriated by users during their use of the technology (Orlikowski, 2000). However, taking this kind of thinking towards technology, it will be difficult to explain ongoing changes in both technologies and their use (ibid), transformations that normally happen when technologies are installed in organizations. According Orlikowski (2000) these structures are not embodied in the

technology but rather they are emergent in nature and therefore, when people interact with a technology in their ongoing practices, they enact these structures, which shape their emergent and situated use of that technology. Technology-in-practice is the resultant technology after a particular technology undergoes a number of enactments (ibid). Organizational transformation may result over time as users enact technologies in response to their local experiences, skills, beliefs and needs (Boudreau and Robey, 2005).

The concept of technology enactment assumes a level of technology malleability in which human agents draw on it and improvise in ways that produce novel and unanticipated consequences. According to Boudreau and Robey (2005), tightly integrated technologies like the Electronic Resource Planning (EPR) package is less malleable compared to other technologies and therefore limit the level of user enactment. This is the case because tightly integrated technological systems or infrastructures highly depend on standardized interfaces to ensure interoperability of multiple artifacts; and thereby increasing the interdependences and complexity of the entire system, rendering it relatively hard to experiment with (Orlikowski, 2000). In other words, the level of user enactment increases along the continuum ranging from tightly to loosely integrated technologies.

Based on the human agency concept, when technological systems like information systems are installed in organizations, some users may use it minimally, some may choose to completely neglect it and continue with their old ways and some may choose to invoke it individually or collaboratively and improvise in ways that produce novel and unanticipated consequences (Boudreau and Robey, 2005). From structurational point of view, multiple enactments come to play as users draw on their interpretive schemes (experiences, knowledge and skills), norms (beliefs about the system) and facilities (e.g. other systems that they have) to mediate their actions as far as the new technological system is concerned.

In a study of networked technologies Orlikowski (2000) came up with three examples of user enactments, namely inertia, application and change. Inertia is the limited use of technology, where users choose to use it to retain their existing ways of doing things (ibid). Boudreau and Robey (2005) describes inertia with an example as follows:

> "…users were also comfortable with the legacy system and found it difficult to break their old habits. Confronted with the complexity of Compass, they elected to use the new system as little as possible, recreating the way they processed financial information under the legacy system. Users relied on paper forms, duplicated transactions, and continued to use their shadow systems. Users' disinclination to change reflects an enactment of inertia" (Boudreau and Robey 2005; page 11).

Inertia involves drawing on and not changing interpretive, technological, and institutional conditions, and in this way, reproducing and reinforcing them over time (Orlikowski, 2000).

Change or reinvention is another example of user enactment that happens as the result of improvisational learning by the users that help them develop new practices of using the technology in unintended ways (Boudreau and Robey, 2005; Orlikowski, 2000). Improvisational learning is a process that can lead to the transition from inertia to re-invention enactment (Boudreau and Robey, 2005). People may choose to use the new technology to augment or refine their existing ways of doing things and thereby enacting different applications of the technology. Such enactments result in the reinforcement and enhancement of the structural status quo, noticeable changes to the data and/or tool aspects of the technological artifact, as well as noticeable improvements to work processes (Orlikowski, 2000).

In their attempts to disaggregate and explain more the human agency perspective, Emirbayer and Mische (1998) presented what they called three elements of human agency, namely *iterational, projective and practical-evaluative* element, which actors draw upon to shape their engagement with the world around them. The ***"iterational"*** element is oriented to past practices in which actors attempt to situate their thoughts about action in terms of familiar routines that help to sustain identities and institutions over time. It is manifested in actors' abilities to recall, to select, and to appropriately apply the more or less tacit and taken-for-granted schemas of action that they have developed through past interaction. The strong formative influence of the past can be seen in the perseverance of organizational procedures

even in the face of inefficiency, due to the imprint of founding practices that commit organizations to routines (ibid).

Human agents also configure the way they relate and interact with the world around them through imaginative engagement of the future. This is represented by the "*projective*" element of human agency. Immersed in a temporal flow, actors move beyond themselves into the future and construct changing images of where they think they are going, where they want to go, and how they can get there from where they are at present (ibid). Through retrospective and prospective process, actors also draw upon past experiences in order to clarify motives, goals and intentions to locate possible future constraints and to identify morally and practically appropriate course of action. This process according to Emirbayer and Mische (1998), is never accomplished once and for all, but rather subjected to continual reevaluation in the light of shifting and multidimensional character of human motivations and social relationships. Boudreau and Robey (2005) gave an example where users' hopes about new ERP system's benefits, expressed in their excitement and intention to use Compass was very high during implementation of the system. But these hopes eventually changed (to inertia) when they started to interact with the system partly because they did not have enough knowledge about its functionality. As the result, the users went back to their manual systems.

The third element which actors draws upon is the "*practical-evaluative*" element that represent the capacity for practical and normative judgments made in the present context of emerging demands, dilemmas, and ambiguities (ibid). The practical evaluative dimension, according to Emirbayer and Mische (1998), represent what the exercise of situationally based judgment has variously termed as practical wisdom, prudence, art, discretion, application, improvisation and intelligence. Judgments and choices must often be made in the face of considerable ambiguity, uncertainty, and conflict, where means and end sometimes contradict each other (ibid). For instance confronted with misfits in a new technology users can choose either to ignore the technology or improvise and use it in unintended ways depending on the current demands or dilemmas. Practical evaluative element involves three analytical components, problematization, decision and execution, where all of them require contextualization of projects or of habitual practices within the concrete circumstances of the

moment (Emirbayer and Mische, 1998). Problematization consists of the recognition that particular situation at hand is somehow ambiguous, or unresolved, posing challenges in application or contextualization. In an attempt to resolve the situation, the problematic circumstance(s) is related to principles or schemas from past experience by which they are characterized in some fashion. Decision for the proper course of action to follow is then made out of alternative and often conflicting possible ends. Execution represents the implementation of the decision.

As noted by Emirbayer and Mische (1998), the three elements of human agency influence actors' choices although not to the same degree. At one point in time actors may be more influenced by one element, for instance their wish to sustain previous patterns of technology use and at other point in time, they may be more strongly influenced by future possibilities (Boudreau and Robey, 2005). At each moment, actors are faced with the contingencies of the past, future, and present, making specific actions more difficult to anticipate (ibid). Multiple enactments such as the examples given above (inertia, reinvention and application enactments) come to play as users draw on their past, present and future possibilities represented by the three element of human agency. For according to Boudreau and Robey (2005), a wide variety of enactments of technology may result as users assess their current situations, draw on past practices and future projects; and evaluate alternative courses of action and the need to execute specific choices.

The HIS in most developing countries as explained in the previous sections are fragmented partly because of the existence of uncoordinated vertical programs harboring different technical solutions, data standards and data formats running in parallel with the national HIS. Integration of these disparate systems aims at the use of standardized data standards, data formats and in some cases use of common technical solutions (software standards) for data processing. For instance, in my case study, data sets and data formats from different stakeholders (vertical programs, MoHSW) were standardized and some of them integrated as a move to reduce duplication. Use of common data processing and analysis tool at the district level and above (including vertical programs) was also a goal that aimed at alleviating or eliminating the use of spreadsheets and Epi info software programs for routine data

management with an appropriate tool for routine data management. While in some cases these goals have been met in some degree, in some other cases use of previous systems and work practices (data formats and software tools) alongside the standardized HIS still exist. By drawing on the human agency perspective I seek to analyze and discuss how different user groups (health facilities, districts, vertical programs) applied agency and enact different technologies-in-practice which presented challenges to the integration attempts.

Chapter 3

3. RESEARCH SETTING

This chapter presents the settings where I conducted the research. The research was conducted in Zanzibar, a semi-autonomous region of Tanzania. The situation analysis of Zanzibar is presented in section 3.1. Section 3.2 presents the structure of the healthcare system in Zanzibar, the Health Management Information System is presented in section 3.3 and lastly, section 3.4 presents the overview of the districts studied.

3.1 Situation Analysis of Zanzibar

This section briefly describes the situation analysis of Zanzibar to show the country's geography and its position and structure. The political history and the current administrative system are described to show how it relates to Tanzania in general and the public healthcare services in particular. Furthermore, the section presents the population size, state of education, socio-economic profile and the health sector performance, which I believe have direct impact to the delivery of health care services and hence on the health information system.

3.1.1 Geography

Zanzibar is made up of two main islands, Unguja and Pemba, and several others islets located in the Indian Ocean, a few miles to the east coast of the Tanzania Mainland. Zanzibar has an area of 2,332 square kilometers (the total area of Tanzania is 945,000 Km), and is divided into five administrative regions, each with two districts. The districts are subdivided into 50 constituencies, 32 in Unguja and 18 in Pemba. The lowest government administrative structure at the community is the Shehia level. The whole of Zanzibar has 289 shehias, 198 in Unguja and 91 in Pemba.

Zanzibar Town is the capital of Zanzibar. Chake Chake is the unofficial capital of Pemba Island with most government ministries having their head offices there. However the Ministry of Health has a head office in Wete district with some vertical programmes having their offices in Chake Chake district. Figure 3.1 shows the map of Zanzibar and its position on the Tanzania map

Figure 3.1: Map of Zanzibar

3.1.2 Political History and the Current Administrative System

Zanzibar is a semi-autonomous region within the United Republic of Tanzania. Zanzibar became independent on the 10th of December 1963. The People's Republic of Zanzibar was established after the revolution of January 12, 1964. Soon after this revolution, Zanzibar joined with the former Tanganyika in April 26, 1964 forming what is currently known as the United Republic of Tanzania. Though, Tanganyika surrendered all her authority of sovereignty to the Union, Zanzibar remained semi-autonomous with the Zanzibar government assuming some administrative responsibilities for the people of Zanzibar, including those related to delivery of healthcare services. The Zanzibar administrative system comprises of the Executive, Legislative and the Judiciary branches.

The Zanzibar President, who is also the Chairman of the Revolutionary Council, heads the Executive branch. Each ministry has headquarter in Unguja and a head office in Pemba in order to simplify the administrative activities between the islands.

3.1.3 Population Size

According to the 2002 population and housing census, Zanzibar has a total population of 981,754 people with an annual growth rate of 3.1%. Unguja Island has a population of 620957 inhabitants (63.2%) and 360797 inhabitants (36.8%) live in Pemba. However, the population structure shows that 44.3% of the population is under 15 years and the population density is 400 people per square kilometer.

3.1.4 State of Education

The education system consists of 7 years of primary education followed by 3 years of first cycle secondary education (or sometimes referred to as junior secondary), 2 years of second cycle (or senior) secondary education and 2 years of advanced level secondary education. The first and second cycles together form what is normally referred to as ordinary level (O-level) secondary education. The 10 years of schooling covering primary and first cycle secondary education are legally compulsory and the right of every child in Zanzibar. It is this duration of schooling that forms basic education in the Zanzibar context. To enter into the second cycle of the secondary education special examinations are instituted by the Ministry of Education. However, most people especially in the rural areas end up on the first cycle lower secondary education.

There are a reasonable number of schools and adult education programmes but still the illiteracy rate is high at 40% recorded in the year 2000 (MOFEA 2002). The primary school net enrolment rate has been improving from 59.6% in 1995 to 81.6% in 2000 (MOFEA 2002) and now stands at 100%, though continuation rate are reported not to be as high. The government owns most schools but private institutions and non-governmental organizations are currently also working in the education sector.

Swahili is the national language and is used as the language of instruction at the primary school level. Having an official language status, English is taught as a compulsory subject from primary school. English being the post primary school language of instruction, experience shows that students face difficulties during the switching over of language of instruction (ADEA, 2003). This state of affair has been taken as a significant contributory factor to the falling standards at the secondary education level and above (ibid).

3.1.5 Socio-economic Profile

Zanzibar's major economic sectors include agriculture, trade and industries, and tourism. Agriculture is the mainstay of the economy largely due to the government controlled clove industry, which is the main foreign currency earner. Historically, trade has been second to agriculture but many years of isolation and the socialist policies adopted after the 1964 revolution have completely undermined its potential in Zanzibar economy. Recently, tourism has emerged as a possible successor to the ailing clove industry. Zanzibar as part of the United Republic of Tanzania is currently ranked as one of the poorest countries in the world.

3.1.6 Health Sector Performance

The current healthcare system in Zanzibar is based on the post-revolution health sector policy, in which the government declared free healthcare access to all Zanzibaris with an emphasis on disadvantaged groups in the rural areas particularly, and all poor women and children. Due to the implementation of the policy, the health infrastructure was improved and currently the majority of Zanzibar people live within 10 kilometers of healthcare facilities and 95% of Zanzibar people live within 5 kilometers walking distance to a health facility. Health services are delivered through Directorates of the MoHSW and specialized vertical programs such as Reproductive and Child Health, Zanzibar AIDS control program, the Malaria control program and TB and Leprosy control program (MoHSW 2002a).The policy worked very well within the first few years up to the late 1980s. However, the economic downturn that Zanzibar faced in the mid-1980s, together with reduced direct donor support in the mid-1990s, left the government unable to adequately support the public health sector despite the good healthcare infrastructure that the islands enjoy.

Since the mid 1990s, the public health sector performance has been declining dramatically in both the quantity and quality of services. This is reflected in the reduction of the per capita visits to a health facility from 2.11 in 1995 to 0.95 in 2001 (MoHSW 2002b). Still the sector is facing high burdens of diseases, indicated by the high Maternal Mortality Rate (MMR) estimated to be 314 per 100,000 live births, high Infant Mortality Rate (IMR), which was estimated to be 75.3 per 1000 live births in 1998, and increased morbidity for perceptible parasitic infectious diseases such as malaria which alone constitutes 35% of all outpatient cases reported (MoHSW 2002b).

In the late 1990s, the Zanzibar government allowed the establishment of private hospitals and clinics. However, the implementation was mainly in towns and many of the poor cannot afford to pay for the services. As part of efforts to improve the current situation, the Ministry has adopted the Health Sector Reform strategies as its rational process to increase efficiency in the healthcare sector. The reform is also emphasized in the Zanzibar Poverty Reduction Plan (MoHSW 2002b).

The main sources of health sector financing are donor funds and fiscal operations of the government. The major current partners in terms of their financial support include DANIDA, Global Fund for AIDS, Tuberculosis and Malaria (GFATM), the African Development Bank, and the United States government (MoHSW 2006). Like in many developing countries however, coordination of the donors' funds is a problem. While there are many activities in the health sector being funded by donors, there is near absence of disclosure by donors on disbursement schedules, time frame of assistance, modalities of procurement, etc (MoHSW 2003). The government financing is derived from general tax revenue sources. According to a study by the African Development Bank (ADB), revenues generated by the health sector itself cover less than a half of one percent of annual health sector expenditures and account for insignificant share of total government revenues (ibid).

Nonetheless, delivery of health services depends on 3,769 personnel, including technical, administrative and support staff. Distribution of staff is uneven; for example, Unguja has a disproportionately larger share of trained personnel than Pemba (ibid).

3.2 Zanzibar Healthcare System Structure

Public healthcare services in Zanzibar are organized and offered by the Ministry of Health and Social Welfare (MoHSW). The healthcare system is organized in three levels: primary, secondary and tertiary. In practice the higher-level healthcare institution can also provide the lower levels care services. This means that tertiary hospital can also provide the secondary and primary healthcare services and the secondary healthcare institution can also provide primary healthcare services. The primary health care units are based at the proximity of the community. Primary healthcare services are under the Department of Preventive Services while the secondary and tertiary healthcare services are under the Department of Curative Services. This study focuses on the Primary Health Care (PHC) services. The primary healthcare system is organized under the Department of Preventive Services.

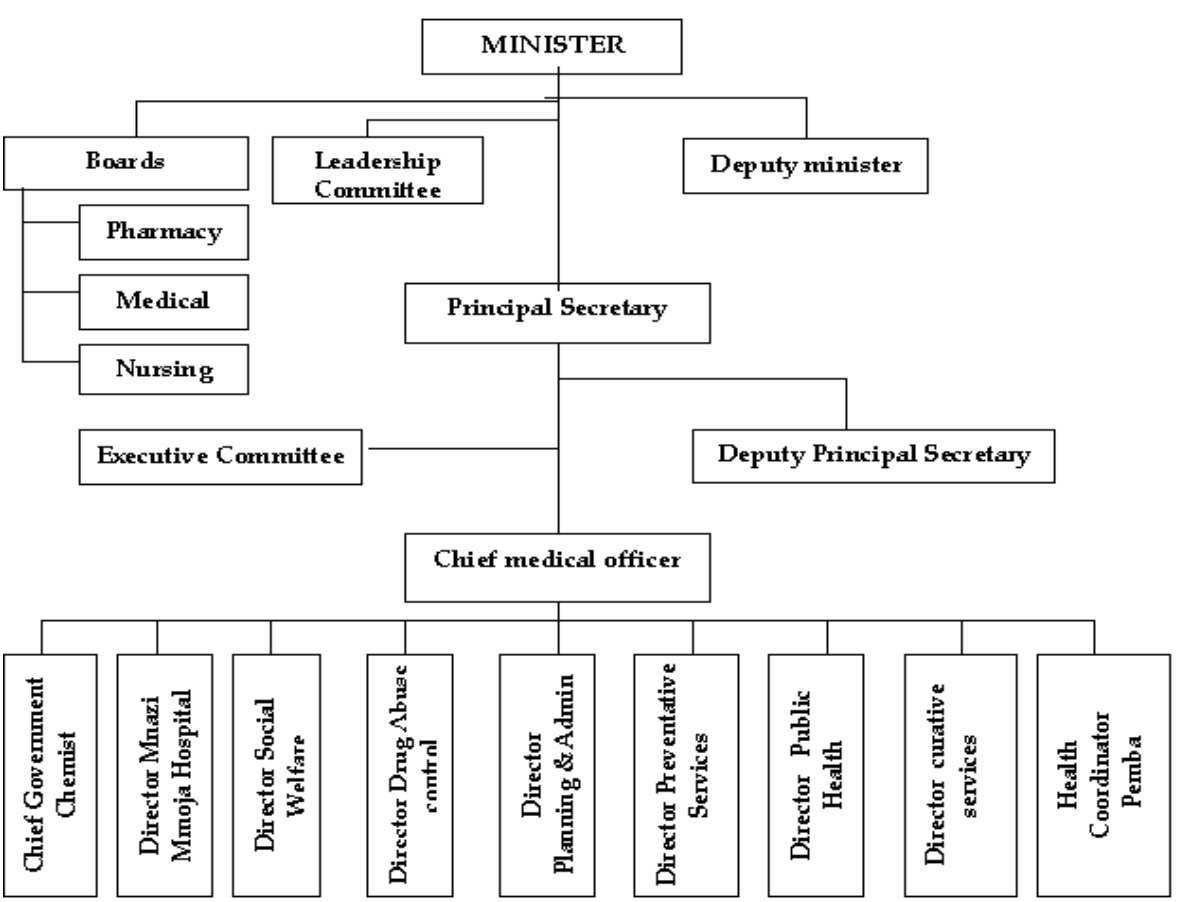


Figure 3.2: Structure of the Ministry of Health. (Source: Hamad (2003))

3.2.1 Primary Health Care (PHC) Services

Zanzibar is divided into two health zones, Unguja and Pemba, which are then divided into health districts that are the same as the administrative districts. Unguja Zone has six health districts: Urban, West, North 'A', North 'B', Central and South. Pemba Zone is divided into four health districts: Micheweni, Wete, Chake Chake and Mkoani. A Zonal Health Management Team (ZHMT) administers each zone, which is responsible for overseeing all health activities within the zone with the exception of tertiary healthcare services. Every District Health Management Team (DHMT) is responsible for overseeing a particular health district. The DHMT officials include the District Medical Officer (DMO) who is the head of the team; District Health Administrative Officer responsible for the overall administrative works within the district; District Public Health Officer; District Public Health Nurse, District Health Materials Manager responsible for management of medicines and other medical and non-medical supplies and the District Financial Officer. The ZHMT maintains an administrative structure similar to the DHMT structure.

The primary healthcare services are divided into three levels depending on the capability in terms of resource concentration of a particular healthcare facility:

Primary healthcare unit (PHCU) 1st line: These are healthcare units with normal clinical investigation but which cannot do laboratory diagnosis or provide dental care services.

Primary healthcare unit (PHCU) 2nd line: These are health units capable of doing both clinical investigation and laboratory diagnosis as well as providing dental care services.

Primary healthcare center (PHCC): These are cottage hospitals capable of providing more services compared to the later two above, which services such as minor operations and X-rays. In total, there are four cottage hospitals, two in Unguja and two in Pemba.

3.2.2 Secondary Healthcare Services

These are the district hospitals, which are the second referral level from the primary healthcare level. The district hospitals are capable of performing major operations and some

have specialized doctors. However, the district hospitals are located on Pemba Island only, where there are three district hospitals: Abdulla Mzee Hospital at Mkoani, Chake Chake Hospital and Wete Hospital.

3.2.3 Tertiary Healthcare Services

These services are only available in Unguja Island at Mnazi Mmoja referral and teaching hospital. The hospital incorporates Mwembeladu Maternity Home and the Mental Hospital, which are located in different sites from the main site. The hospital provides referral services for the whole population of Zanzibar and also provides the secondary healthcare services for the Unguja Island.

3.3 Zanzibar Health Management Information System (HMIS)

Prior to the restructuring process described below, the health information system in Zanzibar was poorly organized and mainly shaped by fragmented vertical programs' reporting systems. The vertical programs include Family Planning, Malaria, Tuberculosis and Leprosy, Nutrition, HIV/AIDS and Safe Motherhood programs. Most of these programs maintained separate health information reporting systems.

3.3.1 HMIS Restructuring

The Zanzibar health sector reforms target on decentralization and improvement of the health information system, among many other things (MoHSW, 2006; MoHSW, 2002b). Consequently, in 2001 the HMIS unit was formed, by fusing together the Epidemiology, Research and Statistics sections within the MoHSW. However, before the formation of the HMIS unit, all HIS data related activities of the Ministry from all the primary health care units and centres were under the Statistics unit. The unit has 12 staff whereas two of them are IT personnel.

A situational analysis of the HMIS conducted in 2004, disclosed plethora of problems which included scarcity of resources, gaps in data collection tools, poor analysis of data, fragmentation at the higher levels, poor feedback, lack of motivation, and limited use of information (Hamad, 2005).

As an attempt to improve the situation, a strategic plan ("roadmap") was drafted by a joint team of stakeholders; comprising both scientific and organizational researchers, major MoHSW donors (DANIDA and WHO), University of Oslo and some officials from the MoHSW and the vertical programs (ibid). The roadmap detailed agreed upon major activities to be undertaken. The HMIS restructuring is being funded by DANIDA through a contract with the University of Oslo under the Health Information System Programme (HISP). HISP is a participatory action research network that aims at enhancing district health information systems in developing countries through the introduction and local adaptation of open source software known as the District Health Information Software (DHIS). DHIS was first developed and adapted in the health sector in South Africa and subsequently adopted in other developing countries.

The HMIS restructuring processes in Zanzibar, following a participatory prototyping approach started out by re-designing and prototyping data collection tools in two pilot districts, and thereafter circulated in all other districts. Training on the revised tools was conducted to all district health officers and to the health workers at the periphery level of the health system.

The DHIS software was adopted and piloted in three districts by the HISP team in collaboration with the MoHSW and other stakeholders since June 2005 and later rolled out to all ten districts. The work of implementing the new system is still in progress; where among major ongoing activities include formal training and user support in activities such as data entry, data presentation, analysis and local use of information to all levels of the health system.

The subsequent section presents an overview of the districts where this study concentrated most.

3.4. Overview of the Districts Studied

This research was carried out in three health districts; two in Unguja and one in Pemba Island within a period of five months (June to November, 2006).The districts visited in Unguja are Urban and West; both of them are located on the west region of the island. Most of the MoHSW main offices such as HMIS unit and vertical programs' offices are located in these two districts. In Pemba the research was conducted at Chake Chake district, which is located on the south region of the Island. This district which is relatively rural compared to the later two and is considered unofficial capital town of Pemba. Figure 3.3 indicates the position of the three districts on the maps of the two islands.

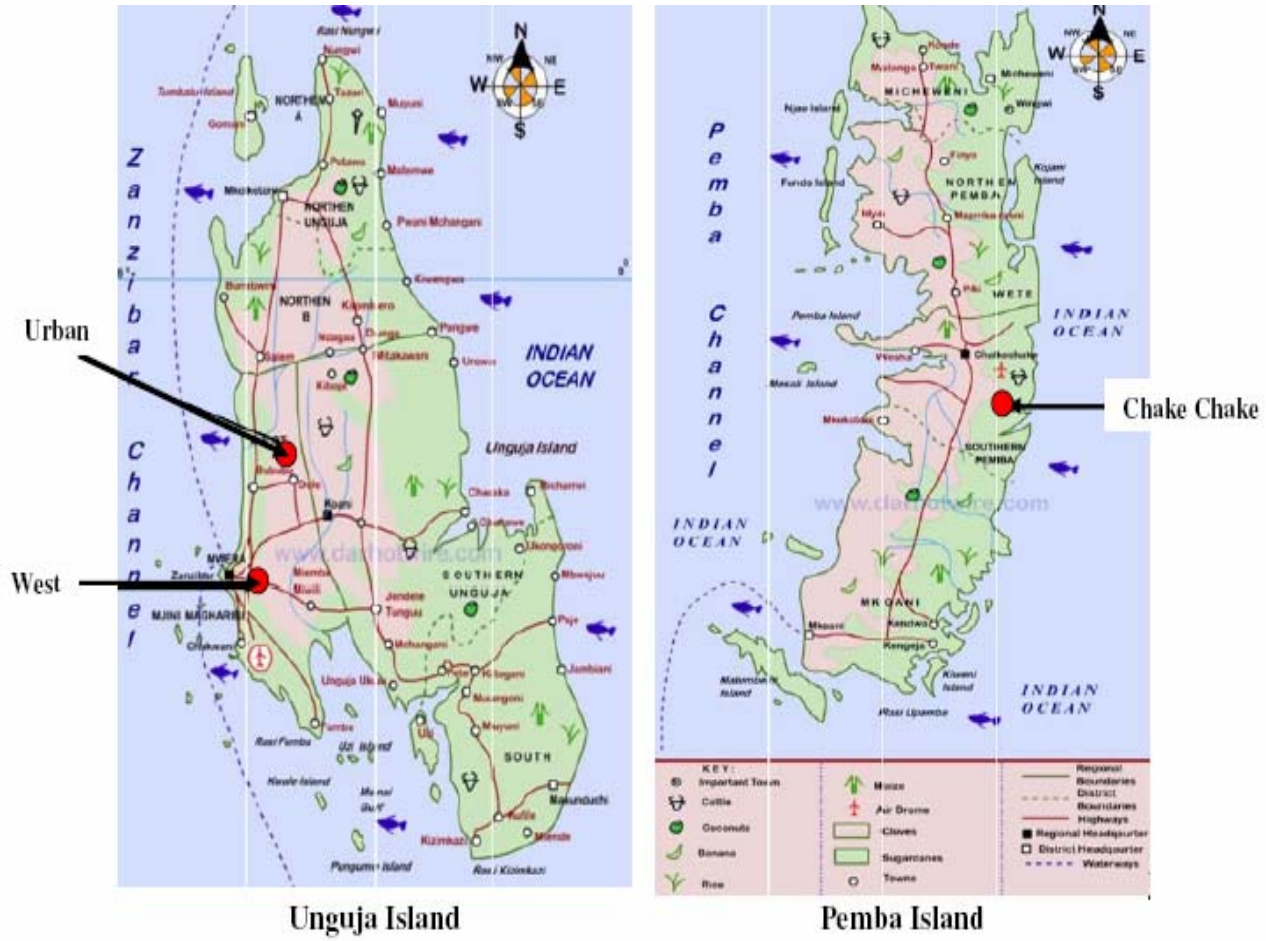


Figure 3.3 : Maps for Unguja and Pemba indicating the districts where this study was conducted

Table 3.1 shows the PHCUs, PHCCs and the hospitals found in each district.

