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Cultivation Strategies in the Implementation of Health Management Information System in Zanzibar:

An Action Research Study

MASTER THESIS

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Dedication

To my Mother, Imani; the memory of my Father, Abel; my Sister, Stella and my Brothers, Jonathan and Allan.

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Abstract

This study focuses on the challenges of building health workers capacity for understanding and using health data through training and support. The study falls under the action research paradigm in which health workers at district and facility levels were trained and supported on data collection, processing, analyzing, reporting and using. These actions aimed at gaining an understanding of organizing training and support to deliver effective training and to strengthen the culture of using information among health workers. This was to help health workers develop a sufficient understanding of using DHIS, data collection tools and collected data.

Findings have indicated that, HMIS in Zanzibar face challenges such insufficient training for health workers, low educational levels of health workers, culture of non-ownership of data collected, the design of data collection tools and poorly motivated health workers. There challenges are in one way or the other leading to collection of incomplete and inaccurate data, untimely reporting of data, poor utilization of the data collected, and underutilization of the DHIS. Facing these challenges, this research has proposed building individual and system wide capacity of the HMIS for collecting, analysing, reporting and using health data through training and support.

The study was informed by qualitative and quantitative methodologies where I employed concurrent triangulation methodology. Using this methodology, data was collected and analysed qualitatively and quantitatively concurrently, giving priority to the qualitative data. The study was conducted in three districts (Chake Chake, West and Urban) and twelve health facilities in Chake Chake and Urban districts.

The results of the findings of this research indicate that training can improve skills and performance of health workers qualitatively and quantitatively if it is appropriately organized. Training should not only concentrate on how to make the system work but also why. Health workers can change their perceptions and attitudes towards training if its outcomes are motivating and rewarding to them.

Keywords: Training, Support, Learning, Information culture, Capacity Building, Health Information Systems, Zanzibar, Developing Countries

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List of Acronyms

AIDS	Acquired Immune Deficiency Syndrome
CBDs	Community Based Distributors
DANIDA	Danish International Development Agency
DHIS	District Health Information System
DIP	District Implementation Plan
ERP	Enterprise Resource Planning
HISP	Health Information System Programme
HIV	Human Immune Virus
HMIS	Health Management Information System
ICCM	Immunization and Cold Chain Monitoring
ICT	Information and Communication Technology
IT	Information Technology
K/Samaki	Kiembe Samaki
MCH	Mother and Child Health
MDSR	Monthly Disease Surveillance Report
MoHSW	Ministry of Health and Social Welfare
MTUHA	Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya
OPD	Out Patient Department
PHCU	Primary Health Care Unit
PHN	Public Health Nurse
RCH	Reproductive and Child Health
RCHS	Reproductive and Child Health Services
RHINO	Routine Health Information Network
SDA	Seventh Day Adventists
STI	Sexually Transmitted Infections
V/Cottage	Vitongoji Cottage
WHO	World Health Organization

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1. CHAPTER 1: Introduction

1.1. Introduction

To improve health care delivery is the main goal of all Health Management Information Systems (HMIS). However, this goal has been difficult to achieve in most developing countries where the Primary Health Care Unit (PHCU) is constrained by scarce resources, which are poorly allocated and used. To improve this situation, most of the countries have undergone health sector reforms and used different strategies for implementing HMIS.

Most would agree that data is worth collecting if and only if it is used. The health sector collects a large amount of data in the health facilities (HFs) but many studies show that decision makers do not rely on routine data because they believe it is irrelevant, unreliable and untimely. Chambers (1994) argues that, "much of the material remains unprocessed, or, if processed, unanalysed, or, if analysed, not read, or, if read, not used or acted upon" (p. 53) conversely, the objective of HMIS is not to produce information but to use it.

A number of research studies have shown that building individual capacity for understanding and using data, and strengthening the system capacity in support of data collection and use is one of the strategies to improve and sustain good quality of health data (Braa et al., 2001; Lippeveld, 2001). In addition, health workers need training and motivation to interpret data and respond accordingly. This will create a culture of information that will empower them to use information to identify and address the root problems though (Lippeveld 2001) argues that, changing people's beliefs, attitudes and practices will take time.

However, different studies have shown that users are being trained to adopt new technologies and become technically literate, yet the type of training and support offered to them rarely give them the basic skills necessary to evolve along with the infrastructure (Star and Ruhleder, 1996).

According to Byrne and Sahay (2003), Primary Health Care systems in developing countries are very complex systems and factors such as history, geography, culture, infrastructure, inadequate skill levels and pressure of everyday work increase its complexity which make its design, development and use of information system a challenging task and contribute to poor functioning of HMIS. Zanzibar as a developing country faces these challenges and as they are revising the health sector and implementing it, they are looking for strategies that will sustain the implementation. The revised HMIS has targeted on improving data collection tools and procedures and computerizing some of the functionalities at the district level.

In addition, there is low data quality in routine health systems and one of the reasons, according to Lippeveld (2000), is poor training. He argues that, "health care providers receive little if any training in data collection methods, and they rarely are given standardized instructions on how to collect data. They are poorly motivated to produce quality data, because most data collected are irrelevant to their own information needs. They rarely receive feedback on the data reported to higher levels" (p. 109).