Service level	DISTRICT			
	Urban		West	Chake Chake
PHCU 1st line	1	Bandarini	Beit-el-Ras	Chake MCH Clinic
	2	Forodhani	Bwefumu	Chonga
	3	Jang'ombe Matarumbeta	Kiembe Samaki	Mgelema
	4	Kidongo Chekundu	Kizimbani	Mvumoni
	5	Kidutani Nursery	KMKM	Ndagoni
	6	Kwamtipura	Kombeni	Shungi
	7	Mafunzo	Magogoni	SDA
	8	Makao Makuu JKU	Mbweni Matrekta	Tundaua
	9	Migombani	Sanasa	Uwandani
	10	MM MCH Clinic	Selem	Vitongoji Jeshini
	11	OTTU	SOS	Ziwani
	12	Salama	St. Camilius	
	13	SDA	Welezo	
	14	Shauri Moyo	Shakani	
	15	Ziwani Polisi		
PHCU 2nd line	1	Chumbuni	Al Hajir	Gombani
	2	Raha Leo	Fuoni	Pujini
	3	Sebleni	Fuoni Kibondeni	
PHCC	1			Vitongoji Cottage
Secondary	1	Mental Hospital		Chake hospital
	2	Mwembeladu Maternity		
Tertiary	1	Mnazi Mmoja Hospital		

Table 3.1: Health care facilities in Urban, West and Chake Chake districts.

Urban District

Urban district has 18 PHCUs (15 first line and 3 second line), 2 secondary level hospitals and 1 tertiary hospital (see Table 3.1). The district has 40 Shehias and a total population of 206,429, with 48% males and 52% females (2002 population censers). Included in the study from this district are the district health offices and the Zonal level offices, housed in the same premises. In addition, vertical programs main offices located in this district were also visited. This included the HIV/AIDS, TB and Leprosy, EPI and RCH program.

West District

West district is bordered by North B district to the north, and to the south by the Indian Ocean and Central district. To the east and west, it is bordered by Urban district. The district has 29 Shehias and population of 184,710 with 49% males and 51% females (2002 population censers). As indicated in Table 3.1, the district has 17 PHCUs. This research was conducted at the district level health office including six PHCUs namely, Kiembe Samaki, SOS, Fuoni, KMKM, Welezo Camp and Magogoni. The Malaria control program offices located in this district were also visited.

Chake Chake District

Chake Chake district is bordered by Mkoani district to the south and Wete district to the north. To the east and west is the Indian Ocean. Chake Chake district is divided into 21 Shehias and it has the total population of 83,351, among them 49% are male and 51% are female (2002 population censers). The district has 13 PHCUs (11 first line and second line), 1 PHCC and 1 secondary level hospital.

In this district the following were covered in this study, the district health office and six PHCUs namely Ziwani, Gombani, Chake Chake clinic, Ndagoni, Vitongoji Cottage and SDA. Vertical program offices located in this district were also visited. These were the HIV/AIDS and EPI offices.

Chapter 4

4. RESEARCH METHODOLOGY

This chapter sets forth the research methodology followed in the study. The study drew on qualitative research methods to explore the challenges of integrating the routine health information systems in Zanzibar healthcare system. Integration of the HIS in developing countries has been argued by researchers to involve not just technical factors but also the social-political ones which brings institutions and people with their perceptions, norms, practices and procedures into play (Aanestad et al. 2005; Shidende, 2005; Chilundo and Aanestad, 2004.). In understanding the challenges presented by these factors in any change attempts, require methodologies which go beyond counting and involve those which help to decipher the meanings which the institutions and people give to their previous systems with respects to the new one. As explained in the subsequent sections, this is what influenced the choice of qualitative methods.

The rest of this chapter is organized as follows: section 4.1 presents the research approaches, where I give brief description of different research approaches, section 4.2 provides the research design followed and section 4.3 sets forth the data collection techniques employed. Mode of data analysis and interpretation is presented in section 4.4 and followed by section 4.5, covering reliability and validity of the empirical data. The chapter is then finalized with section 4.6 which presents ethical clearance issues and the study limitations.

4.1 Research Approaches

Research can be envisioned as an attempt by careful enquiry, experimentation, study, observation, analysis and recording which aim to discover new facts, knowledge and information. Research can also be used to develop new interpretations of facts, knowledge or information; or to discover new means of applying existing knowledge. To achieve any research objectives, application of research methods, which represent the means to achieve the research objectives, is crucial. At least the literature on research approaches that I have come through present two major research approaches that can be employed in research enquiry; quantitative and qualitative research approaches (Silverman, 2005; Creswell, 2003; Myers, 1997; Yin, 1994; Hancock, 2002).

Quantitative research approaches represent the early forms of research originated in the natural sciences such as biology, chemistry, physics, geology etc. and was concerned with investigating things that we could observe and measure in some way (Myers, 1997; Hancock, 2002). Precisely, quantitative research is more concerned with questions about: how much? How many? How often? To what extent? Examples of quantitative methods include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modelling (Myers, 1997).

Conversely, qualitative research originated from social sciences and attempts to increase the understanding of why things are the way they are in our social world and why people act the ways they do (Myers, 1997; Hancock, 2002; Silverman, 2005). That is to say, it aims to help us understand the world in which we live and why things are the way they are. Examples of qualitative research approaches are action research and case study research. Action research is a research method that solves immediate practical problems while expanding scientific knowledge (Avison et al. 1999). Through actions researchers are concerned with creating organizational change and simultaneously study the process. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 1994). Case study research can be applied to explain complex causal links in real-life interventions; to describe the real-life context in which the intervention has occurred; to describe the intervention itself and to explore those situations in which the intervention being evaluated has no clear set of outcomes (ibid).

In the field of information systems, researchers have used qualitative approaches to study social, political and managerial issues that impinge IS implementation and use in organizations (Myers, 1997). Moreover, different research in the area of health information systems in developing countries have used qualitative research approaches such as case studies and action research, to study problems associated with the current systems and engage in an intervention process to change the situation (see for example, Lagebo et al. 2005; Hamad, 2005; Lungo, 2003; Mosse, 2004).

Silverman (2005) argue that, application of either quantitative or qualitative or both research approaches should strongly be based on the research objectives rather than on the ideology of the superiority of either method. Nonetheless, McBride et al. (1994) affirm that researchers can mix both qualitative and quantitative research approaches within a stage of the study or across two of the stages of the research process. For example, a researcher might conduct a survey and use a questionnaire that is composed of multiple closed-ended or quantitative type items as well as several open-ended or qualitative type items. Another example is that a researcher might collect qualitative data but then try to quantify the data.

This study however, relied heavily on the qualitative approach and very mildly on the quantitative methods. In order to understand the challenges in the integration of HIS, I needed to understand people and institutional behaviors and practices, which in one way or the other impacted the integration processes. This made the choice of qualitative methods more appropriate for this research, for as Silverman (2001) argues, qualitative research is concerned with exploring people's everyday behavior. Also qualitative methods are conducted in natural settings and are characterized by the use of data in the form of words rather than numbers (Mukama, 2003). Being conducted in a natural setting, qualitative methods are believed to have emergent characteristic where the researcher gets first hand knowledge of issues as they present themselves in the field (Cresswell, 2003). This emergent characteristic also made qualitative method more favorable for my research, because health informatics was a new field to me. Therefore, the use of qualitative methods helped me to gradually learn new issues related to public health as they emerged in the field.

More specifically, the qualitative methods used in the study included semi-structured interviews, meetings, participant observation, and document review including the previous and the new data formats, user manuals and district health plans and reports. However, quantitative approach was mildly drawn upon in one area of this study, where qualitative methods were used to collect data related to health workers´ education levels in different health units and later I quantified the data and calculated percentages covering different education levels of the health workers (see Table 5.7 and Table 5.8).

In the subsequent sections, I present more detailed description of the research design followed in this study and the data collection techniques used.

4.2 Research Design

This study was done as part of an ongoing action research of health information system restructuring process that is undertaken by the Health Information System Program (HISP) in collaboration with the MoHSW and other development partners in Zanzibar. HISP is a global research and development network on health information systems by the University of Oslo in Norway, which started in South Africa in 1994 and thereafter spread to other developing countries such as Ethiopia, Vietnam, India, Mozambique, Botswana, Tanzania Mainland, Malawi and Nigeria. In all these countries, the primary goal of HISP is to design, implement, and sustain Health Information System through participatory approaches to support local management of health care delivery and information flows (Braa et al. 2004a). In 2005, Zanzibar became a node in the HISP network, when the University of Oslo was contracted by the MoHSW to engage in the restructuring of the HIS. Since then, a number of activities were undertaken ranging from standardization of the data sets; redesign of new data formats standards; adaptation of a software standard and institutionalization of these standards in different levels of the health system.

Getting at the middle of this action research in Zanzibar to study the HIS integration challenges whose some of its initial activities were already implemented by other HISP team members, use of in-depth case studies and engagement in the on-going actions on the ground was deemed important. Case study is an appropriate approach for bringing an understanding of a complex issue, which could be a program, event, an activity or a process involving one or more individuals and using a variety of data collection procedures over sustained period of time (Cresswell, 2003). Since the aim of this research was to develop a comprehensive understanding of the challenges encountered in the processes of integrating the HIS, case study proved to be a feasible approach.

In understanding the challenges in the processes of HIS integration in Zanzibar, the study concentrated in three districts, Urban and West districts in Unguja Island and Chake Chake

district in Pemba Island, as sample settings. The choice of the three sites was motivated by the social, political and economic differences that were envisioned to affect the integration processes.

By participating in the actions taking place on the ground which included activities like institutionalization of standards and customization of reporting tools created an opportunity to understand the challenges in the process of HIS integration. According to Dick (2002) as cited by Lungo (2003), actions in a research bring about change in some community or organization and increase understanding on the part of the researcher or the client. For instance, I participated in the training of health workers in twelve health units situated in West and Chake Chake districts described above, so as to develop understanding of the challenges of institutionalizing the standards at the periphery levels.

During the course of this study, I was accompanied with my colleague who was doing a study in the same settings and in the same domain of health information systems. Since our topics were similar in some aspects, we went together in doing activities such as data collection through interviews and participant observation in meetings and in conducting trainings at health facility and district levels. In this thesis 'we' is used to refer to activities carried out together.

4.3 Data Collection Techniques

The primary sources of data were in-depth interviews, participant observation, documents review, and software analysis.

4.3.1 Interviews

Interview is one of the most common and most powerful ways to understand human being for it gives room to both the interviewer and interviewee to clarify opinions and points of view through interactions (Creswell, 2003). Interviews can be highly structured, semi structured or unstructured. *Structured interviews* consist of the interviewer asking each respondent the same questions in the same way (Hancock, 2002). A tightly structured schedule of questions is used, very much like a questionnaire.

Whereas, *semi structured interviews* (which sometimes referred to as focused interviews) involve a series of open-ended questions based on the topic areas the researcher wants to cover. The open-ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail (ibid). On the other hand, *unstructured interviews* have very little structure at all (ibid). The interviewer goes into the interview with the aim of discussing a limited number of topics, sometimes as few as one or two, and frames the questions on the basis of the interviewee's previous response. In this study, semi structured interviews were used, where interviewees were asked open ended questions to elicit their viewpoints related to the HIS integration processes.

At the health unit level, 38 informants were interviewed, 19 in Unguja and 19 in Pemba. The goal was to gather impressions and perceptions of the health workers in relation to the previous and the newly integrated HIS, which ultimately helped me to learn micro level challenges that impinge the integration processes. At this level, all the interviews were conducted in the health unit premises and took 45 minutes up to one hour. As the upshot of that, most of the interviews were carried out in a group, which in most cases was comprised, of all the health workers in that facility. The open ended nature of semi-structured interviews helped me to explore and discuss several issues related to my topic that emerged during the interviews which were not in my interview guide (See the interview guide in Appendix B).

Informants at the health unit level sometimes became reluctant to give information that is linked with the higher levels, fearing of being reprimanded or losing their jobs. To allay this fear, it was made clear to the health workers that every disclosed information would be made anonymous, whereby no name of either the health facility or staff would be attached on it. In addition, being a member of the HISP team, I made the interview to carry a consultancy feature, where I spent some time discussing and solving some of the reported problems related to the new data standards. This in turn created an atmosphere of trust between the health workers and me as a researcher, and thus helped me to elicit more information related to the previous and the new standards. Table 4.1 depicts number of informants in each health unit visited both in Unguja and Pemba.

	Health Units Visited	Number of the Informants
Pemba	Ziwani	3
	Gombani	2
	Chake Chake	4
	Ndagoni	4
	V/Cottage	4
	SDA	2
	Total	**19**
Unguja	K/Samaki	4
	SoS	1
	Fuoni	4
	KmKm	3
	Welezo Camp	3
	Magogoni	4
	Total	**19**
Grand Total		**38**

Table 4.1: Number of Interviews conducted at the health unit level

At the district level the interviews involved the following informants: District Medical Officers, District Health Officers and some vertical programs data managers. The gist of the interviews at the district level was to understand the challenges related to the process of institutionalizing the software standard -DHIS, which was done through formal and informal trainings. I also conducted some informal interviews with different District Management Team members on a one to one basis as a way of confirming and clarifying some of the issues I observed or covered in the formal interviews. In addition, HISP team members involved in the implementation of DHIS were interviewed as an attempt to uncover the challenges related to customizing, training and rolling out the software. At the national level, I interviewed different vertical programs general managers and HMIS officials. The goal was to learn macro level challenges that impinge the HIS integration processes. During the interviews different programs managers' viewpoints in relation to the new data sets and tools were gathered. Table 4.2 depicts the number of informants interviewed at the district level and higher levels of the health system.

Name /Position	No. of the Informants
District Medical Officers	3
Vertical programs data managers	7
Programs general managers	2
National level HMIS officials	3
District Health Officers	3
HISP team members	2
TOTAL	**20**

Table 4.2: Number of Interviews conducted to the district levels and above

4.3.2 Document Review and Software Analysis

A wide range of written materials can produce qualitative information; and they can be particularly useful in trying to understand the philosophy of an organization as may be required in action research and case studies (Hancock, 2002). Document analysis involves making sense out of texts and images, which help the researcher to get information to supplement other forms of data collection techniques (Creswell, 2003).

Name of the document	Reason for its inclusion
Previous data collection formats	To learn and understand the level of fragmentation and the magnitude of changes made and how they were standardized and integrated
New data collection formats	They were used together with the old data formats to reach the stated goal above.
District Implementation Plan (DIP)	To understand data use problems facing district officials when it comes to preparation of the DIP
District monthly report	It was used implicitly to specifically assess use of DHIS software at the district levels and generally the understanding of the newly integrated HIS.
Zanzibar Health Sector Reform Strategic Plan (II) (2006 –2010/11)	To understand how the integration of the HIS is broadly linked up with the health sector reform pr
Field visit HMIS assessment report (January, 2006)	This document opened door for me to get the perspective of other stakeholders in relation to the problems and opportunities in the HIS integration process.
DHIS user manual	Used to learn the challenges in adapting the user manuals to reflect the newly customized software and the Zanzibar HMIS context in general.

Table 4.3: Documents reviewed and the reason for its inclusion in the study

In the field, I identified and analyzed different documents including the previous and the new data formats, district implementation plans, district monthly reports, Zanzibar Health sector reform strategic plans document, field visit HMIS assessment report and the DHIS software user manual. The reason for the inclusion of these documents is summarized in Table 4.3.

Moreover, the DHIS software was considered as another source of data from the field. The software was analysed to identify the challenges in adapting it into the Zanzibar health care context.

4.3.3 Participant Observations

Observations are used in field sites, where field notes on the behavior and activities of individuals in the research site are taken (Creswell, 2003). As a HISP team member; I played the role of a participant observer by taking part in the ongoing activities on the ground such as institutionalization of the standards through trainings, customization of reporting tools to fit the needs of different stakeholders (vertical programs, districts) and supporting health workers through on-job trainings.

Furthermore, I participated in different meetings which involved HMIS top management, vertical programs managers, donors, HISP team, district health officers and health unit staff. The meetings were conducted in a quarterly basis at the district and zonal levels.

Districts level quarterly meeting

HISP team and HMIS official meeting

Figure 4.1: Some of the meetings I attended as a participant observer

During the meetings and discussions, I took notes as participant observer and sometimes I engaged in the discussions by suggesting how to solve some of the problems related to the functioning of the integrated health information system.

4.4 Data Analysis and Interpretation

In qualitative research, there is no clear distinction between the data collection and data analysis as is commonly done in quantitative research (Avison and Myers, 2002). Analysis and interpretation of qualitative data is a continuous process that starts in the research field involving processes of data collection and validation and its interplay with some given theoretical concepts.

During this study, data from the fieldwork was transcribed, expanded and organized in a memo right after the fieldwork. This was done so as to make sure that most of what was discussed during the interview or after the observation was well documented before forgetting the details. At the end of each fieldwork day, the expanded data in the memo was analyzed and categorized in an analytical memo, which helped me to see how satisfactory the collected data met my research objectives. Anything that was unclear from the fieldwork was followed up for clarifications in the subsequent days of the fieldwork. This increased both the validity and the reliability of the research findings.

Content analysis was drawn upon to write up and analyze the empirical materials. Content analysis is a procedure for the categorization of verbal or behavioral data, for purposes of classification, summarization and tabulation (Hancock, 2002). The content can be analyzed on two levels. The basic level of analysis is a descriptive account of the data: this is what was actually said with nothing read into it and nothing assumed about it (ibid). The higher level of analysis is interpretative which is concerned with what was meant by the response, what was inferred or implied (ibid). Both levels of analysis were drawn upon to present the empirical materials where in some cases quotes were used to present the informants viewpoints and in other cases I reported what was implied or meant by the responder. The findings were classified into three major categories covering the standardization,

institutionalization of the standards and the results and problems related to the newly integrated HIS. However, minor categories were also identified covering the challenges under each major category.

4.5 Reliability and Validity of the Data

As described in the above sections, during the fieldwork triangulation technique was employed where a number of different data collection methods were used which included semi-structured interviews, document analysis, participant observation in meetings and engagement in the on-going activities on the ground. Validity according to Hammersley (1990) as cited by Mukama (2003) refers to the extent to which the research accurately represents the social phenomena to which it refers and the degree to which the research methods measure or record what they aim to measure. The multi-method approach used in this study helped me to clarify and confirm findings obtained by one method with same findings gathered using another method, which ultimately increased its validity. For instance, the review of the monthly reports at the health unit level demonstrated a poor understanding of the new data formats, which I presumed to have been caused by inadequate education levels of the health workers at that level. However, using participant observation, I engaged in a training exercise, which helped to confirm the hypothesis.

The multiple data sources used attempted also to ensure reliability of my findings. According to Hammersley (1992) as cited by Mukama (2003), reliability refers to the degree of consistency with which instances assigned to the same category by different observers or in different occasions. Also I spent prolonged times in the field which helped me to confirm some of the findings through informal discussions and working with the health officials at the districts. And in some other cases, I used the time to discuss the findings with the informants, for instance I held discussions about malaria program findings with the program's data manager who was an informant to make sure that every viewpoint was correctly reported.

4.6 Ethical Considerations and Study Limitations

This study maintained ethical issues during the fieldwork through gaining written permission prior to the commencement of fieldwork from the Ministry of Health and Social welfare and from the districts involved in the study (Appendix A presents the ethical clearance letters). In

addition, health workers consent was sought prior to conducting the interviews and the purpose of the interview was made clear to each respondent before hand. Explanation of my dual roles, as a HISP team member engaging in the implementation and as a researcher, helped me to win the health workers' consent, after realizing that I was also a problem solver rather than just a passive researcher.

The anonymity of the health workers and the health units was maintained by ensuring that the names of the health workers or their units were not used in reporting the results of the study. All patients' information that was classified as confidential was meticulously treated with utmost care and seriousness to ensure that none of it leaks out to other people or used directly in this study.

However, this study faced some limitations. For instance, one of the districts that were chosen to be involved in the study, had to be changed during the study after failing to find the responsible district officers due to many errands. This situation happened when we arranged training on the DHIS software for that particular district.

Due to electrical power rationing in Pemba, we were sometimes forced to work during night hours when there was power. Activities that had to sometimes be done during night hours included installation of DHIS, fixing computer problems and providing support on data entry. In addition, transportation to the health facilities was a big problem in Pemba. The public transport in Pemba was unreliable which was sometimes caused by lack of gasoline and small number of commuter buses. Hiring a taxi was also a problem because it is very difficult to find one. Sometimes it was difficult to make follow up to health facilities located in remote areas.

Chapter 5

5. EMPIRICAL FINDINGS

This chapter presents the findings from the Zanzibar case study where I seek to explore the challenges in the integration of the HIS. The findings have been obtained through in-depth case studies and active involvement in the processes of integrating the HIS.

The rest of this chapter is organized as follows: section 5.1 presents the findings covering standardization of data sets; the findings on the institutionalization of the data sets and data collection tools through training is presented in section 5.2 and adaptation and implementation of the software standard follows in section 5.3. Findings covering institutionalization of feedback mechanisms is presented in section 5.4. The chapter is finalized by section 5.5 covering the findings presenting the results and problems faced by the newly integrated HIS.

5.1 Standardization of Data sets

To epitomize the challenges of integrating the fragmented reporting systems, in each section below I commence by explaining briefly the vertical program associated with a particular data set and data collection tools to shed light to the challenges they generally pose in the standardization and integration processes.

5.1.1 Immunization Data set

The Expanded Programme on Immunization (EPI) is a national program that is tasked with providing vaccinations to children and mothers in order to prevent communicable diseases. The program's broad areas of activity are routine service delivery, disease surveillance and supplemental immunization to eradicate polio, control measles and eliminate neonatal and maternal tetanus. Two zonal and ten district management teams implement the immunization program. EPI services are provided free of charge and is the responsibility of the zonal and district management teams. The program is funded partly by the government and by development partners such as WHO and UNICEF. The national level provides logistical support and technical input for the zones and the districts. Based on the vaccination services, the program maintained an information system, which provided information for planning,

control of antigens, monitor vaccination coverage and the quality of the services in general. That system which was paper based at the periphery and district levels and computer based (using Excel and Epi Info) at the national level, have very strong follow-up mechanisms, which made it to be very popular to health officers at the periphery and district levels.

The program has two data managers, one for Pemba and another for Unguja who made sure that EPI data is collected from all Health facilities and submitted to the district, where the District Health Officer (DHO) compiled district immunization report and submitted to the zonal data manager in a monthly basis. The monthly reports were of two types, vaccination and vitamin 'A' report and a disease surveillance report. Any shortcomings (e.g. over reporting, under reporting) with the monthly reports from the Health facilities were uncovered and followed up by the managers who went through all the reports before/after a district report was compiled. Consequently, the EPI information system procedures and practices were firmly implanted in the minds of the data collectors and DHOs in such a way that if one mentions data collection to them, quickly they would think of EPI. While this may be considered as a good work practice, however, as explained later, changing these mindsets of the health workers to consider other data sets as legitimate and effectively work on them proved to be relatively difficult.

The standardization process started by revision of both primary[2] and secondary[3] data collection tools for the vaccination and vitamin 'A' data set[4] that was relatively stable compared to other data sets.

[2] Primary data collection tool (s) as applied in this study refers to the tools which are mainly used at the health facility for data collection during daily patient (s) encounters. Eg: patient registers, drugs dispensing registers, tick sheets etc.

[3] Secondary data collection tool (s) refers to the tools which are used at the health facility for monthly aggregation of data from the primary data tools and transmitted to the higher levels of the health system. E.g. monthly disease surveillance report, monthly immunization report, etc

[4] Data set may be defined as a set of the most important data elements, selected from all primary health care programs that should be reported by health service providers on a routine basis, with the aim of being able to generate indicators that monitor the provision of health services in an integrated manner (Shaw, 2005).

Tool Name	Major stakeholders	Type
Immunization register (register new babies)	EPI	Primary
Vaccination and Vitamin 'A' Supplement tick sheet	EPI	Primary
Vaccination and Vitamin 'A' report	EP & Nutrition	Secondary

Table 5.1: Tools revised to form the new data set for Immunization

Following cyclic process and participation of different stakeholders from EPI (both in Zanzibar and East Africa EPI Center), HISP and from the MoHSW, the data set was harmonized and refined which led to the data elements being halved. Changes which were unanimously made in the secondary data tool ranged from removal of unnecessary data elements such as age groups (0-12moths, 1-5 years), population under one year (semi-permanent data) to introduction of descriptive formulas for calculating antigen wastage and its percentage.

The primary data collection tools, which did not undergo major changes, were in Swahili (local language) unlike the secondary tool, which was in English. The stakeholders (EPI and MoHSW officials) and the HISP team noted this as a source of confusion to health workers but it was agreed to leave it unchanged as an attempt to reduce the magnitude of changes. The minimal changes made and massive participation of the major stakeholders in the redesign and testing of the data set lessened the tension between what should be removed and what should be left unchanged. However, a number of revisions and testing of the data collection format was done before it was agreed to be stable and simple to the data collectors.

5.1.2 Disease Surveillance Data set

Disease surveillance information system is a subsystem of the routine health information system, which is used for systematic collection and analysis of data and provision of information, which leads interventions to prevent and control infectious diseases. The disease surveillance reporting system was fragmented where different programs maintained their own systems leading to duplication and gaps in data collection (Hamad, 2004). Statistics unit of the MoHSW maintained a monthly disease surveillance system whose data served many

stakeholders including malaria program. This system was based on a stroke form, which was daily filled at the HF and submitted monthly to the district level without leaving a copy at the point of data collection. As described above, EPI maintained its own disease surveillance system, where monthly immunization surveillance report from health facilities was sent to the district and directly submitted to the program. Major problems with the stroke form were high number of diseases (about 40) and age groups (8), sex categories that made the data elements to be very high (216) and lack of secondary tool for monthly reporting.

Tool Name	Major Stakeholders	Type
Stroke form (Tally Sheet)	Statistics Unit & Malaria Program	Primary
EPI monthly surveillance report	EPI Program	Secondary
Patient register (OPD register)	Statistic unit / HMIS	Primary

Table 5.2: The disease surveillance tools revised

The redesign process aimed at cutting down the data elements and integrating the two disparate systems to get one comprehensive disease surveillance system. Following a participatory prototyping approach, the work commenced by revising the stroke form which led to major changes such as removal of sex categories, reduction of age groups from eight to two (<5 and <5), removal of semi-permanent data (Number of staff and qualification) and reduction of the diseases.

The EPI tool was equally revised where diseases were halved and the age groups changed. New primary data collection tool called ‘OPD Tally sheet’ and a corresponding secondary reporting tool named ‘Monthly Disease Surveillance (MDS)’ was designed.

Nonetheless, these major changes spurred heated debate from major actors based on the reduction of age groups, removal of sex categories and the issue of integration of the two subsystems. One of the actors who was advocating age groups to be left unchanged by arguing that it is easy to augment small and many age groups to get the two (<5 and <5) rather than the opposite, created and circulated his own tool behind the scene. When asked why they did that, the answer was very clear,

> "*They have taken out almost all the age group categories and left what they feel will satisfy their needs, but how about us. They were supposed to take from us all the data that we want; otherwise the system won't be useful to us but only to them. So we tried to design it just to show them how it is supposed to look like"* (Manager, Vertical program, August 2006).

According to these actors, collecting almost everything will help them meet any data needs (currently unknown) from different stakeholders who normally come with different multiple data requirements.

> "*Our program is supported by donors who have multiple data requirements, that's why we collect 'enough' data which will help us meet their needs whenever they arise"* (Manager, Vertical program, August 2006).

However, this would violate the idea of essential minimum data set whose aim is to collect only the data which is "must know" and leave behind the rest, with the aim of reducing workload to data collectors and increase the quality of data collected. To quench this fire of what should be included and what should not, it was unanimously agreed to stick on the minimum data set as a starting point where other data needs would be added as those needs arise.

5.1.3 Reproductive and Child Health (RCH) Data set

Reproductive and child health services are integrated health services, which bring together different programs, and services such as family planning (FP), nutrition, delivery services, antenatal and postnatal services. All these services are delivered under one roof at the point of data collection. But the reporting system of these services was fragmented, where different primary and secondary reporting tools were used to cater for information needs of different stakeholders. Providing the periphery levels with standardized and integrated data collection tool for the integrated services was seen as a critical step in making the information more readily and easily available for use at all levels.

Tool Name	Major Stakeholders	Type
FP Register	FP	Primary
FP Day-to-Day book register	FP	Primary
FP Monthly Report	FP	Secondary
ANC Register	EPI	Primary
MCH attendance tick sheet	EPI	Primary
MCH monthly attendance report	EPI	Secondary
Postnatal care report	Safe Motherhood	Secondary
Children Nutrition Tick Sheet	Nutrition	Primary
Nutrition and ANC monthly report	Nutrition & Safe Motherhood	Secondary

Table 5.3: RCH services tools used in the previous fragmented system

In consultation and collaboration between different stakeholders, the work commenced by revising the family planning services monthly reporting tools. Major changes made ranged from removal of redundant data elements to reduction of age groups from seven to two. These changes were made based on the age groups requirements in the Millennium Development Goals (MDGs) family planning indicators. Ultimately, the family planning data elements were reduced drastically from 216 to 32 data elements. However, the primary data tools were not standardized. Family planning clients are registered in the tools randomly without any age categorisation. Monthly reports however, require them to aggregate the reports using age categories. Having, one hundred or more clients all of them mixed up, sorting them out in different age categories is both a time consuming and error prone exercise. As was learned by this study, health workers maintained their own improvised tally sheets to simplify the work of aggregating the monthly reports.

Nutrition and ANC services data was previously aggregated monthly at the health unit level and reported to the districts using one integrated data collection tool. Nonetheless, their primary data collection tools were separate. The National nutrition program manages nutrition services and the ANC services were under safe motherhood program, which is now called reproductive and child health program. Although each program relied on the monthly

report submitted from districts, according to one nutrition program officer, much of the data was hard to find.

> *"…. It has been very hard to get data from Pemba zone. Normally we relied on data from some few districts in Unguja"* (Vertical program officer, August 2006).

According to that official, that was due to lack of proper procedure (standardized) for data transmission between different levels. To ensure comprehensive data collection for the programs and other stakeholders, standardization of the nutrition and ANC data set and integrating it in the RCH data set was perceived indispensable.

Primary and secondary tools for nutrition services were harmonized and unanimously agreed to meet data requirements for children growth monitoring indicators. Antenatal services reporting tool was likewise revised where reduction and introduction of new data elements were the major changes made.

Malaria in pregnancy related data elements were among the new data elements introduced. Zanzibar Malaria Control Program (ZMCP) is involved in the prevention and treatment of malaria among pregnant women attending in PHCUs and PHCCs for RCH services. As part of a comprehensive antenatal care package, ZMCP initiated Intermittent Presumptive Treatment (IPT) of malaria in pregnancy using SP which is administered in two doses; the first between the 20th and the 28th weeks of pregnancy and the second, between the 28th and 36th weeks. When this service was introduced in 2004, according to the manager, data collection tools and procedures were not put in place to capture data that will be used for monitoring and evaluating the services.

> *"We were planning to come up with a way to capture data related to malaria in pregnancy services; but because it has been integrated in the RCH tool, we are now getting our data through the new tool. This has saved our resources (time, money, manpower etc) in designing and implementing a new tool just for that service"* (Manager, Vertical program, July 2006).

So integrating these data elements in the RCH tool has helped them not to come up with their own tool, which they were planning to have for that purpose.

Likewise, postnatal reporting tool, which was previously run separately, was harmonized and aligned, and integrated with the reproductive health reporting tool. The number of data elements was reduced from twenty to four. Finally, delivery services and infant/maternal death reporting tools were also revised and ordered with the reproductive health reporting data set (See Appendix C for the samples of the previous and the new data formats[5] for RCH).

5.1.4 STI and HIV/AIDS Data set

STI and HIV/AIDS services are delivered in all hospitals and in some selected health facilities in Zanzibar. Zanzibar AIDS Control Program (ZACP) manages these two services. Different donors such as the Global fund, CDC, UNDP, UNICEF, WORLD BANK and WHO, are funding ZACP. To ensure effective use of their funds, according to the program data manager, each donor has a number of indicators[6], which require huge amount of data to be collected.

> *"… all of these donors have different indicators for monitoring and evaluating their activities. This is a challenge because our data collection tools need to satisfy calculation of all the indicators"* (Manager, Vertical program, August 2006).

Nevertheless, the United Nations volunteer specialist on HIV/AIDS in Zanzibar observed that Zanzibar was lagging far behind other countries in the region in developing "concrete strategic" data on HIV prevalence, a factor which was impeding concerted efforts in the overall fight against HIV/AIDS (IRIN, 2002).

[5] The terms 'data format' and 'data collection tool' are interchangeably used to mean the same thing.

[6] Iindicator is used in public health sense to signify information used to measure the extent in which health targets are met (e.g. **Target:** Have halted by 2015 and begun to reverse the spread of HIV/AIDS **Indicators:** HIV prevalence among pregnant woman aged 15-24, Condom use rate, Condom use at last high-risk sex). An indicator is calculated from data elements as a rate or ratio.

As an attempt to meet data needs, ZACP relies on a number of data sources such as blood banks, hospitals, health facilities and sentinel sites. The HIV/AIDS data come from individuals voluntarily checking their HIV status and testing in Voluntary Counselling and Testing (VCT) centres, pregnant women from antenatal clinics, blood donors donating blood and patients visiting health facilities and hospitals showing symptoms of AIDS. Most Health facilities/hospitals running VCT services provide STI services as well. The hospitals and the Health facilities collect data routinely using registers; STI and VCT book registers and HIV test request forms.

Tool Name	Major Stakeholders	Type
STD Register	ZACP & Medicos Del Mundo	Primary
VCT Register	ZACP & Medicos Del Mundo	Primary
HIV test request forms	ZACP	Primary
VCT quarterly report form	ZACP	Secondary

Table 5.4: Tools for STI and VCT services, used for the formation of the new data set

However, STI was funded by a different donor (Medicos Del Mundo[7]) and hence maintained its own reporting system. All the resources such as registers and other supplies used in the Health facilities running STI services were supplied and monitored by that donor. Monthly report is extracted from STI register by the donor who sent a copy to ZACP office. There was no secondary data collection tool for aggregated monthly reporting. Unfortunately, the STI project ended at the beginning of the year 2006 but the donor left the health facilities with resources to run for one year under the management of ZACP. Since that time, the Health facilities are providing services and recording data in the registers but according to one health worker the data they record has no owner anymore.

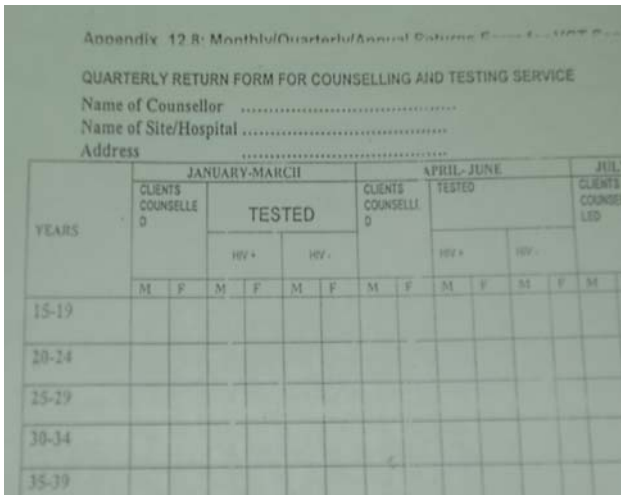
> "*…After they have finished their program, we have not seen anybody coming to collect the data. You can see, we have all the reports starting from March till now with us, no one has asked for them*" (Health officer, October 2006).

[7] Medicos Del Mundo is an international non governmental organization which was providing STI services in Zanzibar since 2002 to 2006

The VCT services data is monthly reported using the HIV test request forms that are routinely filled at the point of service delivery in every patient encounter (see figures 5.1.and 5.2).


MINISTRY OF HEALTH
REQUEST FOR HIV TEST

Figure 5.1: Request for HIV Test form routinely filled at the health facility and monthly submitted to the ZACP


QUARTERLY RETURN FORM FOR COUNSELLING AND TESTING SERVICE
Name of Counsellor .....
Name of Site/Hospital .....
Address .....

YEARS	JANUARY-MARCH						APRIL- JUNE					
	CLIENTS COUNSELLED		TESTED				CLIENTS COUNSELLED		TESTED			
			HIV+		HIV-				HIV+		HIV-	
	M	F	M	F	M	F	M	F	M	F	M	F
15-19												
20-24												
25-29												
30-34												
35-39												

Figure 5.2: Quarterly counselling and testing services report filled at the health facility level and sent to the ZACP.

Only patient numbers are posted on these forms for confidentiality reasons. Quarterly reports are also collected from health facilities, which accumulate data from VCT registers, counselling registration forms and the Request for HIV form. Though the VCT register is formalized, some health facilities use their own improvised register books that barely provide the details required by the monthly and quarterly reports. Each district was given a computer and a printer to monthly aggregate, process and analyse these routine data from Health facilities using Epi info program. In most of the districts this didn't work as explained by the program data manager,

> *"… HIV program installed computers in every district and trained all DHOs some computer basics and data analysis using Epi Info, but most of them do not remember even how to open the program. They are busy with other business*" (Manager, Vertical program, July 2006).

This led to disintegration of the data flow, where only in few districts data is being aggregated and processed, most of the reports go straight to the program zone (for Pemba) or main office where it is entered in Epi info program. According to ZACP data manager and as observed from previous reports, the data collected from health facilities suffer from variety of quality problems such as incorrectness, incompleteness, inconsistence and incomprehensiveness.

In an effort to change the vertical reporting practice, a new integrated data set for STI and HIV/AIDS was proposed to ZACP and to the donors (Medicos Del Mundo) by HISP and HMIS unit. As explained above, the program collects huge amount of data. This was recognized as one of the impediments of achieving minimum data set. To avoid this, it was collectively agreed to start with the 'must know' data elements that will help calculate the MDG indicators related to HIV/AIDS, where the rest will be added as the needs arise. This approach was taken to give leeway to stakeholders to learn more the significance of minimum data set concept.

STI & HIV/AIDS monthly reporting tool was designed by targeting data elements that will be used to calculate the MDG indicators from the two registers, counselling registration forms and the Request for HIV Test form. Based on the new reporting system, all primary data tools and a copy of the monthly aggregated report is left at the point of data collection to serve immediate information needs to the local planning and decision making processes.

5.1.5 Maternity Data set

Maternity services are offered in all hospitals and primary health care centers (PHCC) in Zanzibar. The PHCC are under the DHMT and therefore maternity wards report to the district. This being the fact, maternity data set was deemed important to be revised and integrated in the district health data repository. The previous maternity reporting practices were marginally fragmented compared to other data sets, most of the data was sent to Safe Motherhood program (the major stakeholder for maternity data). The reporting frequency was done quarterly from the health facilities to the districts where it was manually aggregated and sent to the vertical program.

Tool Name	Type
Maternity ward report	Secondary
Comprehensive care post abortion report	Secondary
Neonatal deaths report	Secondary
Maternity Ward register	Primary

Table 5.5: Tools harmonized to form the maternity data set

A number of reports were used such as maternity ward report with seventy five data elements, comprehensive care post abortion report with ten data elements and neonatal deaths report with five data elements. This fragmented reporting practice was recounted as one of the de-motivating factors of immediate information use at the point of data collection. To resolve this dilemma, it was agreed that the data sets should be standardized and integrated to form one comprehensive reporting tool. In a collaborative work between care providers, HISP team and some HMIS officials the number of the data elements was cut down from ninety to thirty six essential data elements and the different reporting tools harmonized and aligned to form one reporting tool. The reporting frequency was also changed from quarter to monthly reporting practice.

Other new data sets and data tools were introduced for management of drug supplies and assessment of community outreach and health education programs. These tools are mainly used at the periphery level for both patient and health unit management. The tools include drug stock for PHCU and PHCC, daily dispensing register and drugs return report, community outreach assessment and health education assessment tools.

Following hereunder is Table 5.6 indicating summary of primary and secondary data collection tools for all the revamped and the newly introduced data sets above.

Data tool type	Tool Name
Primary tools for routine data capture	OPD Register
	OPD Tally Sheet
	Children Nutrition Tick Sheet (Hali ya Lishe ya Watoto)
	Immunization and Vitamin 'A' Supplement Tick Sheet
	Reproductive Health Tick Sheet
	Daily Dispensing Register
Secondary tools for monthly reports	Disease Surveillance
	Immunization and Cold Chain
	STI and HIV/AIDS Management
	Reproductive and Child Health
	Maternity Ward
	Drugs Stock for Cottage Hospitals
	Drug stock for PHCU
	Drugs return
	Community Outreach Assessment
	Health Education Assessment

Table 5.6: Summary of the new standardized data collection tools

In summary, agreeing on the data elements to be included in the data sets standards was not straightforward; there has been some 'pull and push' between the stakeholders. As described above, almost each data set is associated with a vertical program which has multiple donors with high heterogeneous demands of data. This increased the pressure of wanting to include almost everything in the standards. As commented by one HMIS officer, it is hard to satisfy every stakeholder:

> *"It is difficult to satisfy all the vertical programs and all the multiple levels of the entire health system with multiple requirements. Some of them have their own agenda to continue with the previous paper system. Aligning them all at once presents a serious challenge, which requires multi prolonged approach. Things can not be changed overnight* (HMIS officer, July 2006).

Though participation of key stakeholders in the standardization and integration of the data sets and data tools above was an important strategy in the whole process but as was pointed out by one HMIS Officer, low capacity and sometimes wrong choice of the representatives presented problems in the process.

> *"… some vertical programs sent some participants who could not say even a single word about the type of data they collect"* (HMIS Officer, July, 2006).

This was underscored by another HMIS official who stressed that participatory approach is a formality rather than a technique to get their views included in the design process.

> *"…We invited participants' from every district but the problem is that most of them were there physically without giving any input in the discussion. Some of them were dosing waiting for the allowance and go back. That was mainly the case because of their knowledge being inadequate. Sometimes, participation is done as a formality to make sure that at least everyone gets information about what is going on, rather than taking part by giving their views"* (HMIS Officer, July 2006).

Limited knowledge on indicators and on public health issues in general to most of the stakeholders challenged the standardization process by increasing the pressure of what to include and what should not.

> *"Knowledge of indicators is not only a problem to the local levels (health units and districts) but also here at the national level. Most of the health officers have very limited knowledge on indicators"* (HMIS officer, July 2006).

Nonetheless, capacity building was suggested as a mechanism to mitigate the problem.

> *"… I think capacity building is central to make sure that those involved understand well the subject matter so that they can give their sentiments"* (HMIS Officer, July 2006).

5.2 Rollout and Training of the Data Formats Standards

After standardization of the data sets and design of corresponding data collection tools, the tools were pre-tested in the pilot sites until they were deemed stable for circulation and use. That being the case, the next step was to institutionalize the standards through training. In an attempt to involve the districts in the process, the tools were handed to DHMTs to circulate to their respective health facilities. This was preceded by training on the new data formats that was conducted in January 2006 and brought together DHOs from all districts in Unguja and Pemba. The aim was to equip the DHOs with knowledge on the new data formats so that they may take the role of change agents to their respective health facilities. This training of trainer (ToT) cascade approach was also attempted as an effort to minimize costs and as a way to slowly transfer ownership of the HIS from HISP to the DHMTs.

However the approach used failed partly because the DHOs were always busy, so they could not find time to train the data collectors and other DHMT members. Following complaints from the health workers about not understanding the new tools, the HMIS Unit in collaboration with the HISP team adopted a clustering approach where at least two health workers from each HF were summoned at the district level for one day training of the sixteen data collection tools. This exercise was conducted in March 2006 and was run in both parts of Zanzibar, Unguja and Pemba. Table 5.6 indicates the tools trained. Nonetheless, the training approach used gave opportunity to the Health workers from the periphery level who could not participate in the standardization of the data sets and design of the tools, to give their comments and opinions on the new data elements and data collection tools. Though time was very limited, some of them were able to suggest some changes and ask some questions about the newly introduced data elements. The limited time (one day) allocated for the training coupled with high number of tools (sixteen) trained, led to misunderstanding of the tools.

> *"The time allocated for the training was not enough to comprehend all the details of the tools. Also we were trained on about sixteen data tools; this number is very high to understand everything in a single day"* (Health worker, July 2006).

The changing nature of the data set standards and the corresponding tools as vertical programs and other stakeholders came with major changes to be effected in the tools presented problems in the training exercise. An example of this was the EPI data set that was revised again after circulation and training for all the tools was conducted. This led to organization of another training, which was conducted at the end of March, 2006 by the EPI officers with their own funds in collaboration with the HISP team and HMIS. However this turned out to be advantageous to both the EPI and HMIS in general, for this gave an opportunity not only for training the immunization data tool but also other tools which were not clear in the previous training conducted in the entire country.

As an attempt to understand more the particularities of institutionalizing the standards at the periphery level through training, we (the two researchers, as explained in the methodology chapter) conducted training in eleven Health facilities, six in Pemba and five in Unguja.

KMKM PHCU – Unguja (July, 2006)

Ndagoni PHCU – Pemba (August, 2006)

Figure 5.3: Health unit level trainings on the use of data collection tools, data quality issues and data use (Source: Zanzibar Fieldwork, July & August 2006)

As explained below, inadequate education level was one of the major problems encountered, which in turn led to data quality problems such as incorrectness, inconsistencies and incompleteness. From Table 5.7 below, 53% out of 34 health workers interviewed both in

Unguja and Pemba, finished form three and acquired a certificate in health care. Those who finished form four were 38.2% and the remaining 8.8% finished form six. The problem of low education level of health workers is more pronounced in Health facilities located in the rural areas. Table 5.8 shows that out of nineteen health workers interviewed in Chake Chake district which is relatively rural compared to West district, 73.7% finished form three and 15.8% finished form four. In West district, out of 15 health workers 26.7% finished form three and 66.7% finished form four.

Education level	Number	Percentage
Form 3 + Certificate	18	53.0
Form 4 + Certificate	13	38.2
Form 6 + Diploma	3	8.8
Total	**34**	**100**

Table 5.7: Overall Education level of Health workers at the periphery level

District	Education level	Number HW	Percentage
West, Unguja	Form 3 + Certificate	4	26.7
	Form 4 + Certificate	10	66.7
	Form 6 + Diploma	1	6.6
	Total	15	100
Chake Chake, Pemba	Form 3 + Certificate	14	73.7
	Form 4 + Certificate	3	15.8
	Form 6 + Diploma	2	10.5
	Total	**19**	**100**

Table 5.8: Comparative education level of Health workers at the periphery level

The consequence of the inadequate level of education and poor knowledge of English language as was evident from the monthly reports at the district level was misunderstanding of some data elements, low arithmetic skills and English language proficiency problems.

Also as observed, the low level of education presented problems in the training exercise as most of the health workers could not grasp basic HMIS skills such as data quality issues, indicator calculation and data use in general.

In summary the institutionalization of the standardized and integrated data collection tools through training at the periphery level encountered the following problems: Relatively low education levels of the health workers, Financial problems to conduct formal training to all health workers for a longer period rather than one day as was the case, Lack of information officers who could take the role of change agent which led to the failure of ToT approach where DHOs could not find time to take that role and the Changing nature of the data set standards and the corresponding tools as more and more requests from the stakeholders was effected in the standards.

5.3 Adaptation and Implementation of Software Standard

The previous HIS was paper based from the periphery to the national level, with some vertical programs maintaining their own disparate computerised systems running in Excel and Epi info for processing and analysing routine data. However these two programs are not appropriate for routine data management. So after standardization of the minimum data sets, the next move was to adapt the data sets standards in software standard to be used for data processing and analysis at the district, zone, and national level and by the vertical programs.

The software standard is called District Health Information Software (DHIS) version 1.4 database application, which is the re-development of DHIS version 1.3 which has been used in the national HMIS in South Africa since 1999. This new version has been developed by the South African HISP team since 2004 but it was not yet firmly tested and put to use for actual data management. As such this was recognized as one of the serious challenges, for apart from being adopted and adapted for actual use in Zanzibar, it would at the same time being tested. Nonetheless, since the software standard was developed for the Southern African health care systems, contextual issues associated with technology transfer were the anticipated challenges of adapting it in Zanzibar health care system.

The work of adapting the standard started by creating the organizational units, the health care information system organization structure in the database, starting from the National level (MoHSW) to the point of data collection. The data elements and their corresponding groups for the standardized data sets were defined into the software system. Design of the data entry screens was accomplished by mimicking the paper based data collection tools. This process was cyclic as the data collection tools were not yet stable, requested changes in the paper forms triggered changes in the data entry screens in the software. The process went on until a statement was issued by HMIS to the stakeholders, to stop sending changes and give way for the implementation of the standard. Any other changes in the tools were therefore agreed to take place in the next review of the HMIS, which will be done at the end of every year.

5.3.1 Rollout and Training of the Software Standard

Implementation of the standard was commenced by installation of the software, which was done by the HISP team in January 2006 in all districts, in Unguja and Pemba. By this point in time, the software was not yet stable due to requested changes to the data tools from the stakeholders, which implicated changes in the software. However, the rollout was done for two reasons, first to be used to train the district officers how to use DHIS in general using dummy data values and secondly to give the officers time to exercise with the software before they can start to work on actual data. The training exercise was considered imperative in institutionalizing the software standards at the district and higher levels of the health system.

The training was therefore scheduled and conducted for five days to all DHOs and MCH coordinators covering data entry, processing and analysis using DHIS software. Nevertheless, from five allocated days only two days was used for DHIS training, where three days was spent in imparting basic computer skills, which turned out to be very problematic. As the upshot of that, time was not enough to cover in details the basics of the software standard. The number of days could not be increased because the allocated funds were for five days only. This led to ineffectiveness in the DHIS training where some officers could do very little as entering data with the software. Also after the training, the officers (especially DHO) didn't have time to use the acquired skills, which led to them forgetting

almost everything. This challenged the actual use of the system, as health workers could only do data entry by the software. The evidence of this was a statement given by one data clerk,

> "…. *Yes, we are entering data in DHIS, but how do we get it out?"* (Data Clerk; July 2006).

Another ostentatious evidence for this argument was the observation that preparation of the district monthly reports like Immunization report by DHOs (received training) was done manually, which took at least two to three days to aggregate all data elements from all health facilities in the district. Surprisingly, as I observed, all the data was already entered in DHIS by the data clerk, where monthly reports for say Immunization could be printed out for just a minute.

The training was also challenged by the absence of information officers at the districts, where DHOs were taken to assume this role. The observed problem with the DHOs was that most of the time, they were busy with other chores. The aftermath of this was that those who were entering data in the software were not the one who attended the training. Some other districts could do nothing when the DHOs were not there, and when asked why, the answer was that '*we are not the one who attended the training*'. The problem was rectified by training other district officers through on-job training in all the districts with this problem. Nevertheless, this approach was faced with another deadlock where most officers trained in this round were not among the DHMT members who are expected to use the information in planning, monitoring and in evaluating their activities. This hampered data use at the district level, where as noted above processed data is available in the software but with no one to use (manual system as usual).

In an attempt to get first hand knowledge of these issues at the district level, I participated in a training exercise in two districts, West district in Unguja and Chake Chake district in Pemba. This was done after learning the training shortcomings and challenges described above. The training focused on the DHMT members and any other district officers who would like to attend, where two main areas planned to be addressed were computer basics

and use of DHIS software in data capture, processing, analysis and presentation. In Chake Chake district we could hardly get one DHMT member to attend the training, which we scheduled for five days. All of them had all sorts of reasons for not attending such as '*I'm busy'*, *'I'm attending a workshop or a seminar'*, *and 'I have guests*', etc. While these may sound as legitimate reasons, but one of the district officers made it clear that,

> *".. The only reason is that, you didn't promise to offer them training allowance, which they are used to receive in occasions like these. This is a common practice here, unless you do that, you won't get them. Even those who claimed to be attending seminars and workshops, they have gone there because of that (the allowance)"* (District officer, August 2006).

We therefore conducted the training in the absence of DHMT members, with attendance of district officers, program managers, one HMIS data clerk and other health workers from Chake Chake hospital.

Figure 5.4: Computer and DHIS training in Chake Chake district, Pemba
(Source: Fieldwork Zanzibar, August 2006)

In West district, Unguja the situation was even worse for we couldn't get even one of them for more or less similar reasons as in Chake Chake district. We paid them several visits to see

if they would change their minds but without any success, until when they attended in a quarterly feedback meeting where they were confronted for their poor performance especially in data capture using DHIS software. Because of that, they started to call for help, where after, two DHMT officials were trained how to use DHIS to capture and analyse their data.

As the result of the training shortcomings, the implementation team chose a more pragmatic approach using on-job training through hands on exercises. Though this approach was more expensive and timing consuming to the HISP team, but the results were appealing. However, technical problems with the software were encountered in the early stages of the implementation process, which took much of the time (which was to be used in supporting users) of the team in doing repeated implementations of revised versions of the database. One of the challenges of the repeated implementation was to ensure uniform versions of the standard across all sites (districts, zones, vertical programs) taking into account the scarce resources (human and financial) available. Nevertheless, as the stability of the software increased, much of the time was spent in supporting the districts through on-job trainings.

In summary, the process of institutionalizing the software standard at the district level encountered following problems: Low or lack of basic skills in computer; Lack of funds to increase the number of days for both computer basics and DHIS training led to infectiveness to the use of the standard; Lack of information officers who could take the role of maintaining the software standards, process and analyze the data and give feedback to lower levels, instead this role was taken by DHOs who were always busy; Institutionalized practices such as allowances (transport money) hampered the training exercise, even if the training was scheduled and conducted in their premises most of them didn't attend because no allowance was promised to them before hand.

5.3.2 Implementation of the Analysis and Reporting tool

The DHIS database application enables collection, management of data and gives some standard reports, which do not include high level analysis based on the indicators defined in the system. Providing the stakeholders with analysis tool which is simple, adaptive (easily

adapted to suit their reporting requirements) and which can give different level of analysis was deemed indispensable in making the software standard more attractive and useful.

To fulfil this dire need, a reporting tool that enables the users at all levels to analyse the data and produce reports according to their particular needs was developed by the HISP team using Excel pivot tables. All the indicators and data defined in the database system were included in the reporting tool. When the database is updated say by entering additional data, the reporting tool can be refreshed and include the updates.

Templates including indicators and their graphical presentations are designed for each health program. Users can select health program (EPI, Malaria, RCH, etc. as can be seen in Appendix D.) and administrative level (e.g. health facility /hospital, district, zone, Zanzibar) and get indicators presented as graphs and figures. Each level (e.g. district, zone, national) can select and print appropriate reports for their area. The user is also able to make individual analysis and reports since all data and indicators are available in the pivot table. Installation and training on the use of the reporting tool was done to all districts, zones and at the national level.

Most of the vertical programs as stated in the standardization of the data sets, maintained their own information systems. Some were paper based and some computerised. Most of the computerised systems were running in Excel and Epi Info programs. As I have noted before, these programs are not suitable for management of routine data. In that respect, implementation of the database application and the analysis tool in the vertical programs was therefore significant.

By using incremental approach, the implementation process started by installation of DHIS1.4 and the reporting tool at EPI and Nutrition programs' offices in Unguja and Pemba. The reporting tool was customized differently to suit particular vertical program reporting requirements. One of the challenges encountered in the customization of the reporting tool was meeting the disparate reporting formats requirement, emanating from the different vertical programs.

For instance, EPI had a well formatted reporting procedure using excel which was mimicked in the new reporting tool, with addition of new functionalities. Before, data were manually entered in their excel program covering all districts in Zanzibar. Whereas in the new reporting tool, data from districts is sent to the vertical programs in a soft copy that is imported in DHIS and automatically read by the reporting tool presented in their preferred format. This has been one of the factors, which lured the vertical programs to align with the integration initiatives. Using the same logic, the implementation process is being scaled up to include other vertical programs such as Malaria, Family Planning, HIV/AIDS and RCH.

5.3.3 The New Information Flows

As was reported by Hamad (2004), the information flow was fragmented where some information from the PHCUs and PHCCs was directly submitted to the vertical programs and donors without passing to the district or zonal level. Definition of the information flow and data transmission procedures was thus cardinal if the integrated system is to be useful to all stakeholders. As depicted in figure 5.5 under the new information flow all the primary health care units and centres report monthly to the districts.

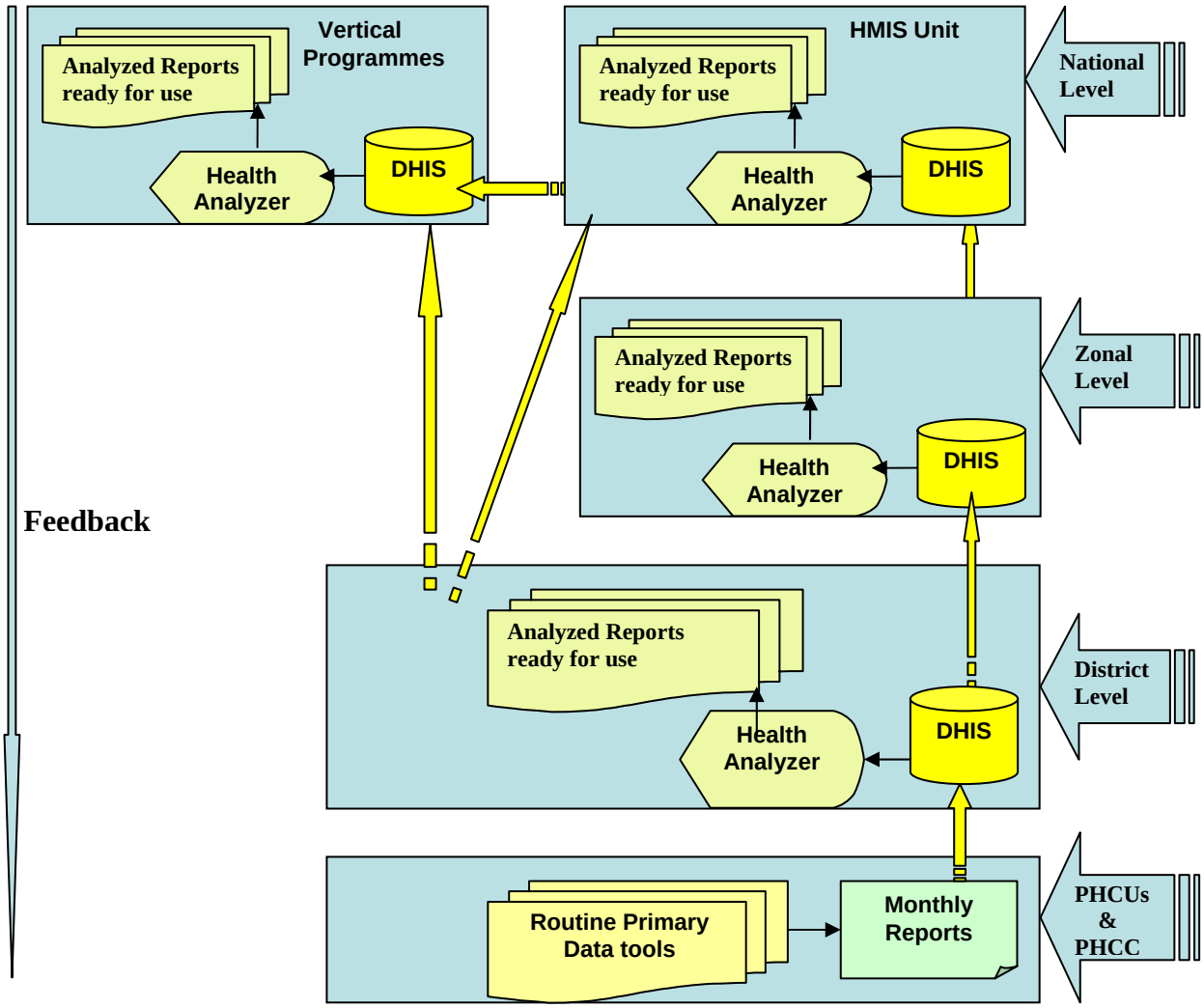


Figure 5.5: Integrated HIS data flows from health unit level to the national level

The reports are aggregated, processed and analysed using DHIS. Export files including all the reports are sent from the districts to the zonal level where they are imported in DHIS. Zone export files are finally transmitted to the national level and imported in DHIS, which forms the national data repository. Most of the vertical programs prefer to collect their data from the district as an attempt to avoid the delays in the transmission paths. Under the new transmission procedure, the district data repository is considered as an important node where data from all Health facilities converges and diverges to other stakeholders.

5.4 Institutionalization of Feedback Mechanisms

5.4.1 Quarterly Meetings at the Zonal Level

Feedback from the senior level to the districts was not commonplace especially on data related issues. As reported by Hamad (2005), there was no feedback whatsoever from the zone, be it Pemba or Unguja to the DHMTs. This was also confirmed through one official from the MoHSW:

> "*Before, we had no feedback mechanism, but now we have started doing it, through institutionalized quarterly meetings conducted to DHMTs and other stakeholders"* (HMIS Officer, July 2006).

Collaboratively, the implementation team and MoHSW introduced and institutionalized quarterly meetings where matters related to HMIS can be discussed and agreed upon. For instance, 1st quarter meeting drew participants from all districts, vertical programs, donors(DANIDA), HISP team and MoHSW to discuss HMIS performance in relation to data collection, collation, analysis and use. Each district was given its performance and compared with other districts in terms of report submission and data quality issues (completeness). Explanations were given by each district depending on its performance. Those who performed well explain clearly to others the '*magic*' behind their achievements. For instance some of the districts which performed very well in data capture using DHIS in the face of power problem during the day, explained to others their secret of working overnight in their office or at home (in one of the districts one official took the computer home to work from there to avoid traveling in the night). Likewise those who didn't perform well gave their sentiments, which were discussed, assessed and unanimously agreed whether they were valid reasons, or not. Reasons mostly cited for poor performance ranged from fuel problem, lack of electricity, computer and software problems to lack of data collection tools.

1st Quarter feedback meeting in Unguja

2nd Quarter feedback meeting in Pemba

Figure 5.6: First and second quarter HMIS feedback meetings (source: Fieldwork Zanzibar, 2006)

Table 5.9 depicts first quarter performance of each district in Pemba in terms of report submission for three data sets. From this feedback report, disparities in report submission performances were discussed, where reasons for good performance of the two data sets (EPI and RCH) were discussed and agreed that the mechanisms brought about the good performance be applied on other data sets to improve reporting performance in general.

District	Type of tool	No. submitted	Target	% submission
Micheweni	Monthly Disease Surveillance	20	39	51.28%
	EPI Report	35	39	89.74%
	RCH Report	36	39	92.31%
	OVERALL	91	117	77.78%
Wete	Monthly Disease Surveillance	36	57	63.16%
	EPI Report	53	57	92.98%
	RCH Report	39	57	68.42%
	OVERALL	128	171	74.85%
Chake Chake	Monthly Disease Surveillance	21	39	53.85%
	EPI Report	40	42	95.24%
	RCH Report	39	42	92.86%
	OVERALL	100	123	81.30%
Mkoani	Monthly Disease Surveillance	31	42	73.81%
	EPI Report	26	45	57.78%
	RCH Report	19	45	42.22%
	OVERALL	76	132	57.58%
Overall Pemba	Monthly Disease Surveillance	108	177	61%
	EPI Report	154	183	84%
	RCH Report	133	183	73%
	OVERALL	395	543	73%

Table 5.9: First quarter reports submission – Pemba (Source: Fieldwork Zanzibar, June 2006)

5.4.2 Quarterly Meetings at the District Level

Quarterly meetings are institutionalized routines that DHMTs use to pass information to health workers and discuss health related issues of the districts. HISP team used these meetings to discuss problems of data quality, availability of data collection tools, timely submission of reports to the district levels, clarification of new data elements for instance total head count, fully immunized and the like. Data use in outreach and health education programs was also emphasized as a move to improve quality and coverage of health services.

HMIS related matters were not discussed in these meetings before, therefore HMIS was not perceived as part and parcel of the districts routine activities. These meetings were used to change the attitude of the DHMTs and health workers towards HMIS. For instance, earmarking part of the district disbursement for HMIS related activities was not done by the district managers, claiming new disbursement. Due to the involvement of the donors in these meetings, clarification on this was made to the managers that HMIS is part of their normal chores and should therefore depend on the districts normal disbursements.

Quarterly meetings were also used to involve health workers in the design process. Participation of the periphery level in design of data collection tools was pertinent to ensure ownership of the information systems. In one of the meetings health workers were informed on the initiative of formulating Deaths register, where they were asked to give their views and comments on its structure.

Other incentive mechanisms in form of awards to the districts will be initiated to add up on the quarterly meetings where the district that will perform better will publicly be rewarded as a move to motivate other districts.

> "*We are planning to award certificates or congratulatory letters to districts which will perform better in terms of data collection, reporting and use, as an incentive to boost their commitment"* (HMIS Officer, July 2006).

The impact of the institutionalized feedback mechanism was observed by increased performance in terms of submission and completeness of reports. In the first quarter the overall report submission was 78% and completeness was 65% while in the second quarter report submission was 80% and completeness was 70%. These changes as observed during the meetings can be envisioned as to have been brought about as the result of the districts officials realizing that bad performance will not end up in their files but brought forward and discussed before other districts which have performed better. Furthermore, the idea of the badly performing district giving reasons for poor performance can also be considered as the source of the increased performance for that mechanism was used to make them more accountable and therefore committed.

5.5 Results and Problems Faced by the Integrated HIS

The data formats are standardized and integrated at the periphery levels that provide immediate information needs to the decision making processes. Monthly reports give summarized data that can easily be converted to indicators for both patient and health unit management. Health units can now be compared with others in terms of its performance using the standardized data elements.

For the first time in Zanzibar the districts have access to comprehensive information about health services from all public primary health care units and canters. The districts are now preparing their plans using data from HMIS; though the level of use is different from one district to another. Their monthly, quarterly and annual progressive reports are now informed with rich statistics from all the health units. For instance STI data was previously sent directly to donors without passing to the district, but now all the STI and HIV/AIDS data from all the PHCUs and PHCC converges at the district level.

> *"It's now very easy to prepare our monthly and quarterly reports. By using the analysis tools, we can get different level of analysis at a very short time. Things like top ten diseases for under fives and above fives and coverage of different health services like immunization is easily obtained without scratching our heads as before"* (DMO, October 2006).

At the national level, HMIS was used to inform the MoHSW budget speech preparation as was noted by one HMIS official,

> *"This time preparation of the ministry's budget speech was relatively easy and simple, because data from almost all PHCUs in Zanzibar was available at our hands. So the speech was well informed and thereby depicting the picture of the health services especially the primary health care services. As such the information was used to convince the State to increase the budget of the MoHSW, for it has been made clear of the health sector status in general using data from HMIS. Though we are still striving with some data quality problems, but we have started to enjoy first fruits of the information systems*" (HMIS officer, July 2006).

The availability of comprehensive data in all districts was used to depict the image of the health care interventions. For instance the presence of the routine data depicted the impact of *malaria rapid test.* Malaria in almost all PHCUs and PHCCs relied mostly on clinical diagnosis, which led to malaria cases to be statistically very high. Malaria diagnosis based on laboratory test was very rare; mostly it was done in Health facilities and hospitals with the required diagnostic tools like microscope.

Malaria rapid test program was run in selected districts (North 'A' and South) where all malaria complains were confirmed using laboratory tests. As seen from figure 5.7, comprehensive data from the selected districts and the remaining districts (diagnosis is mainly clinically based) was used to make comparisons between clinical and the laboratory based malaria diagnosis. The presence of comprehensive data undoubtedly made this possible.

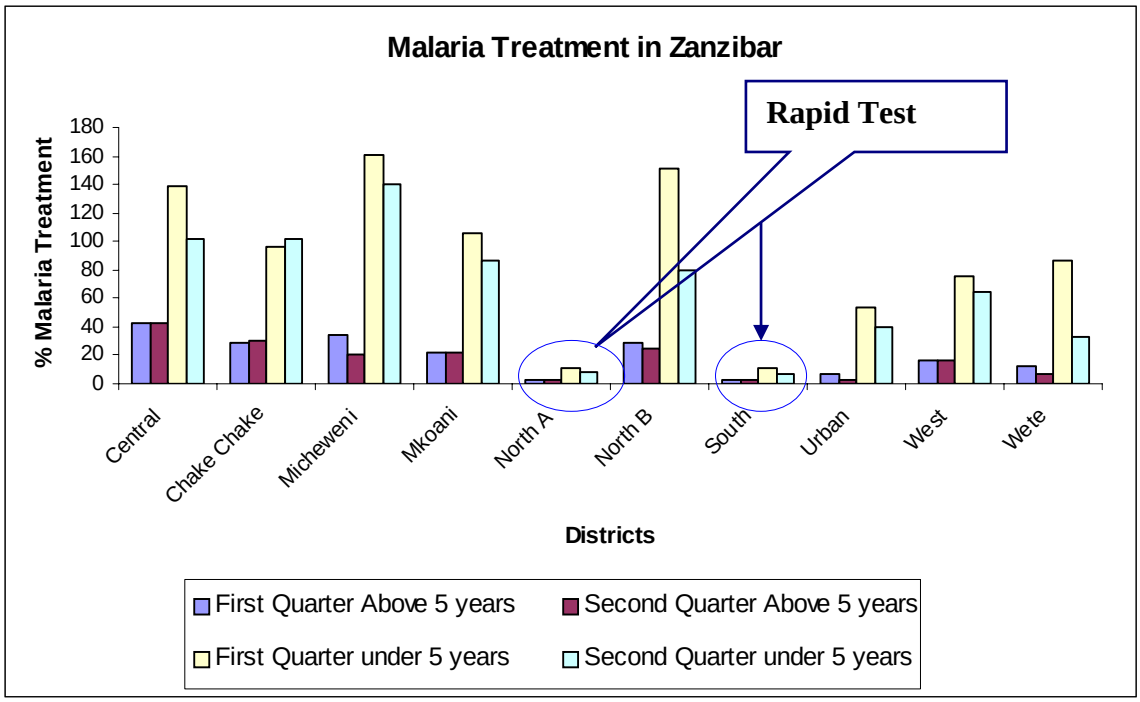


Figure 5.7: Malaria treatment graph depicting the difference between clinical and laboratory based diagnosis (Source: Zanzibar Fieldwork, 2006)

The results from the pilot project paved way for countrywide implementation of diagnostic tools in each health unit, which as pointed out was still underway.

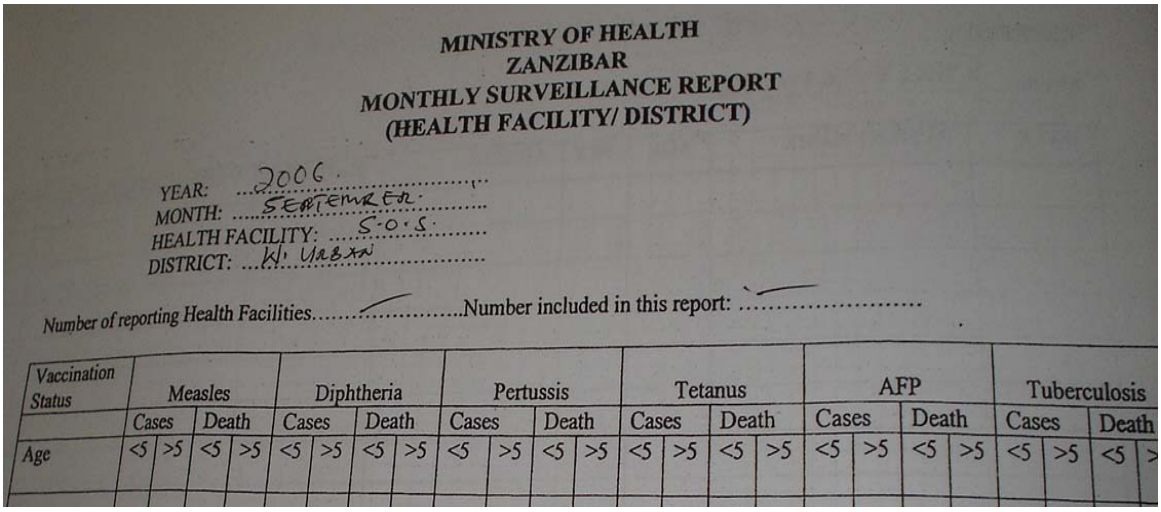
> *"The malaria program has a plan to distribute microscopes in every health facility in Zanzibar. At that juncture, all cases from the periphery level will be confirmed using the tools"* (Manager, Vertical program, August, 2006).

These achievements have been accompanied by a number of problems as presented below.

5.5.1 Inertia of the Previous Vertical Systems

The integration initiative sought to align different disparate systems to form a data repository at the district level that gives access of data to different stakeholders. Though as described above this has been achieved to a certain degree some other vertical programs whose data sets are aligned with HMIS still run their own information systems in parallel with the new

system. Example of this is the monthly disease surveillance for EPI that is integrated in the new minimum data set (see Figure 5.8).



MINISTRY OF HEALTH
ZANZIBAR
MONTHLY SURVEILLANCE REPORT
(HEALTH FACILITY/ DISTRICT)

YEAR: 2006
MONTH: SEPTEMBER
HEALTH FACILITY: S.O.S
DISTRICT: W. URBAN

Number of reporting Health Facilities.....Number included in this report: .....

Vaccination Status	Measles				Diphtheria				Pertussis				Tetanus				AFP				Tuberculosis			
	Cases		Death		Cases		Death		Cases		Death		Cases		Death		Cases		Death		Cases		Death	
Age	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>5	<5	>

Figure 5.8: An extract of monthly disease surveillance report submitted to the district by September 2006 (Source: Fieldwork Zanzibar, Octobar 2006)

Although the data set has been running for more than eight months, still EPI have been collecting their data using their system as usual. Their explanation for this is that,

> *".. Until we are sure of getting our data from HMIS, we can not abandon our system"* (Manager, Vertical program; July 2006)

This resulted to duplication of work at the point of data collection. Similarly, in some districts, family planning has been running in parallel with the new integrated system despite the fact that all its data is integrated in the RCH data set that is monthly submitted to the district. This practice has been commonplace until the time of writing. When the health workers at health facilities were asked why they still use the previous data collection tools for family planning, some answered,

> ".. *The new forms do not have all the required data elements as the old ones. So we fill in the old one to make sure that all the required information is taken to the owners (the Family Planning program)* "(RCH coordinator, July 2006).

Another health officer noted,

> *"We have not been told to abandon them; we still submit them monthly to the district"* (MCH Aides, August 2006).

Furthermore, some health officers at the district level still demand submission of the family planning report using the old health facility data tool. This could be attributed to inadequate knowledge about what is supposed to be done as far as the old and the new reporting system is concerned. As observed, lack of teamwork and sharing of information at the district level between those who participated in the design process and those who didn't could have also been the cause for that malady.

HIV/AIDS is another program which despite been involved in the process of designing its own data set and integrate it in the new initiative is still running separately. This program as explained before maintained its own fragmented information system, one for VCT and another one for STI services. These subsystems were integrated into one STI and HIV/AIDS data set, with its corresponding data collection tools. The data set has been functional for more than six months with all its data routinely collected and collated in all Health facilities providing the two services and submitted monthly to the district level. Although most of the data is submitted to the districts and transmitted to higher levels, this data is not fetched and used by the HIV/AIDS program. Instead, the program depends entirely on their previous systems. The reason for this as the data manager puts it is because HIV/AIDS is very dynamic unlike other programs like EPI, which deals with issues that are relatively static.

> *"… HIV is very dynamic, today we have PMTCT and VCT, but we don't know what we will have tomorrow, there might be new services, unlike other programs like EPI that is relatively static. Another issue is that donors are not fixed, they come any time and go any time with their variable indicators which demands different data requirements"* (Data Manager, Vertical program; August 2006).

Another reason given was that the new data set does not fulfil data requirements for program management and so it was not designed for them but for HMIS.

> "*The new tools are for the higher levels only; they can not help us in any way. We need more information compared to what is on the HMIS form. It is not designed for us*" (Manager, Vertical program; July 2006).

Though the program officers participated in the design of the data set, but they claimed to have participated as consultants to help HMIS get its data, not for them.

As explained by one HMIS official, this resulted from lack of trust by the vertical programs to the capacity of HIMIS unit to maintain and sustain the information systems due to inadequate resources.

> "*…Mostly we rely on donors in almost everything which sometimes lead to mistrust by the vertical programs of our capability to maintain and sustain the information system. For instance EPI are performing well because they have enough funds. Also HIV/AIDS have many donors which imply enough funds, unlike HMIS which has very scarce resources both physical and human resources*" (HMIS Official, July 2006).

As an attempt to solve this dilemma according to the HMIS official, the HMIS unit use consensus building through participatory approaches like meetings, workshops and seminars. This as stressed by that official is exemplified by mobilization of concerted efforts and funds by HMIS unit to solve availability of data collection tools problem.

The problem occurred when HMIS failed to fund production of data collection tools due to financial constraints. To solve the problem, which if left unsolved would have undermined the whole system, vertical programs as one of the major stakeholders of different data sets were summoned in a meeting to deliberate and agree on strategies to resolve the problem. In the meeting it was agreed that vertical programs contribute on the production of data collection tools. Most of the programs considered it as one of the feasible solution for the

problem. Those who were at first reluctant to agree on this, slowly as they saw others responding to this, they also followed suit. Based on the agreement, production of both primary and secondary data collection tools to be used for a period of one year was done using funds from different vertical programs.

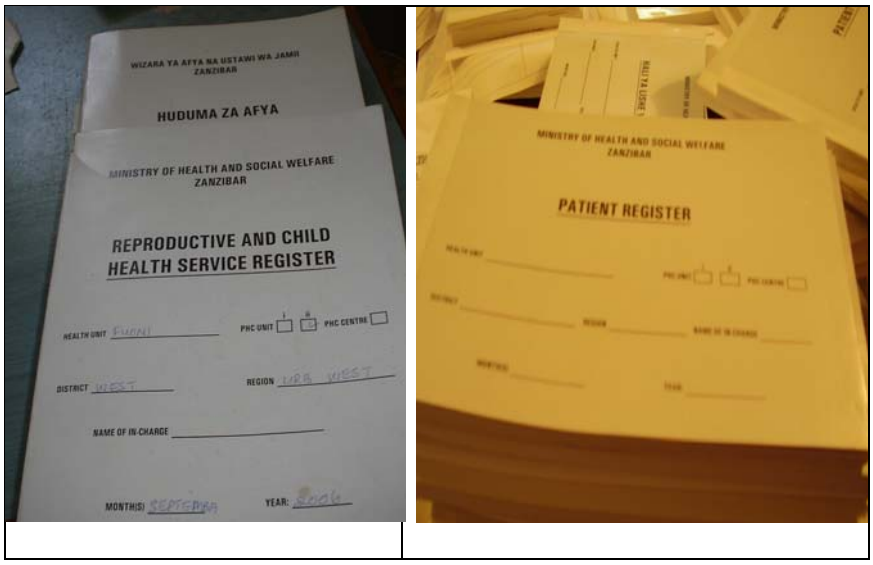


Figure 5.9: New data collection tools produced to be used for a period of one year (Source: Fieldwork Zanzibar, November 2006)

The massive production of the tools was however done after using monthly production of tools for a period of eight months, where major requested changes in the tools were done before they were deemed stable for massive production.

However, as an attempt to explain the reason and solution for the continued use of the previous systems one stakeholder from the donor community puts it this way:

> *"We have agreed if possible not to talk about integration any more because when people working in these disparate systems hear this, they think of being robbed of their jobs and hence their salaries. This problem is more pronounced in developing countries context where there is massive unemployment rate. We better talk about communication and collaboration between these programs and the HMIS unit. Let the HMIS unit coordinate all these disparate systems to make sure that comprehensive data is obtained from these systems in a cost effective way"* (Program director, Donor Community; November 2006).

5.5.2 Inertia of Behaviours and Work Practices

Vertical program mindsets have been observed which led to health workers behave differently when it comes to handling different data sets. For instance as observed, some health workers when one talks about data collection they quickly think about EPI data because that is the data they are used to collect. This is also the case because EPI have very strong follow-up and feedback mechanisms. The evidence of this argument is a statement given by one workshop participant when his district was criticized for poor reporting of different data sets;

> "*… my responsibility is EPI data set, and that reporting is good"* (District officer, June 2006).

These vertical system mindsets were undermining the effort to attain integrated system that requires collective responsibility for data collection and collation at the Health facilities and districts respectively. Also negative attitudes have been observed where health workers at the district level consider the system as owned to those who were involved /participated in the process and not to them collectively as a district. This led to miscommunication and lack of shared vision between those who deal with HMIS and the program officers at the district as is remarked by one of them below,

> *"I don't even know what the HMIS data clerk is doing, sometimes when they have a problem with the forms, they don't even know who to see for clarifications."* (Manager, Vertical program, July 2006)

This was undermining teamwork spirit as those who participated (as representatives) were left to do the work of aggregating, processing and analyzing the data alone. Information use, which requires involvement of all the district managers, was also severely hampered. In one district, a data clerk complained of this malady by explaining what others say to her,

> "*They normally tell me that, 'you are the one who participated in the design / training of HMIS, so you have to do the work"* (Data Clerk, July 2006).

Some work practices that were commonplace in the previous fragmented systems have been changed and some abandoned. For instance in the previous Family planning data tools, continuing clients data element referred to all the registered clients since the advent of the services whereas in the new integrated RCH tool, continuing clients refers to the clients continuing in that particular month. Though this may sound simple and easy to understand, but abandoning this practice has not been easy with the health workers. Another practice is the use of blanks or zeros in the previous system, either of them to mean zero but in the new initiative a zero means zero and blanks are not used at all. If particular services say postnatal in the RCH data format is not offered in a certain health facility, a dash is used to indicate this, so blanks are considered ambiguous raising some questions whether the data element was forgotten, unclear or means zero. This practice, which can also be considered intuitively simple, it has been a problem to let go by the data collectors.

5.5.3 Lack of Clear Management Structure

The HMIS unit was formed in 2001 by fusing together the Epidemiology, Research and Statistics sections of the MoHSW. It has 12 staff whereas two of them are IT personnel. Before the formation of HMIS, all data related activities of the Ministry from all the primary health care units and centres were under the Statistics unit. The augmentation of the three sections to form HMIS was unfortunately not followed by defining clear roles and responsibility to either the new staff or to those who were working in those different sections, especially at the district level. This led to unclear management structure especially at the district level as one manager commented,

> *"The management structure of HMIS is still not clear or non existent; here at the district level I don't know who to see when I have a problem"* (Manager, Vertical program, August 2006).

In almost all the districts there is no HMIS focal person (information officer); currently DHO who is always busy with other issues (seminars, workshops, meetings and trainings – with espoused aim of getting the allowance ['transport money']) is considered the focal person. Further more there were no written official instructions, job descriptions and guidelines from

the MOHSW to guide the focal persons and make them accountable for their day-to-day activities. The consequence of this was lack of awareness of HMIS at the district and periphery levels of the information system

> *"…but, what is HMIS, what does it stand for"* (Health worker, August 2006).

Short of clear roles and responsibilities at the district level, further led to fragmentation where as explained above district program officers responsible for a particular data set focused on that program data collection tool only.

After failing to get HMIS responsible people in some districts and engage them in the process, most of the work was being carried out by the HISP team. As the result, in some district HMIS was considered as 'HISP' System by the lower levels, rather than 'their' system. This argument is reinforced by the statement that was given by one district officer when we went to train them after having an appointment with them, yet to find out that most of them were not there.

> "… *when are you coming to enter our data in DHIS?"* (District health officer, June 2006)

Whereas anticipated question would have been '*when are you coming to train us*?' As such, lack of clear management structure and shared responsibility at the district level was undermining the initiative of integrating the fragmented systems by reflexively encouraging more fragmentation.

Chapter 6

6. ANALYSIS AND DISCUSSION

This chapter presents the analysis and discussion of the findings. I draw upon the concept of installed base from the socio-technical conceptualization of large, integrated systems called information infrastructures (II) and the literature on the HIS integration in developing countries, to analyze and discuss the challenges ensued in the integration processes of the HII. Within the II perspective, the installed base is seen as an actor who is involved in every II development initiative, from where the new II inherits both its strengths and weaknesses (Hanseth and Monteiro, 1998). By drawing on the installed base concept, this chapter seeks to analyze the challenges presented by the existing systems, standards, work routines and practices in the process of integrating the HII.

Furthermore, this chapter draws on user enactment concept based on the human agency perspective to discuss the challenges and opportunities emanating from the integrated HII. Whereas the II perspective is used to analyse the challenges in achieving the Integrated HII, user enactment concept help me to go further and analyse how different user groups have enacted different ways of responding to the newly integrated HII. However, cultivation strategies employed in curbing the HII integration challenges are also discussed.

Generally, the analysis and discussions in this chapter seek to meet the following three research objectives: 1) *to understand the challenges in the processes of integrating the HIS in the context of developing countries broadly, and specifically in Zanzibar,* 2) *to explore the challenges emanating from the way users received and related to the newly integrated HIS and* 3) *to explore approaches and strategies used/to be used to address the challenges generally and very specifically within Zanzibar healthcare sector context.* The rest of this chapter is organized in three sections as follows: section 6.1 presents the challenges in the processes of integrating the HII, section 6.2 presents the challenges and opportunities from the use of the integrated HII, section 6.3 provides summary and discussion of the combined challenges and lastly, section 6.4 presents strategies used to deal with the observed challenges.

6.1 Challenges in the Processes of Integrating the HII

The integration of HII involved two major processes: standardization and institutionalization of the standards. In the subsequent sections I analyze and discuss the challenges encountered in these two processes.

6.1.1 Standardization Challenges

Standards are considered to be cornerstone for an integrated HII to be realized (WHO, 2006; Braa et al. 2002). Integration of the HII started by standardization of the data sets and data formats, data processing tools (software) and work practices surrounding the data sets and data collection tools as an important step to change and align the installed base.

Following a participatory prototyping approach, the data sets and the corresponding data collection tools were standardized by way of streamlining and sorting out overlaps, gaps and inconsistencies. During this process, related fragmented reporting tools were aligned and integrated to form one reporting tool. For instance, the reproductive and child health services reporting format was formed by integrating family planning, antenatal care, postnatal care and child nutrition services reporting formats together. Providing the periphery level with standardized and integrated data collection tool for the integrated services was seen as a critical step in making the information more readily and easily available for use at all levels. Some work practices such as the reporting frequency and mode of aggregating and filling the monthly reports were also standardized. Maternity reporting frequency for instance was changed from quarterly to monthly reporting, standardized practices in filling in the forms was adopted e.g. a zero to mean zero, a dash to mean the service is not provided by the health unit and blanks not be used. Whereas in the previous system all of them (zero, dash and blanks) were used without any clearly defined procedure, which ultimately led to poor data quality.

Standardization of the data processing tool at the district levels and above was also an important step for two major reasons. First, was to alleviate or eliminate use of fragmented tools such as spreadsheets and Epi info programs, which are reported as inappropriate for routine data management (Braa et al. 2002); and secondly to create an integrated data repository at the district level for data management which gives access of comprehensive

data from all health facilities to all stakeholders (WHO, 2006). This was also seen as a crucial step in eliminating or at least alleviating vertical reporting practices, which sometimes deprived the local levels access to comprehensive information for management of the primary health care services. To achieve these objectives, software standard (DHIS) was adopted from South Africa and adapted for use. The software standard was customized by first, creating a data dictionary containing all the data elements for all the standardized data sets and secondly by mimicking all the data format standards into the software. However in the early stages of the implementation, the data formats were not yet stable due to more and more requests from stakeholders and therefore led to the customization process to be repetitive.

The standardization process in general faced a number of challenges from the installed base, which included the heterogeneity of interests among the stakeholders, lack of adequate knowledge on indicators and public health issues and use of multiple languages in the previous data collection and reporting tools. These challenges are analyzed and discussed hereunder.

Heterogeneity of interests among the stakeholders

Information infrastructure development involves many users and designers, therefore, identification of the minimum functionalities (standards) which all of them should conform to is an important step to make the wished for infrastructure useful (Hanseth, 2002). In the integration of the HII, standardization of the data sets brought together stakeholders from the MoHSW and from multiple vertical programs such as EPI, Family Planning, HIV/AIDS, Nutrition, Malaria and Safe Motherhood program, to streamline by sorting out overlaps, gaps, inconsistencies and elimination of some data elements in the data sets which appeared to be useless based on the ‘must know’ principle (Braa et al. 2002). The involvement of these heterogeneous stakeholders was important for according to Hanseth (2002), all of them are also designers of the HII, for they all determine and shape its direction.

Nevertheless, as other studies have also found, agreeing on the minimum data sets is not always trivial (Braa et al. 2002; Braa et al. 2005); there has been some ‘pull and push’ between the stakeholders. Almost each data set is associated with a vertical program, which

has multiple donors with high and varied data demands. For instance, the HIV/AIDS program alone is supported by multiple donor agencies such as the Global fund, CDC, UNDP, UNICEF, World Bank and WHO, where each agency has a number of indicators which require huge amounts of data to be collected. And as was seen from the programs data managers' point of view, is to ensure as much data as possible is collected to meet demands which some of them are currently unknown. This increased the pressure for wanting to include almost everything in the data set standard. To show their seriousness with their data requirements, some programs created and circulated their own data sets behind the scene after being involved in creating and training similar data set that was unanimously agreed to meet requirements for the current data needs. This was later on discovered and turned down by the MoHSW HMIS unit officials as being violating the agreement with an emphasis that current data needs should be given more attention, where addition of the rest will be done when needs arise.

The economic hardships of the people engaging in data management as one characteristics of the installed base was another pressure which increased the push for more data which they expect to give to any stakeholder (researchers, donors etc) in return of rewards. For instance, one stakeholder who was arguing for more age groups to be included, in an informal interview when asked why, the answer was '*its good to have them because when anybody comes with data needs and find that we have them, it also help us get something*'.

The heterogeneity of interests among stakeholders (donor agencies, program managers and health reformers) and the installed base of multiple reporting systems on the ground were also reported by Chilundo (2004) as one of the factors challenging the HII integration in Mozambique, a low income country.

Lack of adequate knowledge on indicators and public health issues

The guiding principle towards minimum data sets is the prior knowledge of indicators (Lippeveld, 2001; Braa et al. 2002). Lack of adequate knowledge on indicators to most of the stakeholders challenged the standardization process by increasing the pressure of what to include and what should not. Most of the arguments to include data elements in the data sets from the stakeholders' point of view were mostly based on their normative practices ("we are

used to collect this so why not include them") rather than their knowledge of indicators. However, limited knowledge on the public health issues to some stakeholders and the HISP team was also a challenge when it came to deciding what should be removed or left. Most of the terminologies used needed consultation with doctors and other stakeholders who were sometimes not easily available due to many errands. This is also confirmed by similar study where lack of public health inputs to the HISP team, limited the ability to negotiate with the stakeholders the relevance or irrelevance of some data elements which ultimately limited the flexibility of the standardization process (Lagebo et al. 2005).

Use of multiple languages

Another component of the installed base in the standardization of data sets and data collection tools is the languages used in the previous data collection tools. Most of the data collection tools were in English but some especially primary data collection tools were in Swahili. Lagebo et al. (2005) noted on the importance of matching the primary and secondary data collection tools in terms of data elements and the language used, where without that coherence, data quality may be compromised. But also according to Heeks (1999) the magnitude of change can be a determining factor of success or failure in the implementation process, where the smaller the change the higher the chance of success. While it was also known that some health workers have some English problem, the challenge was which option to choose. But after long discussions with the stakeholders, ultimately it was agreed to continue to use the two languages, as an attempt to reduce the magnitude of change.

6.1.2 Challenges in Institutionalizing the Standards

Institutionalisation of the standards both to the periphery levels and districts levels of the health system was another important process in the integration of the HII. Institutionalization is the process through which a social order or pattern becomes accepted as a social 'fact (Avgerou, 2000). Technology or HII standards become accepted through socio-technical processes as social facts and are maintained because of legitimacy regardless of the evidence of their technical value (ibid). Thus, institutionalization can be envisioned as a process of making steady and gradual changes in people's belief, understanding and acceptance of the

new technology (Kimaro et al. 2004) or social order. Training as one of the basic institutionalization strategies, can lead to changes in people's belief, understanding, and acceptance of the new standards.

At the periphery level, institutionalization of the standards aimed at ensuring understanding of the data collection tools through training. However, at the district level, institutionalization of the software standards was the major focus. The installed base presented challenges in the institutionalization of both data collection tools and the software standards, which are analyzed and discussed in the subsequent sections.

6.1.2.1 Data Collection tools

Institutionalization of the new data collection tools through training to the periphery levels was an important step towards attaining the goal of integrating the HII. Lippeveld (2000) argues that new data collection forms are not self-explanatory and therefore training of the health personnel in data collection procedures is a mandatory step. As described in chapter five, the standardization and redesign processes ended up with sixteen data collection tools (both primary and secondary tools) to be institutionalized in the local levels of the health systems. The process of institutionalizing the tools at the local levels as explained below involved use of different approaches as the implementation team was learning the contextual particularities that impeded the training approaches.

Lack of information officers: Failure of Training of Trainers (ToT) approach

The training of trainers cascade approach was the first chosen method to institutionalize the data sets and data collection tools to the periphery levels. This method was chosen because it would first give opportunity to the District Health Officers (DHOs) to receive knowledge on the new standards who would later take the role of change agents in their respective districts to institutionalize the standards in the periphery level. Another reason for the choice of the ToT approach was to use it as a conduit to slowly transfer ownership of the new HII to the district officials by involving them directly in the implementation processes.

Chaulagai et al. (2005) report on the application of the ToT approach in Malawi, where selected health officials from four central hospitals and 26 districts were given training on the new data standards and tools so that they could train everybody in their respective districts

and central hospitals. This led to successful nationwide training coverage within six months. However application of the ToT approach in Zanzibar settings did not work as expected partly because those who were selected could not find time to take the role of change agents due to many errands. Furthermore, while South Africa recruited information officers for each district at the early stage of the HII restructuring (RHINO, 2003), this was not the case in Zanzibar due to lack of financial and human resources. To institutionalize the standards to the periphery levels another approach had to be chosen. A clustering training approach was chosen where two health workers from each health facility were summoned to the district for a one day training covering about sixteen data collection tools. However, the allocated time was not enough to ensure thorough understanding of the data collection tools, partly because of the high number of tools trained. Increasing the number of days for the training was the preferred option for the HISP team, but because of financial constraints, time could not be increased. Misunderstanding of the tools from the health workers side was evident from the monthly reports submitted to the districts level which had data quality problems ranging from incompleteness caused by not understanding what to fill in to incorrectness which was mostly caused by poor mathematical skills and not knowing where is to be filled what.

Nevertheless, having noted this, another approach was adopted to support the health workers in their respective health facilities (on-job training) and through monthly feedback meetings at the district levels. Moving from one health facility to another with minimal human and physical resources takes time but as an ongoing exercise using incremental steps, more promising results were expected from this approach compared to the previous ones. In the early stages of the implementation where the tools were not yet stable due to many requested changes being implicated in the standards, further challenged the training exercise. For depending on the magnitude of changes, the need for a specialized training for a particular data collection tool was important to create awareness and ownership of the new changes to the health workers. Therefore in the middle of the on-job trainings were some specialized trainings that needed to be carried out in short time intervals compared to the later approach.

Relatively low education levels

The periphery level of the HII is considered as the sole source of routine data for planning and management of the primary health care services (Lippeveld, 2000). Nonetheless, this

study has found that education level of the health workers at this level is relatively low. Mosse and Sahay (2003) noted that qualified staffs are often not willing to go to rural areas, making it problematic for systems to be operated effectively in remote regions. This is also confirmed by this study where health workers with relatively low education levels were statistically found in the health facilities allocated in areas which are relatively rural (see Table 5.7 and Table 5.8). The low level of education of most health providers challenged the training exercise as most of them could not grasp basic skills on data quality issues, indicator calculation and data use in general. Ultimately, the consequence of the inadequate level of education as was evident from the monthly reports at the districts level was misunderstanding of some data elements, low arithmetic skills and English language proficiency problems in which all together contributed to poor data quality.

6.1.2.2 Software Standard

Whereas the standardization and institutionalization of the data sets and data collection formats at the periphery levels aimed at ensuring collection of common data sets using common tools to enable horizontal integration; standardization and institutionalization of software tools aimed at attaining use of a common software at the districts levels and above which is able to aggregate and analyse the data which is received from the periphery level to enable vertical integration (RHINO, 2003). This was a necessary step at the district level and above towards the attempt to alleviate or eliminate fragmentation attributed by the installed base of different software tools such as spreadsheets and Epi info programs which are not appropriate for routine data management (Braa et al. 2002; Lagebo et al. 2005).

The software standard as described in the above sections was adapted by mimicking all the data formats into the software. The data entry screens were designed in such a way that they exactly match with the paper forms a move which helped to reduce confusion between paper formats and computerised formats during data entry. In the next section I discuss the challenges presented by the installed base in the process of institutionalizing the software standard at the district levels which also involved mutual learning, improvisation and tinkering.

Low or lack of basic skills in computer

Institutionalization of the software standard (DHIS), commenced by the installation of the software in all districts. This was done in the early stages of the standardization process at the time when the data sets were relatively unstable. The reason for doing this was to give district officers time to exercise with the software using dummy data values before they could start using real data sets. Following the installation process was training on the use of DHIS in data capture, analysis and presentation to all District Health Officers (DHO) who were to take the role of information officer in their respective districts.

The DHOs received basic skills in computer use which was conducted to all districts by one of the vertical programs, so the HISP team hoped to build on the installed base of the acquired skills in computer by imparting DHIS skills in data capture and processing. Based on that understanding and according to what was to be trained in DHIS, the team scheduled five days for the training. During the training however, as an unintended consequence, the assumption of building on the installed base of prior knowledge of computer skills proved to be wrong, as most of them had forgotten almost everything. Lack of computer skills at the district level, was also cited as a challenge in the attempt to integrate the district based health information system in the Mozambican health systems, which was aggravated by lack of computers in some districts where after trainings, course participants could not use the acquired skills (Lungo, 2003; Mukama, 2003).

Consequently, from five scheduled days three days had to be spent in imparting basic computer skills and the remaining two days for DHIS skills that was hardly enough to finish what was intended. Whereas, increasing the number days for the DHIS training was envisioned as the solution to the problem, another challenge was lack of funds to do so. This however led to ineffectiveness to the use of the standard, as most officers could do only data entry with DHIS. This as explained later caused what is termed as inertia (Orlikowski, 2000), representing limited use of the new system. For instance most of the DHOs who normally prepare monthly districts reports continued to do so manually, which took them a number of days, in spite of the fact that all the data was already in DHIS where the reports could be printed in a just a minute.

Lack of information officers

To firmly institutionalize the standard in the districts, yet another approach that is more rigorous had to be adopted. Just like in the health facilities, where on-job training approach was adopted as the solution for weak institutionalization through formal training, the same was also done at the districts. Through this approach health officers were trained through hands on exercises how to prepare monthly reports, doing simple analysis by using the analysis tool and how to transmit data from the district to higher levels electronically. However, in some districts this approach faced another problem where most of the time DHOs were not around to be oriented on DHIS use. Consequently, most the DHIS related tasks had be carried out by the HISP team while at the same time training of other selected district staff to take up that role was going on.

The unintended consequence of this approach was again weak institutionalization of the standard, where some of the health workers in some districts regarded DHIS as a 'HISP system' and not 'their system'. Another unintended consequence was poor data use, due to the fact that, those who were trained at this round were not among the district management team members who are to use the information for planning and monitoring the activities in the district. Whereas RHINO (2003) noted on the importance of having district information officers to ensure availability and use of information in decision making at the district and periphery levels, until the time of writing this could not be done in the Zanzibar context whose installed base is characterized by inadequate human resources with the required skills. Instead, the DHO who is always busy with many errands had to take up that role which led to inertia as explained later.

Institutionalized practices hampered the training

The installed base of the fragmented health information system infrastructure consists of strongly institutionalized practices, routines, procedures, beliefs, data standards, data tools and technologies which are considered to present both opportunities and challenges in the integration processes of the HII. Braa et al. (2002) presents an example where health workers attribute institutional trust to the existing routine reporting systems and see them as means to

confirm social contracts. And the consequence of this was the tendency of the health workers to resist the new 'improved' standards.

In this study however, institutionalized practices such as allowances (transport money) as any other institutions with dual structural properties presented both opportunities and challenges. Allowance is an institutionalized routine where health officers are given certain amount of money for attending say in trainings, workshops, seminars or even meetings sometimes. During the trainings, when funds were available, allowance was seen as an enabling factor to summon the health officers to attend the trainings. However, this institutionalized routine turned out to be a challenge when we had no funds to give. This was learnt during training exercise that was scheduled to be done at the districts levels covering basic skills in computer use and DHIS. Since, the training was done as part of this study to learn the effect of institutionalized routines, no allowance was promised to be given to the participants. And it was made sure that at least every participant was aware of that before hand. Another thing was to ensure that the training was done in their premises to avoid anyone alleging to have no transport. The ultimate result was very poor attendance of the targeted participants (the DHMT members). The attendance was poor because allowance was not offered. Furthermore, DHMT members most of the time attended in meetings, workshops and seminars where they are given allowances. So to them, allowance is a common phenomenon. Therefore while allowance in some cases enabled the institutionalization of the standards to take place in some cases, in some other cases it hampered that process.

Chilundo and Aanestad (2005) argue that the embedded nature of work practices into the local context and their connection with other local work practices under the context of HIS integration are not easily harmonized and integrated and, they can lead to unintended consequences of workarounds and adaptations. Whereas successful institutionalization of the software standard is considered an integral part of the HII integration, the embedded nature of practices such as allowances hampered that process and led to unintended consequences of workarounds and adaptations such as use of informal trainings to attain the same goal. While some other institutionalized practices can be changed or replaced by others over time,

contextual particularities sometimes reinforce their existence and hence make them hard to change, which ultimately lead to inertia.

Lack of clear management structure

The basis for health information system management is a solid management structure, including affordable health information system resources and well-established organizational rules (WHO, 2000). Nonetheless, this study learned that lack of clear management structure at the districts levels led to weak institutionalization of the standards. During the formation of the HMIS unit under the MoHSW, definition of clear roles and responsibilities to all the staff was not adequately undertaken at the local levels. As the results, most district and health units' staffs are not aware of what exactly is HMIS. For instance most district health program officers did not know whom to see when confronted with data related problems. The consequence of the unclear roles and responsibilities at the district level, led to fragmentation where each program responsible for a particular data set focused on "their" data collection tool only. As explained above, in some district sometimes it was hard to find the responsible personnel and engage them in the process; so most of the work (data entry, doing follow up of monthly reports from health facilities etc) especially at early stages of the implementation had to be carried out by the HISP team. Lack of clear management structure and shared responsibility at the district level was undermining the initiative of integrating the fragmented systems by reflexively encouraging more fragmentation.

In the above sections I have analyzed and discussed the challenges in the design and implementation of the integrated HII. The subsequent section draws on the human agency concept of user enactment to discuss the challenges and opportunities emanating from the use of the integrated HII.

6.2 Challenges and Opportunities from the Use of the Integrated HII

This section draw on the user enactment concept based on the human agency perspective to analyze and discuss how different user groups (health units, districts, vertical programs) invoked the integrated HII. A human agency position suggests that humans are relatively free to enact technologies in different ways, where, they can use them minimally, invoke them individually or collaboratively and improvise in ways that produce novel and unanticipated consequences (Boudreau and Robey, 2005).

As explained in the previous sections and in the empirical chapter, the integration of the HII involved standardizing the data sets, data collection tools, data processing tools and associated work practices; and institutionalization of the standards through training to the local levels of the health system. Though most of these integration processes were executed, from human agency perspective, different users enacted the standards in different ways, some invoked them minimally, and some chose to completely neglect them and continue with their old ways and some of them invoked and improvised them to fit with their way of working.

The different enactments came to play as users drew on their interpretive schemes, norms and facilities to mediate their actions in relation to the new standards (Boudreau and Robey, 2005; Orlikowski, 2000). Analyzed from the three elements representing the temporal view of human agents, the users drew on the iterational element representing their history, the practical evaluative element representing their present context and the projective element representing their future possibilities to shape their decisions and interactions with the integrated HII (Emirbayer and Mische, 1998). Faced with the contingencies of the past, present and the future, users took actions which ultimately led to the multiple technologies being enacted in practice. The multiple enactments presented both challenges and opportunities in the HII integration initiatives. The challenges came from the fact that some users chose to completely ignore the new technology and opportunities resulted from the different levels which users invoked the technology and improvised in different ways that led to innovation. In the subsequent sections I analyze and discuss three examples of user enactments that ensued in the case, which include inertia, intended usage and reinvention enactment (Boudreau and Robey, 2005; Orlikowski, 2000).

6.2.1 Inertia Enactment

Inertia is the limited use of technology, where users choose to use it to retain their existing way of doing things (Orlikowski, 2000). Boudreau and Robey (2005) describe inertia as representing users' ability to avoid direct interaction with a newly implemented technology. The term inertia in the context of this study represents limited (perfunctory) use or non-use of the newly integrated HII standards by different user groups. From this definition and from the discussions below, I argue that there is a need to describe inertia as varying from limited use to completely non-use of the new technology.

Limited use enactment

The HII integration initiative sought to align different disparate information systems to form a data repository at the district level which gives access of data to different stakeholders. Though as explained previously, this has been achieved to a certain degree, some other vertical programs' managers whose data sets are aligned with the new initiative have enacted limited use technology in practice (Orlikowski, 2000) by running some of their previous information systems or tools in parallel with the new system. For instance, the disease surveillance data set for EPI program was aligned with the national disease surveillance standard. Though the national data set was in operation for more than eight months until the time of writing, the vertical program decided to run their surveillance system in parallel with the national system. This vertical program however has another data set (Immunization data set) which is aligned with the new initiative and which is running smoothly. The immunization data set is an autonomous data set, meaning that though it was revised but still the EPI program have more control on it. This is different from the disease surveillance data set which was formed by fusing together the national disease surveillance which was in a stroke form and the EPI surveillance data set. To regain control of their disease surveillance system, the program runs their data set along the integrated data set for disease surveillance. The need to regain control can be explained as to have been shaped by the iterational and projective elements of human agency. The program managers drew on their past experiences of maintaining the system and on the future of their system, where they saw themselves losing control.

Furthermore, the inertia was also partly attributed to by lack of trust by the vertical program to the capability of HMIS unit to ensure sustainability of the integrated HII, for as one program manager asserted, unless we are sure of getting our data, we can not abandon our system. The lack of trust came to play as the managers drew on the iterational element representing the history of poor economic capacity of HMIS unit and on the projective element by looking to the future of the new system. For as Emirbayer and Mische (1998) argues, human agents draw upon past experiences in order to clarify motives, goals and intentions to locate possible future constraints and to identify morally and practically appropriate course of action. Therefore, the managers drew on history and on their future prospects about the new system's sustainability to make the decision to maintain their system side by side with the new system. This retrospective-prospective process underscores the temporal view of human agents when they are faced with the contingencies of the past and future possibilities.

Another health program which users enacted limited use of the system is the Family Planning (FP). In some districts, FP has been running in parallel with the new integrated system despite the fact that all its data is integrated in the RCH data set that is monthly submitted to the district. The enactment resulted as users drew on the iterational element of human agency to conceptualize the new system. This was evident as users drew on the installed base of their past practices of submitting huge amounts of data to the vertical programs unlike in the new standardized RCH tool where the FP data elements have been minimized. Most of the users argued that they were using the old tools to ensure that information owners get all the information they need. Also by building on their past practices, some district officers kept on enquiring about the previous FP reports from the health facilities.

In some districts however, health officers drew on their limited knowledge of DHIS to enact limited use technology in practice, where preparation of monthly reports was done by aggregating manually a number of data sets from all the health facilities, an exercise which took two to three days to finish. While at the same time, all data sets were already entered in DHIS by the data clerk, in which a monthly report could be printed in just a minute. This enactment can be analyzed using the practical evaluative element of human agency which

represents the capacity for practical and normative judgments made in the present context of emerging demands and dilemmas (Emirbayer and Mische, 1998). The decision to go back to the manual systems can be envisioned as to have been made due to the dilemma of not knowing how to use the new systems but also by the present demand of the need to compile monthly reports. For as Emirbayer and Mische (1998) put it, in practical evaluative component actors start by recognizing that the concrete particular situation at hand is somehow ambiguous, unsettled or unresolved, posing some challenges in application or contextualization. In addition, the iterational element was also drawn upon where the health officers' knowledge about the manual systems practices acted as a mediating force to their decisions to go back. This according to Emirbayer and Mische (1998) happens as actors relate the problematic situation at hand to principles or schemas from past experiences by which they are characterized in some fashion (from the case study, this is represented by the manual system and its practices).

Other district health officers enacted limited use by engaging themselves more with a data set for a particular vertical program. The enactment happened as the result of the officers drawing on their past experiences of vertical system mindset unlike in the new integrated HII where all the data sets need to be afforded equal attention. This was evident from what one health officer provided as an answer when he was confronted for poor performance of some data sets, where he asserted that his responsibility was a particular data set whose performance was good. The perfunctory engagement with the integrated HII was also observed at the health unit level where health workers dealt with particular data sets more than others. This limited use at the health unit or district level came to play as users acted on their past practices that are in favour of vertical systems in the conceptualization of the new system which emphasized equal treatment of all the data sets to ensure availability of comprehensive data at all levels.

Non-use enactment

Inertia in the form of non-use was also evident from the actors associated with other programs in spite of the fact that they were involved in the introduction of data sets for collection of data related to their program. The HIV/AIDS program participated in the design of a new data set called STI and HIV data set, which aimed at collecting data, related to both services. However, this data set was operational for about five months until the time of writing, but since then nothing of the data collected was fetched and used by the program. While the idea of having both systems running in parallel may sound good, because using this setup every stakeholder gets access to the data unlike in the previous systems where almost all the STI and HIV data was vertically submitted to the programs and donors, still it has enormous implication on the workload to the data collectors. Rather than rationalizing the fragmented systems and minimize duplication of data, this setup intensify it and ultimately jeopardize quality of the data collected.

The non-use enactment came to play as the program officers drew on a number of assumptions and on their multiple needs of data. Some of the assumptions in relation to the new system are that, *the new system is for HMIS unit*, and so their participation aimed at helping them get their data and that the *data collected in the new system does not satisfy their data needs*. The assumptions can be envisioned to have resulted from users drawing mainly on the two elements of the human agency. They drew on their past experiences of collecting multiple data and on their desire for data to meet future needs, representing the iterational and the projective elements of human agency respectively, to infer that the new system does not satisfy their data needs, and therefore the system is for HMIS unit.

The non-use enacted by the HIV program as was the case for the limited use explained above, was also partly mediated by the poor economic conditions of the HMIS unit, which led to mistrust of the vertical program to the capability of HMIS unit under the MoHSW in ensuring sustainability of the system over a period of time taking into account its almost total dependency on donors.

The resulting picture from the limited or non-use enactments by the vertical programs is what I dubbed as '*pull effect*', where on one side HMIS unit under the MoHSW is struggling to standardize and integrate the fragmented information systems and on the other side the vertical programs (VPs) are enacting limited or non-use of the newly integrated HII by struggling to maintain their own systems. The upshot of this as indicated on figure 6.1 is a *pulling effect* in either side where the winner is determined by the power (e.g. to argue, funds, human resources, good strategies.) which one of the two sides need to have in order to *haul* the opponent.

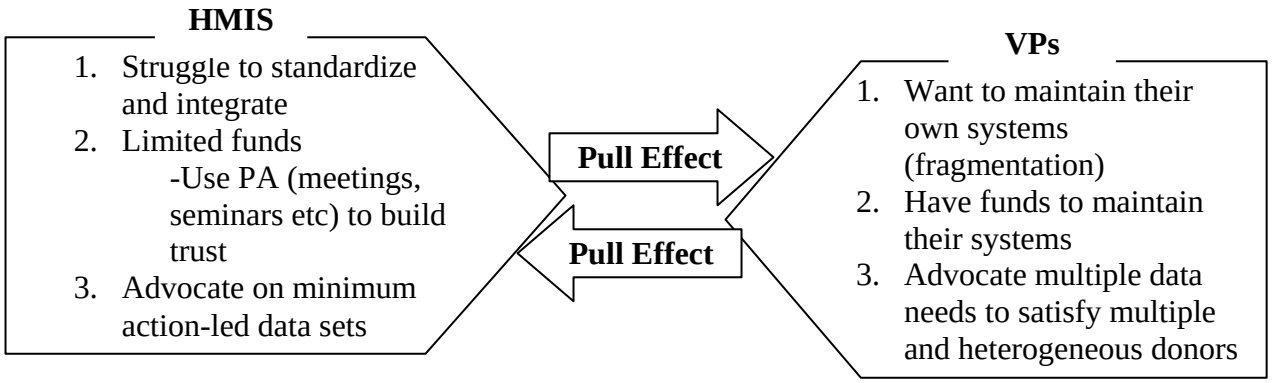


Figure 6.1 : Pull effects challenging integration initiatives in Zanzibar

As an attempt to *haul* the opponent, the HMIS unit used consensus building through participatory approaches (PA) like meetings, workshops and seminars to try to strike a balance between these two forces. This is exemplified by mobilization of concerted efforts and funds by HMIS unit to solve availability of data collection tools problem.

Nonetheless, it must be emphasized that the enacted inertia towards the integrated HII was not static, but dynamic in nature and the level of dynamism is different from one user group to another and from one vertical program to another. For instance the HIV/AIDS which initially enacted non-use of the integrated system, at the very end of my fieldwork during interview with the data manager, he sanctioned the software to be installed in their computers so that they can make comparison between their data and the HMIS data, to supplement their data in case there some missing data in their systems. Though the manager took this decision after learning that having the new system won't prevent him from using their systems, but I see this as a movement from non-use to limited use of the system. Also the health units and districts officers who enacted limited engagement by drawing on their previous vertical

system experience, the enactment slowly started to change as they learned through informal trainings, feedback meetings and seminars that all data sets need to be afforded equal significance. The changes underline the argument that the dynamic possibilities of human agency should be view as composed of variable and changing orientations within the flow of time (Emirbayer and Mische, 1998). Furthermore, the changes also conform to Boudreau and Robey (2005) argument that changing from one enactment to another can be facilitated through improvisational learning, where users learn about the system through unplanned schedule, structure or method.

Generally, the limited and non-use enactments described above resulted as users were faced with the contingencies from their past, present and the future possibilities which ultimately shaped their engagement with the new system. Though the three elements of human agency appeared to have played role in shaping the enactments, the iterational element seemed to dominate. As argued by Emirbayer and Mische (1998), one of the three aspects might well dominate in which, one can speak of action that is more(less) engaged with the past, more(less) directed toward the future and more(less) responsive to the present.

6.2.2 Enacting Intended Usage

People may choose to use the new technology to augment or refine their existing ways of doing things and thereby enacting different ways of applying the technology (Orlikowski 2000). While some districts enacted limited use of the software standard leading to inertia, some other districts drew on their past experiences and skills on computer and on their future prospects that the software will help them accomplish their work much faster to enact different applications of the standard in relation to their work. For instance some district used the DHIS software and the analysis tool to ease the work of preparing monthly district reports. Things like top ten diseases for under-fives and above-fives and coverage of different health services like immunization which before consumed much of their time, were able to quickly obtain and include them in their reports. By drawing on their computer skills some were also able to use DHIS and Ms Excel all together to produce graphs and add some more detailed analysis in their reports. While this could be done by very few districts with committed individuals, some other districts officers drew on their limited knowledge to enact

moderate use of DHIS by printing aggregated district reports for a particular health service say immunization, which helped them to manually prepare the district reports. This resulted as the users drew on their present knowledge about the new system and from past experiences of the manual systems to meet the demand of preparing and submitting district reports to the higher levels.

The enactment of intended usage, results in the reinforcement and enhancement of the structural status, noticeable changes to the data and/or tool aspects of the technological artifact, as well as noticeable improvements to work processes (Orlikowski, 2000). In my case study, the districts where there was high use of DHIS, there were committed individuals eager to learn new things as a way to enhance their status. Their previous skills in computer, commitment and eagerness to learn the software standard helped them to understand much of the DHIS functions, which led to improvements in their work processes such as in report preparation and submission. Therefore, it is the interplay of the past, present and the future represented by their previous skills, the current technology demands and their future prospects to enhance their status which led to the enactment of high degree of intended usage.

6.2.3 Reinvention Enactment

From human agency perspective, when users encounter dilemmas or ambiguities from their present context, they apply agency to counter that situation through prudence and improvisation. This is what Emirbayer and Mische (1998) termed as the practical evaluative dimension of human agency which they say is variously termed as practical wisdom, prudence, art, tact, discretion, application, improvisation and intelligence. The result of that is what I here term as reinvention. Reinvention is a type of user enactment that happens as the result of improvisational learning by the users that help them develop new practices of using the technology in unintended ways (Boudreau and Robey, 2005; Orlikowski, 2000). Johnson and Rice (1987) as cited by (Boudreau and Robey, 2005) define reinvention as the degree to which an invention is changed by its adopters after its original development. In this section I discuss some examples of reinvention enactments that came to play as users tried to overcome some dilemmas related to the integrated HII.

Family planning uses primary data collection tool which for some reasons was not revised in the new initiative. Family planning clients are registered in the tools randomly without any age categorisation. Monthly reports however, require them to aggregate the reports using age categories. Having, one hundred or more clients all of them mixed up, sorting them out in different age categories is both a time consuming and error prone exercise. Different health facilities worked around this problem by enacting different ways of doing it. For instance some drew on their previous knowledge of tally sheets to improvise and prepare family planning tally sheets for their health units. Other health units improvised by buying exercise books equalling the number of age groups available, to use them as registers. So every client depending on the age is registered in a particular register, and a monthly aggregated report is obtained by just counting without categorisation.

In another health facility users improvised the primary data collection tools by adding more data elements to satisfy their local data needs. During the standardization of the disease surveillance data set for instance, as explained in the empirical chapter, the number of diseases and age group categories in the previous standards were cut down by using the 'must know' philosophy (Braa et al. 2002). However, one health facility which is supported by donors prepare monthly reports to send to the financier who require certain diseases in particular age categories in which some of them were not included in the new data sets. To get that information, the health unit improvised the primary data collection tool by adding more diseases and more age categories depending on their needs. They did that knowing exactly that the primary data collection tools are not submitted to the national HMIS, so changing them won't affect the system.

Another area where users applied agency and enacted different ways to workaround some misfits was in the area of ensuring timely monthly reporting in the face of unavailability of data reporting formats. Some health units when faced with problems of unavailability of data formats, health workers used pieces of papers and improvised by manually constructing reporting formats similar to the formal ones. This helped them to overcome delays in submitting their monthly reports.

The reinvention enactment followed the three dimensions of practical evaluative element which include problematization, decision making and execution (Emirbayer and Mische, 1998). Problematization involves the recognition by the actors that particular situation at hand is in some way ambiguous, relating the problem with some principle or schemas from their past experiences and searching for a proper course of action. Decision to act the present moment and in a particular way is made and lastly executed by the actors.

Emirbayer and Mische (1998) argues that as actors increase their capacity for practical evaluation, they strengthen their ability to exercise agency in a mediating fashion, enabling them to pursue their projects in ways that may challenge and transform the situational contexts of action themselves. This is underscored by Orlikowski (2000) who argues that technologies-in-practice can be and are changed as actors experience changes in awareness, knowledge, power, motivations, time, circumstances, and the technology. The health workers' innovation enactment can be explained as resulting from increased awareness, knowledge and skills about their data formats and data elements standards, which increased their flexibility in experimenting and improvising the standards in different ways to accommodate varieties of misfits. This also support the idea that technologies are never fully stabilized or ''complete'', even though they may become institutionalized over time, this is only stabilization for now (ibid). The improvisation of the disease surveillance tally sheet to accommodate local data needs by the health facility exemplifies the temporal view of technologies. Orlikowski (2000) affirm that as people enact modified technologies-in-practice they also change the facilities, norms, and interpretive schemes used in their use of the technology. The changes made to the disease surveillance data format by the health unit staff for instance, not only did they change the artifact but also the rules or norms and their knowledge towards that artifact.

The findings conform to the studies on temporal view of user enactment by Orlikowski (2000) and Boudreau and Robey, (2005). It conforms to the idea that people enact different technologies-in-practice with the same type of technology across various contexts and practices; and that, they do so in response to various technological visions, skills, fears, and

opportunities, influenced by specific interpretations and particular institutional contexts, and shaped by a diversity of intentions and practices (Orlikowski, 2000).

Whereas the previous studies on user enactment were based on technologies implemented in one autonomous organization, this study have gone further and look at how users in different semi-autonomous institutions enact different ways of reacting towards the implemented system. The integrated HII in my case study brought together different stakeholders from the multileveled structure (health unit, district, zone and the national) of the health system, from vertical programs which are somehow semi-autonomous and from the donors. This context with agents of different tastes in terms of their decision making and resources they own, type of services and nature of problems they are dealing with increase the likelihood of different technologies being enacted in practice. As this study suggests, users can enact a completely non-use technology in practice.

The human agency perspective helped me to analyze and discuss different enactments, which ensued right after the integrated HII was implemented. As I have described it, the enactments presented both opportunities and challenges to the integration processes. For instance the application and reinvention enactments both present opportunities to the integration process where the HII standards become more and more institutionalized, making the entire system more accepted. The reinvention is also a trigger to those who are engaging in the integration process to formally fix the misfits that users have worked around them. The inertia is a challenge to the integration process that seek adherence of the users to the standardized data sets and tools.

6.3 Discussion of the Challenges: *Wrestling with the inertia of the installed base*

Hanseth and Monteiro (1998) argue that development of the information infrastructure (or extension of the old) should consider the importance of the existing systems, both technical and non-technical - the installed base and its influence on the integration of the HII; and that the new infrastructure inherits both strength and weakness from the installed base. By drawing on the installed base in the standardization and institutionalization of the standards, the HISP team inherited both the strengths and limitations of that base.

In the standardization process the installed base was characterized by multiple stakeholders with numerous data needs; multiple data sets, poor economic conditions, data elements and the associated work practices; knowledge of the stakeholders and languages used in the previous systems. All of them presented both challenges and opportunities in the HII integration process. For instance, while the presence of the previous data sets and data formats gave the HISP team a point to start the deliberations on what to add or removal, it also presented some limitation in terms of what can be removed or added.

Consequently, the installed base presented the following challenges in the standardization process: heterogeneity of interests among the stakeholders, lack of adequate knowledge on indicators, lack of knowledge on public health issues and use of different languages in the primary and secondary data collection tools.

Likewise, institutionalization of the HII standards had to build on the installed base which was characterized by lack of clear management structure, inadequate skills in computer, inadequate human resources, institutionalized work practices and relatively low education levels of health workers at the local levels of the health system. By building on this installed base, the HISP team inherited all these characteristics, which presented challenges in the institutionalization of the HII standards. Avoiding the installed base as a solution to the challenges is described as a serious mistake that can lead to development failure (Hanseth, 2002), so integration of the HII had to wrestle with the inertia of the installed base.

However, the inertia of the installed base was further enhanced as a result of the power that users have to apply agency and enact different ways of responding to the newly integrated system. As presented in the above discussions, though the HII integration processes wrestled with the inertia of the installed base to achieve an integrated system, still the installed base presented major challenges to the use of the newly integrated HII as the result of users enacting limited and non-use technologies in practice (Orlikowski, 2000). Though stakeholders were involved in the process of achieving the integrated HII but that did not

unleash their power as human agents to enact different ways of responding to the system, which sometimes led to completely non-use situation.

At the periphery level, health workers enacted limited use type of inertia by drawing on the installed base of previous work practices and behaviours, which were in favour of fragmentation. As the result, different data sets were afforded different level of significance and treatment by the health unit staff depending on the vertical program, which owns it. Lagebo et al. (2005) describes the complexity of changing historically embedded work practices by stressing out that it requires prolonged time and effort to change than the technical aspects of the installed base. This is also confirmed in my case study, where standardization of the data sets and tools was not a major hurdle, but changing the mindsets and work practices of the health workers that are in favour of vertical systems proved difficult.

The inertia of the work practices was also evident from the way health workers continued to use their previous knowledge to conceptualize the new data sets, which sometimes led to data quality problems. A simple example being the continued use of zeros, blanks and dashes to mean the same thing and the continued conceptualization of ‘continued clients’ in family planning to mean all the previous clients in that year (see the empirical chapter). While these practices may be envisioned as intuitively simple, abandoning them was not easy.

The health officials at the district level enacted the inertia of limited use, by drawing on the installed base of poor skills in computer and limited knowledge of the software standards. As explained, this led to perfunctory use of the standard, which further challenged the integration initiatives.

At the macro level however, the vertical program managers drew on the installed base of their multiple data requirements and their economic power reinforced by donors to sustain their systems, to enact limited and non-use type of inertia. This as explained above led to a pulling effect (see Figure 6.1), where the MoHSW under HMIS unit strives to standardize and integrate the HII while other stakeholders are doing the opposite. This suggests that

attaining integration requires the ability to strike a balance between the two forces; which can be achieved, as implied from my case study, through enhancement of communication and collaboration between the two sides. The need for communication and collaboration is further described in the subsequent sections where I discuss strategies to deal with the integration challenges.

As seen from above discussions, the challenges presented by the installed base in the HII integration processes are social-technical in nature, and therefore warranting the whole process to be a social technical venture. As a caveat, I can infer that treating the integration of HII as only a technical challenge is a misconception, more so in the developing countries where the existing systems and conditions are characterized by heterogeneity of both social and technical components.

6.4 Cultivation Strategies to Deal with the Ensued Challenges

Inline with similar studies on HIS integration in developing countries (Aanestad et al. 2005; Shidende, 2005; Lagebo et al. 2005; Braa et al. 2002), I have argued that the existing systems, conditions, work routines and practices –installed base, have been taken as a point of departure in the change process. This view is underscored by WHO (2004) as an underlining principle in HIS restructuring in developing countries by arguing that "Do not destroy existing systems; build on the strengths and learn from the weaknesses of what already exists" (WHO, 2004, page 5). For instance, by building on the installed base in the standardization process, the HISP team inherited the following, heterogeneity of interests among stakeholders, use of multiple languages in the previous tools and inadequate knowledge on indicator and public health issues. Albeit, the integration processes have to navigate through these conditions.

Due to the conservative power of the installed base, its resistance against change necessitates use of cultivation approach, which advocates incremental nurturing of the existing systems (Braa et al. 2002; Aanestad et al. 2005). Installed base cultivation strategies include use of participatory approaches (e.g. meetings, workshops, training and evolutionary prototyping) and modularization which advocates the need to break the HII in smaller modules and link

them by using gateways (Hanseth et al. 1998; Lagebo et al., 2005). Participatory approaches helps to improve the knowledge of users and developers upon which systems are built, enables the stakeholders to develop realistic expectations and reduce resistance to change (Bjerknes et al. 1995). In the subsequent sections I discuss how these strategies have been applied in my case study to deal with the installed base challenges.

6.4.1 Standardization Challenges

The standardization of data sets and corresponding data formats was based on an incremental approach -cultivation. Due to fragmentation, that is, having multiple vertical programs with their disparate systems and standards on the ground, more drastic measures were viewed as futile. So the standardization process commenced with the vertical programs that seemed unproblematic in engaging in the integration initiative. For instance Expanded Programme for Immunization (EPI), which had been relatively strong in terms of data collection and transmission, was seen as a preferred program to start with. Since initial negotiations about the standardization initiative between EPI and HISP was positive, that gave green light to the success of enrolling this actor in the process. EPI was also chosen, because almost all health units in Zanzibar provide immunization services and therefore data is also collected from all these areas. While other programs like HIV/AIDS and TB/Leprosy, which are more conservative, and their services are more sporadic compared to the later one, was delayed to be enrolled in the HII integration initiatives. The incremental approach provided a learning platform for vertical programs and the development team, because all necessary stakeholders from all vertical programs and from districts participated in the standardization of every data set through meetings, seminars and workshops.

Through give and take negotiations in meetings, seminars and workshops, common ground was sought between those who advocated multiple data needs (data-driven approach) and those who insisted on the minimum data sets (action-driven approach) (Sauerborn and Lippeveld, 2000). However, as discussed in the previous sections, the participatory approach used was challenged by low capacity of some stakeholders who could not make a case on the kind and amount of data they collect. This was partly caused by inadequate knowledge of indicator and public health issues, where some stakeholders pressed for more and more data

based on their normative practices. Byrne et al. (2003) underlined the significance of developing capacity to participate and to make decisions. However, the incremental approach provided a leeway for the stakeholders to learn from each other, the significance and kind of data they collect. Also, formal and on-going informal trainings were used to ameliorate the understanding of the stakeholders about which data is important and which is not. This study therefore, underscores the dire need for capacity building in order to ensure more fruitful participation.

Participation of the health unit level in the standardization of the data sets and data formats was through prototyping and formal and informal training of the data formats. This was done in the pilot areas that were used as test beds for the new data sets and tools. For instance, the Immunization data format was re-designed at least three times, where each revision was driven by feedback from the end users in the pilot districts. Institutionalized districts quarterly meetings were drawn upon by HISP team to give feedback to health units' staff, and therefore created opportunity for health unit staff to participate in the design process. Through the meetings health workers gave their sentiments about the new standards in terms of number and nature of data elements included, and in some other cases they were asked to suggest the structure of a new data set for vital registration. Institutionalization of quarterly feedback meetings at the zonal level created an arena for health officials from all districts, vertical programs and sometimes from the donor community to participate in the design process. Through these meetings a vital link between the stakeholders and the HISP team was established which helped to improve the knowledge of the integrated HII from the perspective of the users and the developers.

In general the standardization process relied heavily on participatory approaches such as meetings, seminars, and workshops, prototyping and formal and informal training (on-job training) (Byrne, 2004; Braa et al. 2004; Lagebo et al., 2005) to cultivate the installed base as an attempt to deal with the ensued challenges. Though from the discussions above the standardization process is deployed as to have applied the combination of bottom-up and top-down approaches; the top-down approach was the dominant one. The reason for this is due to the standardization approach used where health programs that operate at the national levels

dominated much of the data collected in local levels. Therefore much of the initial decisions about the type of data to be collected were made by the vertical programs.

The standardization approach used in my case study was based on the use of data management approach, where data sets from most vertical programs and from the national HMIS, were incrementally combined and streamlined by sorting out overlaps, gaps and inconsistencies (WHO, 2006). Comprehensive health information was therefore made available from a single source, the integrated district health information system. This approach is different from the essential minimum data set approach used in South Africa which was based on the hierarchy of standards, where an essential set of data was identified and agreed at the national level to be collected by every level of the health system, giving the lower levels flexibility to add data elements for local needs (Braa et al. 2002, Braa et al. 2005; Braa, 2005a). Whereas, the Zanzibar approach can be viewed as relatively less flexible, but it can be argued that due to contextual particularities of size and the number of vertical programs on the ground, the approach used seemed to be more appropriate. Based on the needs-driven approach lower levels of the health system and national level data needs are incorporated on the same data set. However, additional data needs from any level of the health system was agreed to be done annually during revision of the entire system, where all health units, districts and health programs present their needs to be discussed and agreed upon, before codifying them in the standards.

In the subsection below, I discuss how the standards have played a vital role as gateways to overcome the uneven infrastructure problem (Lagebo, et al. 2005; Braa, et al. 2004a), to attain both horizontal and vertical integration of the HII.

Use of standards as gateways to attain vertical and horizontal integration of the HII

Modularization is a cultivation approach where an information infrastructure is divided into smaller modules based on use or user groups; and building one upon the other (Hanseth et al. 1998). The integration of the HII involved modularization where a hierarchical structure was constructed using standardized units (gateways), by simultaneously supporting flexibility, and serving as an interconnecting mechanism between the different modules (ibid). The HII

development in Zanzibar is uneven, where the health unit level is paper based and at the district levels and above, the HII is based on computerized systems. This has been reported as a challenge in the attempt to integrate the HII in different developing countries (Braa et al. 2005; Lagebo et al. 2005; Braa, et al. 2004a). The modularization of the HII and the use of gateways have played a vital role in sidestepping the HII contextual conditions, to attain an integrated HII.

Figure 5.5 indicates that, each level of the health system forms one horizontally standardized, integrated subsystem, which communicates with its higher level (vertically) through standardized interfaces (gateways). The gateways at the health unit level are paper based because the entire system at this level is composed by paper formats (registers, tally sheets, monthly report forms, etc). These gateways at this level are mainly between the standardized primary and the secondary data formats whose communication is based on standardized procedures for collecting, collating and aggregating the monthly reports.

The districts and the periphery levels communicate using interfaces laid between the paper formats and the computers, which in this case include standardized data entry screens resembling the paper forms and the work procedures for interpreting both the paper and the computerized systems when working on them. Horizontal communication between the districts and vertically from the districts to higher levels is based on the computer-to-computer standardized interfaces. This is mainly the import and the export files, which are exchanged horizontally (if need be) and vertically from the districts to zones and from zones to the MoH and the vertical programs. The gateways have therefore been a corner stone for the attainment of horizontal and vertical integration of the HII in Zanzibar (RHINO, 2003).

I have discussed how cultivation approaches were used to deal with the challenges in the standardization of the data sets, data formats and the software standard. The subsequent section discusses how institutionalization of the standards followed a cultivation approach, which helped to cope with the challenges presented by installed base.

6.4.2 Institutionalization Challenges

As discussed earlier, institutionalization of the standards was not a straightforward process, neither was it a one-time event, as it involved tinkering and improvisation of some sort. Cultivation according to Aanestad et al. (2005), seeks to strengthen and nurture growth, through constant care, continuous assessment and a commitment to revise strategies that do not work. This is actually what the whole process of institutionalizing the standards was all about; different methods were applied as the HISP team was learning the contextual particularities that impeded the training approaches. For instance, training of trainers (ToT) approach was the first chosen method for training the data formats at the periphery levels but those who were supposed to take the role of change agents failed to do it due to many errands. Clustering approach had to be chosen, where health workers were summoned at the district levels for training. This approach also suffered a number of problems which included, less allocated time, lack of enough funds to extend the training beyond one day and relatively low education levels of the health workers. Yet, another approach which is more rigorous and sensitive the contextual particularities had to be chosen, on-job trainings of the health workers. This is an on-going incremental approach where health workers are oriented on the new standards through hands-on exercises. The challenge with this cultivation approach is that it is time consuming taking into account the number of health units available vs. the size of the implementation team. District quarterly meetings, which brought health unit staff together, were drawn upon to supplement the on-job training, by taking some of the time to discuss problems, related to the new data standards.

The institutionalization of the software standards at the district levels also followed a cultivation approach. Training of the software tool (DHIS1.4) was scheduled for five days with the assumption that computer skills are not a problem to the district health officers, who before that attended training covering basic skills in computer. The assumption proved wrong in the field, so three days from five days had to be spent in imparting basic skills in computer and the remaining two days for the software standard. As unintended consequence, the limited time spent in training led to misunderstanding of the software, which further led to inertia (limited use). Extending the time for a formal training was not possible due to limited funds. To go away with the inertia, a cultivation approach based on the on-job support of the

district staff through hands-on exercises was chosen. The cultivation approach helped gradual transition from inertia to moderate and even high usage of the software standards in some districts as discussed in the previous sections.

The subsequent section, discuss the need to enhance communication and collaboration between different stakeholders as a strategy to deal with the inertia of the vertical reporting systems.

6.4.3 Addressing the Inertia of the Vertical Reporting Systems

The need to strengthen communication and collaboration between stakeholders:

As discussed previously, the vertical programs in the Zanzibar case have very strong installed base of information systems reinforced by funds from donors. Moreover, these systems have very well defined and elaborate vertical organizational structures with many people employed in there which further reinforce the strength of the installed base and hence its inertia towards change attempts. For instance, the TB and Leprosy program in Zanzibar has its own administrative structure and its own employees working on the information system. Although most of these vertical-reporting systems have been harmonized and aligned in the integration initiatives, as I have described some of the systems are still running side by side by the integrated system. As was found, this state of inertia could be explained partly by the perceived results of integration which ranges from some people who are afraid of losing their positions, those with vested interests with the old systems to lose them to the mistrust on the capability of the national HIS in managing and sustaining the integrated system, given its nearly total dependence on donors. The fear of losing positions is more pronounced in the Zanzibar case, a developing country context characterized by high unemployment rate.

As the corollary, I argue that communication and collaboration between all the necessary stakeholders need to be built and strengthened as a strategy to deal with the inertia of the parallel vertical reporting systems. The national HIS however, need to take a stewardship role to ensure that comprehensive data is obtained from the disparate systems in a cost effective way. This further suggests that some of the vertical systems to run side by side with the national HIS, but then with the mandate that the national HIS take the driver's seat in ensuring smooth collaboration and communication between the stakeholders. This integration

perspective is inline with the concept of accepting to live with a reasonable level of non-integration, as no-one, including the national health authorities, are in ‘control’ in any strict sense, and therefore a relevant strategy cannot be based on a planning or control approach (Aanestad et al. 2005).

From the case, the communication and collaboration perspective is exemplified by the approach used by the HMIS Unit in solving the availability of data collection tools problem. As explained, this problem happened when the unit failed to fund production of data collection tools due to financial constraints. To solve the problem, which if left unsolved would have rolled back the entire system; the HMIS unit summoned all key stakeholders in a workshop to deliberate on the strategies to solve the problem. In the workshop, it was then unanimously agreed that each stakeholder (vertical program) contributes some funds for production of the tools. As the results, production of tools to be used for a period of one year was made possible through communication and collaboration between the stakeholders but with the HMIS unit taking the stewardship role. The national HIS using communication and collaboration processes can play the same role to ensure availability of comprehensive data.

Whereas in this study I have suggested the need to strengthen communication and collaboration between the stakeholders as a strategy to deal with the inertia of the vertical reporting systems, in the next chapter I suggest more research on this area to find out more how this can be achieved.

Chapter 7

7. CONCLUSION

This chapter presents the conclusions of the research efforts by attempting to address how the study met the research objectives. Research contributions and further research areas are also presented in sections 7.2 and 7.3 respectively.

7.1 Research Summary

This study is in the context of health sector reforms in developing countries which advocates among many other things the decentralization and integration of the disparate health information systems. Broadly, the study attempted to develop in-depth understanding of the challenges of integrating the health information systems in developing countries, and more specifically in the Zanzibar healthcare system. The broad objective was met by first looking at the challenges in the processes of achieving an integrated HII and secondly, by exploring the challenges which emanated from the way users received and related to the new system.

Two major integration processes were identified: standardization and the institutionalization of the standards. The challenges observed in these two processes were analyzed and discussed using the installed base concept from the II theory. As discussed previously, the installed base consisted of the multiple stakeholders on the ground, previous data elements, data sets and tools standards, knowledge of the stakeholders, software standards, work practices and behaviours surrounding the previous systems. While these elements of the installed base provided tremendous opportunities to the HII integration processes, in which without them nothing could have been accomplished, they also presented challenges to the integration initiatives.

In the standardization process, as I found, the installed base presented the following challenges: heterogeneity of interests among the stakeholders, lack of adequate knowledge on indicators and public health issues, and use of multiple languages in the previous data sets and tools standards. Likewise, the institutionalization process faced a number of challenges from the installed base, which included lack of clear management structure, inadequate skills

in computer, inadequate human resources, institutionalized work practices and relatively low education levels of health workers at the local levels of the health system.

However, in understanding the challenges which emanated from the way different user groups received and related to the newly integrated HII, the concept of user enactment based on the human agency perspective was drawn upon. Based on this perspective, the study found different ways in which users enacted the integrated HII standards, which presented both challenges and opportunities to the integration initiatives. The challenges came to play as some users such as vertical program managers, district officials and health unit staff enacted limited and non-use towards the new system. Conversely, the opportunities came as some users enacted different applications of the new standards. Also, in some cases other users were able to reinvent different ways of using the standards as an attempt to workaround some misfits. However, these multiple enactments were mediated by the installed base of beliefs, previous knowledge and skills, resources, poor economic conditions, attitudes, behaviours, and previous work practices, which the users drew upon.

As explained in the analysis and discussion chapter, the integration processes wrestled with the inertia of the installed base. Cultivation strategies which advocate on a piecemeal incremental process in the change attempts to give room for experimentation and revision of strategies were drawn upon to curb the challenges presented by installed base. Specifically, cultivation strategies used included participatory approaches and modularization. The participatory approaches used (e.g. meetings, seminars, trainings) provided a learning platform to health units, districts and vertical programs officers, and the development team. Modularization approach was drawn upon to attain vertical and horizontal integration of the HIS, in the face of uneven infrastructure development. Nevertheless, the study also suggested the need to enhance collaboration and communication linkages between the necessary stakeholders as an attempt to deal with the inertia of the vertical reporting systems.

7.2 Contributions from the Study

7.2.1 Theoretical Contributions

Theoretically, this study drew on the installed base concept from II theory and user enactment concept based on human agency perspective to analyze and discuss the empirical materials. The installed base concept has been used to analyze and discuss the challenges in the processes of achieving integration. In trying to understand and explain in details the challenges which emanated from the use of the new system, the installed base concept seemed to have some limitations. This is because of its inherent orientation to history only. By drawing on the installed base concept I could analyze the way users' (vertical program managers, district health officers, health unit staff) history (beliefs, previous work practices, attitude and behaviors) shaped the way they responded to the new technology. Conversely, users do not draw on history only to shape their decisions and actions towards the new system but also on the present and future possibilities. So in explaining how the present and the future affected users' decisions, installed base concept seemed to be relatively weak in that respect.

Nonetheless, by drawing on the user enactment concept based on the human agency perspective, I was able to analyze and discuss how history, the present and the future shaped users decisions and interactions towards the integrated HII. This was made possible by the use of the three elements put forward by Emirbayer and Mische (1998) to conceptualize human agency that enable actors (users or human agents) to shape their responses to situations. By drawing on the first element called "iterational" which is oriented to past practices shaping users decisions and actions, I found myself using both the installed base and the user enactment. In this case the user enactment concept was used to illuminate the installed base to elicit the challenges which resulted from users drawing on their previous practices and experiences. When users for instance enacted limited or non-use type of inertia, they were not doing that out of nothing but by drawing on things like their beliefs, previous knowledge and skills, resources they own, poor economic conditions, and their behaviors, attitudes and their previous work practices; which together forms the installed base or the iterational element for that matter.

Users were also influenced by the "projective" element of human agency which looks at the future in imagining possibilities for reconfiguring patterns of thoughts and action towards the new system (ibid). For instance some vertical program managers enacted limited use of the new system by drawing on their requirement of information to meet future needs. Also users drew on the present context which was characterised by the new system to shape their response towards it, which led to limited use. This is further represented by the "practical-evaluative" element of human agency which is the capacity for practical and normative judgments made in the present context of emerging demands, dilemmas, and ambiguities (Boudreau and Robey, 2005). The limited use adopted by the district officers due to inadequate knowledge on the software standard illustrates how the present context shapes users responses.

The past, present and future, as explained above contributed to the enactment of the inertia towards the new system. Therefore, theoretically the study contributes on the use of the installed base concept and human agency perspective to decipher the challenges emanating from use of the integrated HII.

The previous studies on user enactment were based on technologies implemented in one autonomous organization (Orlikowski, 2000; Boudreau and Robey, 2005). This study used user enactment concept in HIS integration in a setting which is characterized by quasi-independent institutions (vertical programs) housed in a multileveled health care system. This is different from an autonomous organization which sometimes uses managerial power to effect changes. The contribution the study makes is by showing that user enactment concept can also be applied in semi-autonomous organization and yield more or less similar results.

Another contribution is the implication I draw from the use of user participation and the user enactment concepts. According to Bjerknes et al. (1995), user participation helps to improve the knowledge upon which systems are built and enables people to develop realistic expectations and reduce resistance to change. As implied from my case study however, user participation does not always lead to compliance to the new system. From human agency

perspective, users have the power to enact different ways of responding to the new technology irrespective of their participation. For instance, while the vertical program managers from say HIV/AIDS or EPI participated in the integration processes, but that did not unleash their power to apply agency and enact limited or non-use technologies in practice.

Most studies on HIS integration have looked on the challenges of achieving integration (Chilundo, 2004; Shidende, 2005; Aanestad et al. 2005). These studies have not studied in details a process in which integration was actually achieved, nor have they studied what actually happened afterwards from the perspective of the users. This study however, looked at both the activities during the process of attaining integration and the aftermath of that process, where I have explored various ways in which different user groups responded to the new system that presented challenges to the integration initiatives.

7.2.2 Practical Contributions

In the course of this study, as a researcher and a member in the HISP team, I made some practical contributions in the HIS restructuring efforts by engaging in the on-going actions taking place in Zanzibar. As a change agent, I trained the health workers at the periphery level on the use of the new data sets and data format standards. At the district level, the district officers were trained in computer basic skills, data entry and analysis using DHIS software. I also engaged in the customization and implementation of a pivot table reporting tool used for data analysis and presentation at the district level and by the vertical programs.

Moreover, from this study I provide some practical lessons which I believe can be applied in more or less similar context. These include the following:

Start with the actors who seem to be unproblematic to join the initiative

The process of integrating the fragmented systems in Zanzibar commenced with the vertical programs which seemed unproblematic in engaging in the new initiative. EPI which had been relatively strong in terms of data collection and transmission, and whose services are offered in almost all health units was seen as a preferred program to start with. Since initial

negotiations about the standardization initiative between EPI and HISP was positive, that gave green light to the success of enrolling this actor in the process.

As explained, EPI officials participated in the design and implementation process from the start. That being the case, the HISP team worked very hard to make sure that they are provided with appropriate tools for data processing and analysis. DHIS1.4 together with an analysis tool which was adapted to their preferred reporting format was installed in their computers and the data mangers were trained on both tools.

Consensus building between actors is cardinal

Consensus building between heterogeneous actors has been a corner stone in the design and implementation process. Actors agreed on problems and strategies to resolve the problems. In the field, this was exemplified by the collective approach used to resolve shortage funds problem, to be used for the production of data formats. As explained previously, an agreement between the stakeholders (vertical programs, and HMIS unit) was reached where production of both primary and secondary data collection tools to be used for a period of one year was done using funds from different VPs. This collective approach of problem solving in the context of HIS integration is an appropriate strategy in resource deprived settings like Zanzibar.

Engage the stakeholders in the actual implementation

After involving VPs in the standardization of data sets and design of the data collection tools, these stakeholders were also involved in conducting training especially of their data collection tools. For instance Malaria program data manager was involved in conducting training of the disease surveillance data tools to the health workers at the periphery and district levels of the health information systems. Likewise, EPI managers were involved in training not only the immunization data set tools which are used to collect their data, but also other tools. This approach of engaging the stakeholders in the implementation process not only reduce resistance to accept integration initiative but also creates an atmosphere for the stakeholders to own the system.

Keep stakeholders informed through meetings and workshops

Quarterly meetings and workshops were used as conduits to keep abreast the stakeholders on the progress of the implementation process and observed problems like maintenance of their vertical reporting systems in parallel with the new one. Stakeholders were also given chance to air their views in relation to different issues such as accessibility problems of the integrated data and data quality problems, which were discussed and the solution unanimously agreed.

7.3 Further Research

Non governmental or private organizations have traditionally played an active part in the delivery of primary health care. There is a growing involvement of these organizations in the financing of such care, which is adding a new dimension to the way in which health policies are framed and services are organized and delivered (WHO, 2003). This represents new challenges and opportunities for the stewardship role that government plays in the health sector. Integrating the private health care institutions information systems with the national HIS will provide the government with comprehensive data for planning, monitoring and evaluating the health care services of the entire country. Whereas this study looked mostly at the public primary health care institutions, further research can be done to look at the challenges and opportunities of integrating the private primary health care institutions' information systems with the national HIS.

User participation has been cited as an important approach for HIS implementation. The contextual reality of HIS in developing countries, especially at the local levels is characterized by inadequate human resources with inadequate education levels. From the study however, inadequate capacity of the health workers led to their inability to participate effectively in the HIS integration initiative. Further research is needed to look at how the capacity of these heath workers can be enhanced to ensure fruitful participation in the HIS implementation endeavors, particularly in a developing country context.

As explained in chapter 6, some of the vertical health information systems harbor a number of employees working in there, who have fuzzy feeling about losing their positions as the

result of integration. In addition, some of the systems have a very strong structure which is reinforced by funds from donors. Further research is required to look at how communication and collaboration linkages between the different stakeholders can be built and strengthened, as a strategy to deal with the strong inertia of some of these parallel vertical reporting systems in the face of HIS integration.

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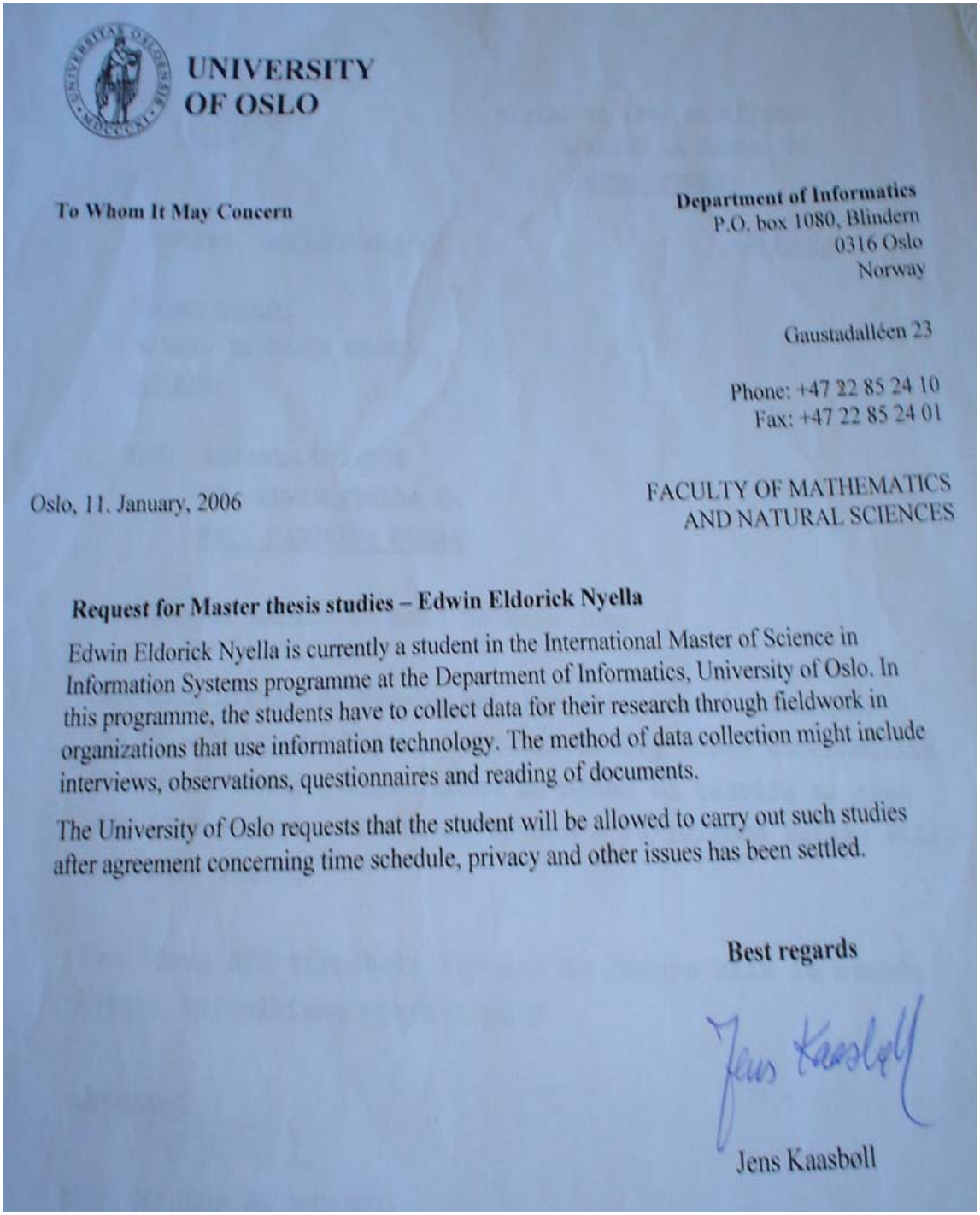
APPENDICES

APPENDIX A: Ethical Clearance Letters

APPENDIX A1: Introductory letter from the University of Oslo



UNIVERSITY
OF OSLO

To Whom It May Concern

Department of Informatics
P.O. box 1080, Blindern
0316 Oslo
Norway

Gaustadalléen 23

Phone: +47 22 85 24 10
Fax: +47 22 85 24 01

FACULTY OF MATHEMATICS
AND NATURAL SCIENCES

Oslo, 11. January, 2006

Request for Master thesis studies – Edwin Eldorick Nyella

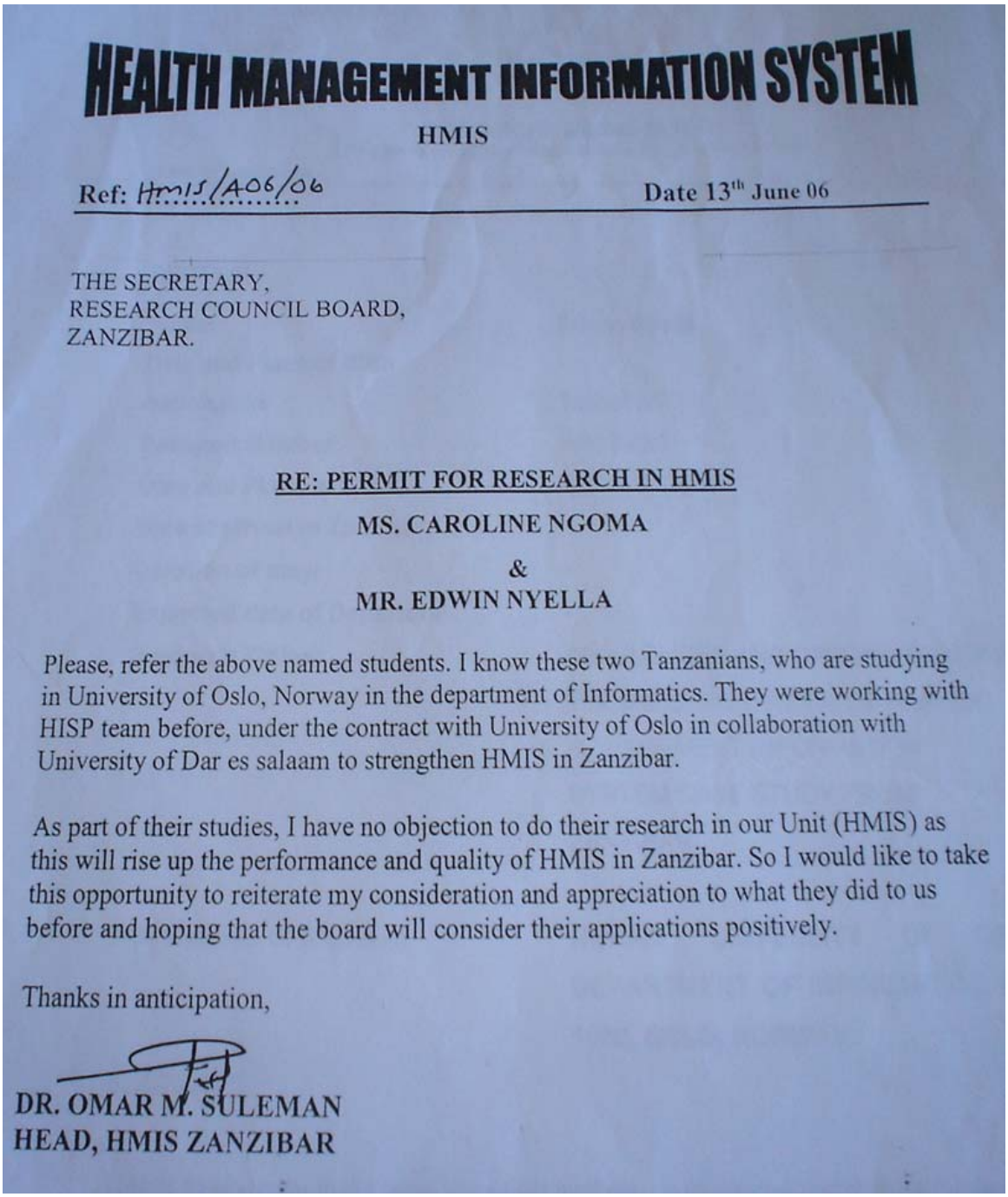
Edwin Eldorick Nyella is currently a student in the International Master of Science in Information Systems programme at the Department of Informatics, University of Oslo. In this programme, the students have to collect data for their research through fieldwork in organizations that use information technology. The method of data collection might include interviews, observations, questionnaires and reading of documents.

The University of Oslo requests that the student will be allowed to carry out such studies after agreement concerning time schedule, privacy and other issues has been settled.

Best regards

Jens Kaasbøll

APPENDIX A2: **Introductory letter from HMIS Unit to the Research Council Board, Zanzibar**



HEALTH MANAGEMENT INFORMATION SYSTEM

HMIS

Ref: HMIS/A06/06 Date 13th June 06

THE SECRETARY,
RESEARCH COUNCIL BOARD,
ZANZIBAR.

RE: PERMIT FOR RESEARCH IN HMIS

MS. CAROLINE NGOMA

&

MR. EDWIN NYELLA

Please, refer the above named students. I know these two Tanzanians, who are studying in University of Oslo, Norway in the department of Informatics. They were working with HISP team before, under the contract with University of Oslo in collaboration with University of Dar es salaam to strengthen HMIS in Zanzibar.

As part of their studies, I have no objection to do their research in our Unit (HMIS) as this will rise up the performance and quality of HMIS in Zanzibar. So I would like to take this opportunity to reiterate my consideration and appreciation to what they did to us before and hoping that the board will consider their applications positively.

Thanks in anticipation,

DR. OMAR M. SULEMAN
HEAD, HMIS ZANZIBAR

APPENDIX A3: **Research permit issued by the Zanzibar Research Committee**

REVOLUTIONARY GOVERNMENT OF ZANZIBAR

SECRETARY
ZANZIBAR RESEARCH COMMITTEE
P. O Box 239
Tel: 2230806
FAX: 2233788

RESEARCH/FILMING PERMIT
(This Permit is only Applicable in Zanzibar for a duration specified)

PERMIT No.ZRP/98

SECTION

Name:	Edwin Nyella
Date and Place of Birth	-
Nationality:	Tanzania
Passport Number:	AB018982
Date and Place of Issue	12/06/05 DSM
Date of arrival in Zanzibar	-
Duration of stay:	-
Expected date of Departure:	-
Research Tittles:	CHALLENGES AND OPPORTUNITIES IN THE IMPLEMENTATION OF HEALTH MANAGEMENT INFORMATION SYSTEM:CASE STUDY FROM ZANZIBAR.
Full address of Sponsor:	NORAD, UNIVERSITY OF OSLO, DEPARTMENT OF INFORMATICS, BOX 1080, OSLO, NORWAY.

SECTION C:

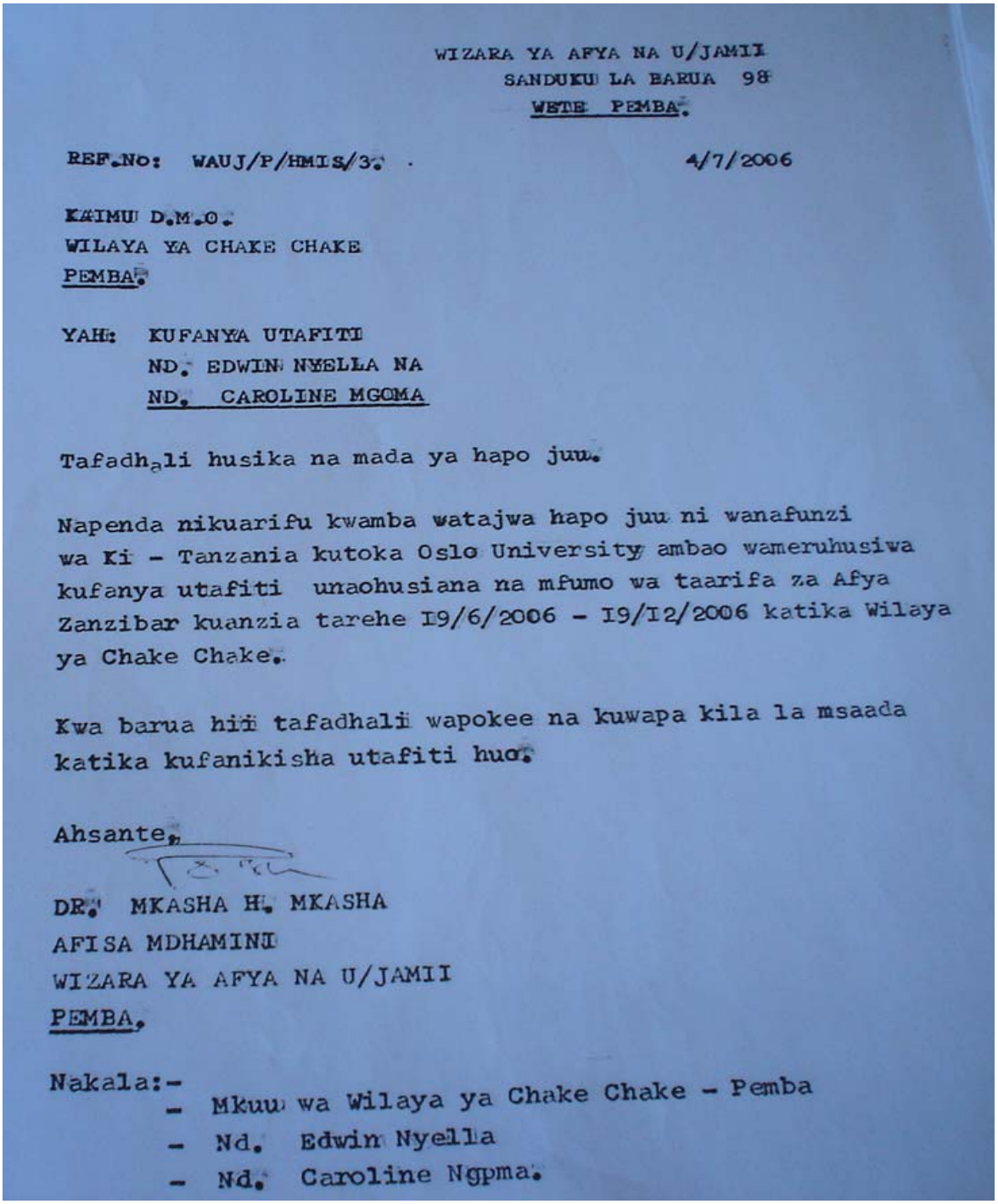
This is to endorse that I have received and duly considered applicant's request I am satisfied with the descriptions outlined above.

Name of the authorizing officer: Mohammed Hafidh

Signature and seal:

Institution: Office of Chief Government Statistician

APPENDIX A4: **Letter of permission from the Ministry of Health, Pemba head office**



WIZARA YA AFYA NA U/JAMII
SANDUKU LA BARUA 98
WETE PEMBA.

REF.No: WAUJ/P/HMIS/3. 4/7/2006

KAIMU D.M.O.
WILAYA YA CHAKE CHAKE
PEMBA.

YAH: KUFANYA UTAFITI
ND. EDWIN NYELLA NA
ND. CAROLINE MGOMA

Tafadhali husika na mada ya hapo juu.

Napenda nikuarifu kwamba watajwa hapo juu ni wanafunzi wa Ki - Tanzania kutoka Oslo University ambao wameruhusiwa kufanya utafiti unaohusiana na mfumo wa taarifa za Afya Zanzibar kuanzia tarehe I9/6/2006 - I9/I2/2006 katika Wilaya ya Chake Chake.

Kwa barua hii tafadhali wapokee na kuwapa kila la msaada katika kufanikisha utafiti huo.

Ahsante,

DR. MKASHA H. MKASHA
AFISA MDHAMINI
WIZARA YA AFYA NA U/JAMII
PEMBA.

Nakala:-
- Mkuu wa Wilaya ya Chake Chake - Pemba
- Nd. Edwin Nyella
- Nd. Caroline Ngpma.

Appendix B: Interview Guide

To assess the changes brought by the system at the Facility Level

1. What is your position and educational level?
2. Were you informed of the process of revising the data collection tools? If yes, were you involved in the revision exercise? If No, what do you think would have been different if you were involved?
3. Were you trained on the new data collection forms? Are there things you still do not understand?
4. How is your responsibility in collecting and preparing routine monthly report affected by the new data collection tools?
5. Do you have shortage of data collection forms? What do you do when the tools are not there?
6. Do you have any problem to send monthly reports to the district?
7. How do you store the monthly reports?
8. Do you use the data? If yes, for what purpose/s? If no, why?
9. Do you get feedback from the district on the report you send monthly? If yes, how often?
10. To whom do you normally send the routine monthly report?

To evaluate the DHIS training and the new reporting format at the district level

1. Do you have any computer skills? If yes, where did you get it?
2. Did you attend DHIS trainings? Do you think the training time was enough?
3. Do you have any problems to prepare the routine monthly report by using the DHIS software?
4. Do the currently revised data collection forms enable you to collect all data that you want it to be collected?
5. Do all the health facilities send reports by the standard data collection forms?
6. How do you validate the correctness of the data that you are receiving monthly?
7. To which institutions or vertical programmes do you send reports out of the health care system?

To study the changes brought by the new system – district and higher levels

1. For what activities do you use the data which are collected from the health facilities?
2. Do you think that DHIS has supported you to accomplish the above mentioned activities? If yes, how? If No, can you please explain why it is not supporting?
3. What problems did you observe in the manual system? (Before the implementation of DHIS)
4. Which of the problems are solved by the implementation of the computerized health information system?
5. What changes have you seen in the health information system after the implementation of DHIS?
6. Do you face any challenges because of DHIS?
7. Do you have any other comments or suggestions on the system?

8. Which indicators are appropriate at this level? Do all the required indicators for your level included in the DHIS?

Interview questions for the HISP team

A. Standardization and integration of data collection tools

1. Who were involved in the revision of data tools?
2. Are there some vertical programmes which were not involved in the standardization exercise? If yes, which of them and why?
3. How does the multiple needs of different stakeholders reconciled?
4. Was there any training on the revised data collection tools? If yes, who were trained and how effective was it?
5. Why are the new primary data tools in Swahili while the secondary tools are in English?

B. Indicator set – agreeing on the essential indicators

1. Who were involved in the selection of essential set of indicators? How were they involved?
2. What were the challenges in this exercise?
3. How was the understanding of indicators by the involved stakeholders affected the selection process?

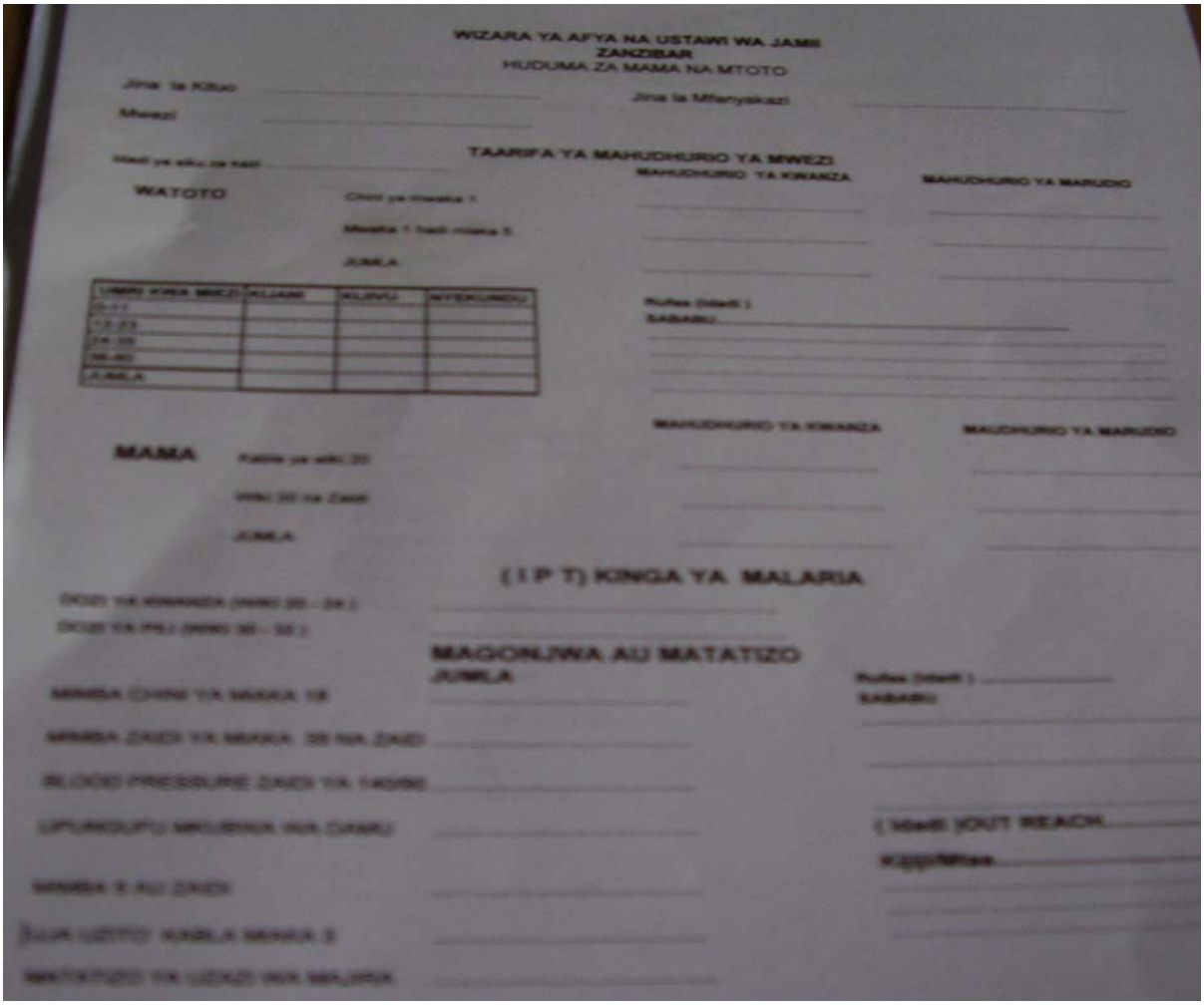
C. DHIS software – Assessing challenges in the adaptation process

1. How difficult was it in meeting client requirements- formats, contents, layout etc.?
2. Was there any tension between the paper forms and the computerized?
3. How did customization of the software evolved over time? What were the major problems in the customization exercise?
4. Who were trained on DHIS? Why?
5. Did they all have any computer skills before? How did it affect their understanding of the software?
6. How long was the training? Was it effective?

Appendix C: Data Formats Samples

Appendix C 1: Samples of the old data formats for RCH services

Nutrition and antenatal monthly reporting format



Family planning monthly reporting format

WIZARA YA AFYA NA USTAWI WA JAMII – ZANZIBAR
IDARA YA KINGA – MRADI WA AFYA YA UZAZI

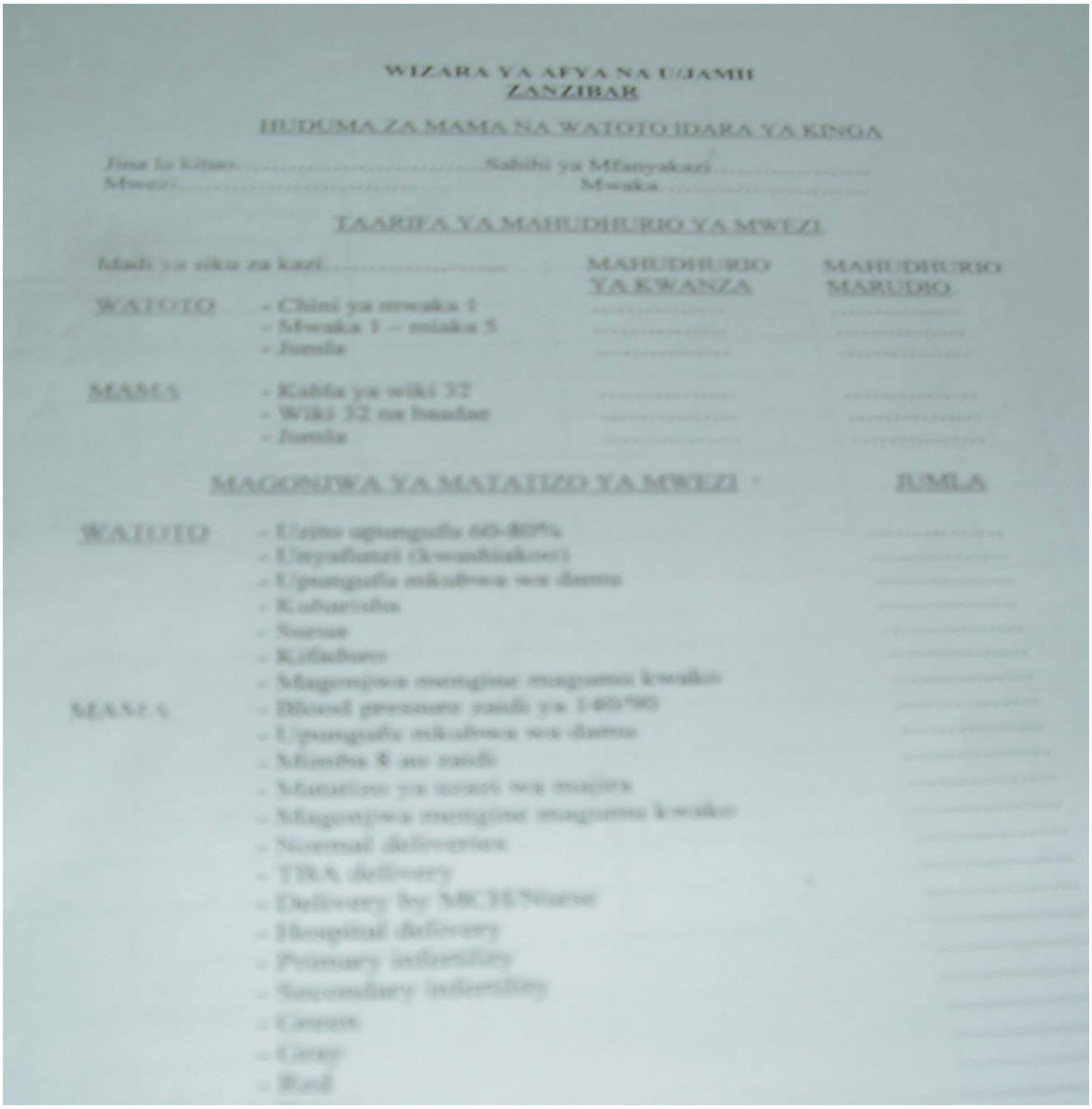
A. IDADI YA WATEJA WA UZAZI WA MPANGO

	AINA YA NJIA	WATEJA WAPYA	WALIOBADILI		WALIOACHA		WALIOACHA NA KUBUDI	WALIO-HAMA	WALIO-HAMIA	WALIOKU-DUMIWA	WANAO-ENDELEA
			NJIA MPYA	NJIAYA ZAMANI	HAWATA-MII TENA	KWA KUZAA					
001	PILL										
002	IUCD										
003	INJECTION										
004	CONDOMS										
005	SPERMICIDE										
006	VASECTOMY										
007	TUBALIGATION										
008	NORPLANT										
JUMLA YA WATEJA											

B. WATUMIAJI WA HUDUMA KWA UMRI WAO:

AINA YA NJIA	15-19		20-24		25-29		30-34		35-39		40-44		45-49		JUMLA YA WATUMIAJI		JUMLA KUU
	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	WAPYA	WALIOKUWEPO	
PILL																	
IUCD																	
INJECTION																	
CONDOMS																	
SPERMICIDE																	
VASECTOMY																	
TUBALIGATION																	
NORPLANT																	

Postnatal monthly reporting format



WIZARA YA AFYA NA U/JAMII
ZANZIBAR

HUDUMA ZA MAMA NA WATOTO IDARA YA KINGA

Jina la kituo.....Sahihi ya Mfanyakazi.....
Mwezi.....Mwaka.....

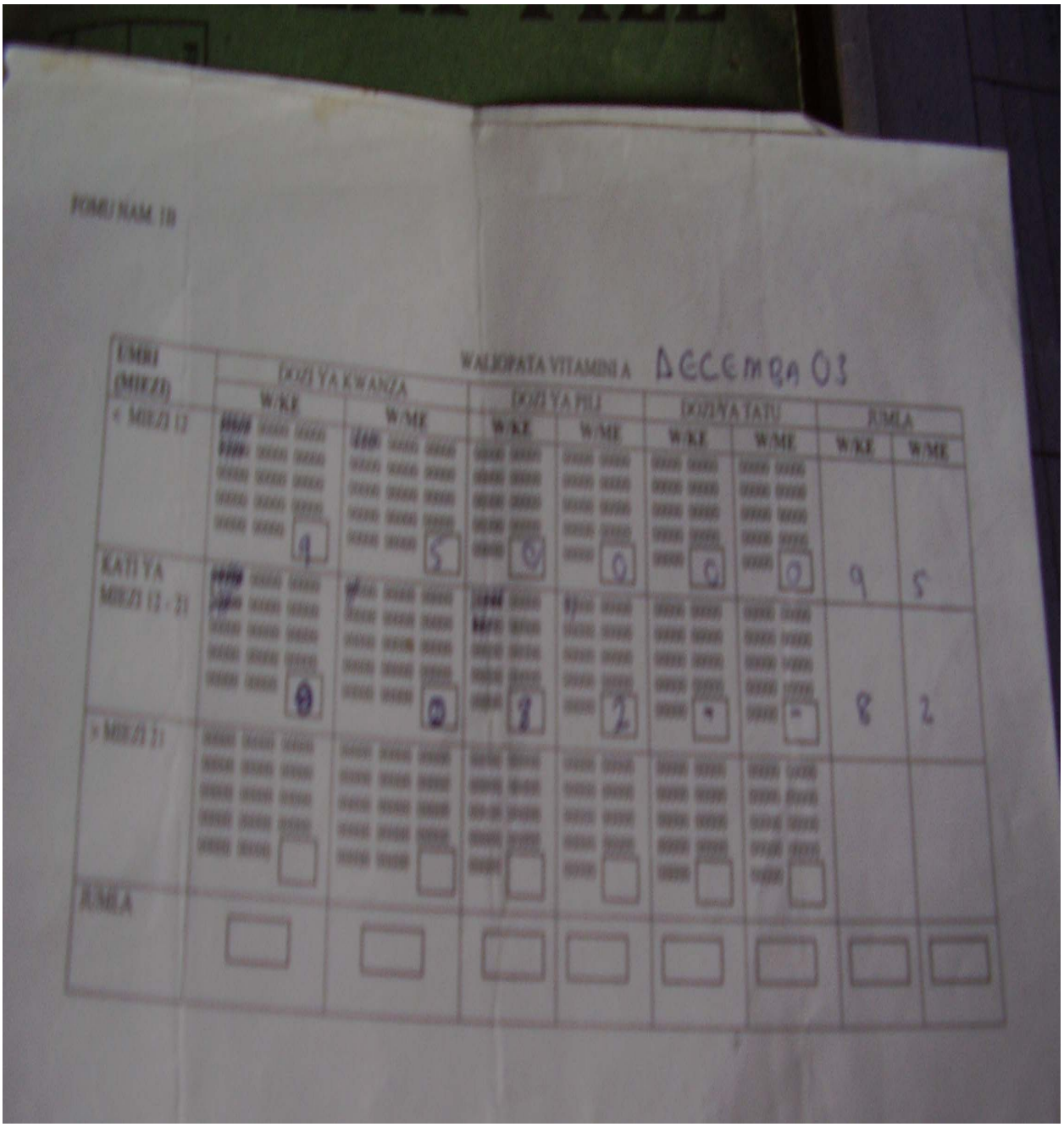
TAARIFA YA MAHUDHURIO YA MWEZI

Madi ya siku za kazi.....

		MAHUDHURIO YA KWANZA	MAHUDHURIO MARUDIO
WATOTO	- Chini ya mwaka 1	.....	.....
	- Mwaka 1 – miaka 5	.....	.....
	- Jumla	.....	.....
MAMA	- Kabla ya wiki 32	.....	.....
	- Wiki 32 na baadae	.....	.....
	- Jumla	.....	.....

MAGONJWA YA MATATIZO YA MWEZI		JUMLA
WATOTO	- Uzito upungufu 60-80%	.....
	- Ureyafunzi (kwashiakor)	.....
	- Upungufu mkubwa wa damu	.....
	- Kuharisha	.....
	- Surua	.....
	- Kifaduro	.....
	- Magonjwa mengine magumu kwako	.....
MAMA	- Blood pressure zaidi ya 140/90	.....
	- Upungufu mkubwa wa damu	.....
	- Mimba 9 au zaidi	.....
	- Matatizo ya uzazi wa majira	.....
	- Magonjwa mengine magumu kwako	.....
	- Normal deliveries	.....
	- TBA delivery	.....
	- Delivery by MCH Nurse	.....
	- Hospital delivery	.....
	- Primary infertility	.....
	- Secondary infertility	.....
	- Green	.....
	- Grey	.....
	- Red	.....

Nutrition program reporting format



Appendix C2: Sample of the new integrated data format for RCH services

ZHMIS B03

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR

REPRODUCTIVE AND CHILD HEALTH SERVICES

Name of health facility _____ **District** _____
Month _____20_____ **No. of working days** _____

Family planning services

Method	No. of new clients		No. of continuing users			
	15-24yrs	>24yrs	15-24yrs	>24yrs	No. of new clients	
Oral pills						
Injection					No. of continuing users	
IUCD						
Norplant					No. of CBDs	
Tubal ligation						
Condoms					No. of clients served by CBDs	
Other methods						

Pregnant mothers attendances

No. of first visits	Prime gravida	Multi gravida
Before 20 weeks		
After 20 weeks		
Total first visits		
Re-attendances	**Prime gravida**	**Multi gravida**
Intermittent Presumptive Treatment (IPT)		
IPT at 20 – 24 weeks		
IPT at 28 – 32 weeks		

No of mothers at risk		
Problem	**Total**	**Referred**
EPH Gestosis / Pre-Eclampsia		
Anaemia		
Malaria		
Syphilis		
Pregnancy below 18 years		
Pregnancy above 35 years		
Pregnancy > 4 gravida		
Pregnancy before 3 years		

Delivery services

No. of deliveries	Prime	Multi	Total
Attended by Skilled personnel			
Attended by TBA			

No. of live births	
No. of still births fresh	
No. of still births macerated	
No. weighed < 2500 gms	

Infant / Maternal deaths

No. of maternal deaths	No. of children died --------→	1 – 28 days	1 – 11 months	1 – 5 years

Postnatal services

No. of mothers attending postnatal Care →	7th day	14th day	28th day	42nd day

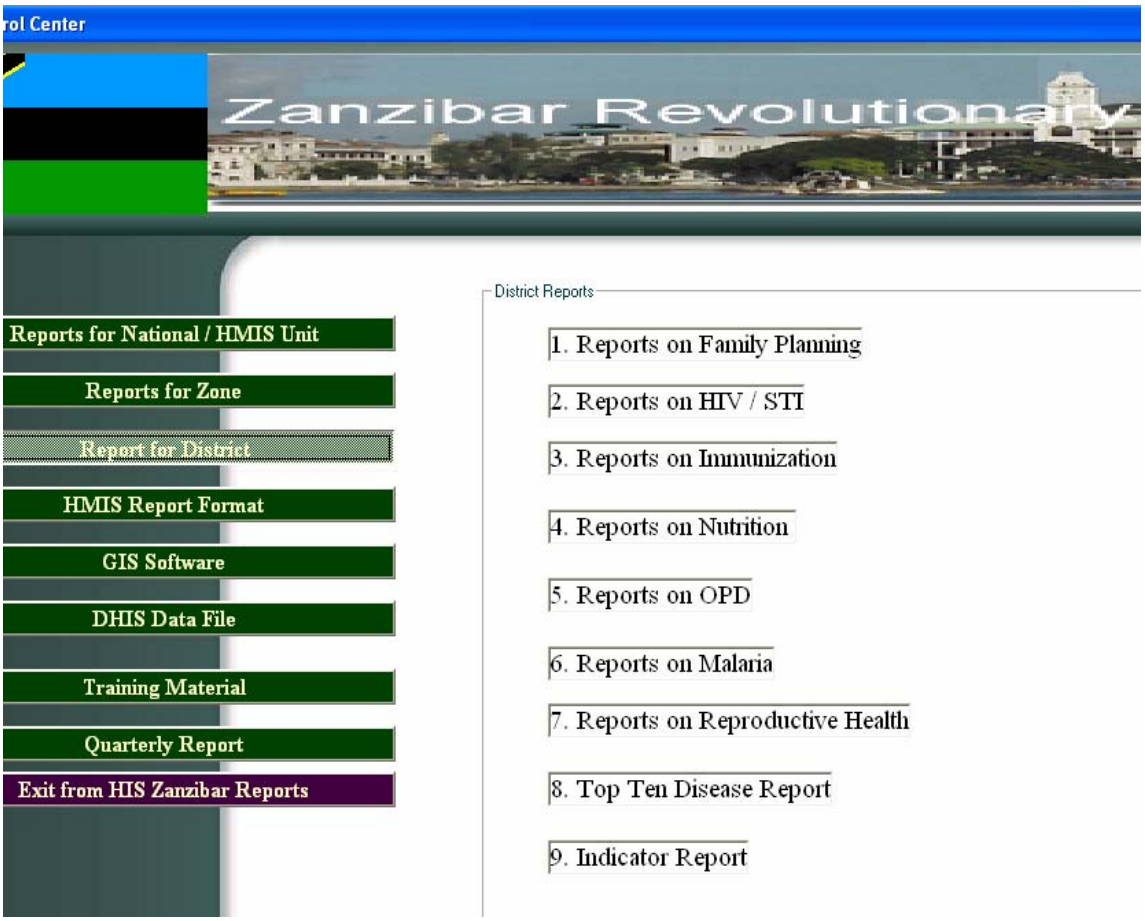
Growth assessment / nutritional status for children under 5 years

Total attendances (Male)			Total attendances (Female)			
Age (month)	Green		Grey		Red	
	Male	Female	Male	Female	Male	Female
0 – 11						
12 – 23						
24 – 35						
36 – 60						
Total						

Name of service provider _____ **Designation** _____

Signature _____ **Date** _____

Appendix D: DHIS Reporting Tool



Main screen of the reporting module depicting various types of reports (Courtesy of HISP team, Zanzibar)