1.2. Research Objective and Research Questions

The objective of this research is to suggest appropriate training and supporting strategies that can be used to sustain the implementation HMIS in Zanzibar. To accomplish the objective of this study, I will answer the following questions:

1. How to arrange training for health workers at the facility and district level in the implementation of HMIS
2. What can be done to improve the culture of using information among health workers at district and facility levels

1.3. Intellectual and personal motivation

This topic is of interest to me because at the time of this study Zanzibar was undergoing the implementation of the reformed HMIS. Myself as a Health Information System Programme (HISP) team member, I was involved in installing District Health Information Software (DHIS) at the district level, distributing revised forms to the health facilities and training and supporting health workers. During this exercise, I addressed some ways that can help health workers at the facilities and district to collect, analyse and use the collected data and to utilize the DHIS effectively.

Different studies show that there is poor data quality in routine health information systems due to many reasons, poor training being one of them. I think improving training strategies, to reflect health workers' needs for training will improve their knowledge and nurture the culture of using information, and as a result improve the quality of health services.

Different studies have shown that the implementation of information systems has failed because of improper training given to users among other things. I am intrigued to address this issue by looking on ways that can sustain training and support health workers for the sustainable implementation of HMIS in Zanzibar.

In addition, this research motivated me because I am a trainer and this research gave me an opportunity to improve my knowledge and understanding on conducting and evaluating training to improve skills, performance and behaviour of trainees.

1.4. Research Design and Research Methods

Qualitative and quantitative research methodologies were used in this study. I chose the qualitative approach to help me answer how and why certain events occur by getting closer to the health workers' perspectives through training, detailed interviews and observations. The quantitative methodology was used for collecting and analysing numerical data.

In this research, I participated in the implementation of HMIS and I was involved in training and supporting health workers on using data collection tools and DHIS at the district and facility

levels. In this section, I explain the research setting, research paradigm and methods used for data collection.

1.4.1. Research Setting

This research was conducted in Zanzibar at the Ministry of Health and Social Welfare (MoHSW) under the HMIS unit. Zanzibar is a country that is part of the United Republic of Tanzania and it is made up of two main islands, Unguja and Pemba. Kiswahili and English are official languages used.

The research was done from June to November 2006, by a team of two Master students. While we collaborated in the process of data collection, we had different research goals. The study was conducted in three districts, West, Chake Chake and Urban. We studied twelve health facilities in West and Chake Chake districts, six facilities in each district, and three district offices, in each of the three districts. This choice was done because we wanted to study and suggest training strategies that could be useful for these different user groups (district and facility health workers).

1.4.2. Research Paradigm

An action research paradigm was used aiming at solving current practical problems while expanding scientific knowledge of training and supporting health workers at the facility and district level. In the study, I developed training and supporting strategies and used them to arrange training at the facilities and districts. These actions aimed at helping health workers build the capacity of understanding and using information for the sustainable implementation of HMIS.

In this study, the actions taken involved two training cycles, one in the facilities and the other one in the districts. Training cycle in the facilities involved training on data collection, analysis, reporting and, using and in the districts, it involved training on using DHIS for entering, analyzing, importing and exporting data, and using the information generated from DHIS. As the research was in a cyclic nature, actions performed were divided into five phases of the training cycles, diagnosing, action planning, action taking, evaluating and specifying learning.

During the diagnosing phase of the research, I identified health workers' training needs and their expectations for training. I also assessed the aspects of their educational backgrounds, English language proficiency, arithmetic skills, and computer literacy. Gaining this understanding helped me to move to the action planning phase where I prepared training strategies to be used, I formulated training objectives, chose training methods to employ, places for conducting training were prepared, training groups and timetable were identified and training materials were prepared.

In the action-taking phase, training was conducted based on the plan devised in the planning phase. The impact of training was evaluated in the evaluating phase and in the learning phase, I reflected back on the actions performed and evaluated and learn from this experience.

1.4.3. Data Collection Techniques

In this research, I collected data qualitatively and quantitatively using interviews, observations, and documents review as data collection techniques. Interviews were used to assess health workers' experiences and viewpoints on different aspects of their practices. Health workers were observed before, during and after training to study their responses on different aspects. For better understanding of HMIS in Zanzibar, I reviewed different documentations such as HMIS data collection tools; health facilities' reports, tally sheets and registers; districts' quarterly, monthly reports and implementation plans; different training and software manuals; and Zanzibar's health sector reform plans and country health profiles.

The data collected aimed at studying the extent to which health information is understood and used by health workers at the facility and district levels. This understanding helped me in formulating training and support strategies that were used in arranging training.

1.5. Overview of HMIS in Zanzibar

The structure of HMIS data flow in Zanzibar has four levels, facility, district, zone and ministry levels. All the information moves upward from the facilities to the ministry, while the budgeting and planning decisions are made at the top level and communicated downwards.

Previously, HMIS data was gathered from different sources and was sent to different destinations. Often the sources were the Primary Health Care services centers and the health centers, and the destinations were the vertical programs and the statistics unit of the MoHSW. Consequently, there were a number of tools for data collection and reporting used from different stakeholders and there was no standard form of data collection, analysis, reporting and utilization.

The HMIS unit with the collaboration of HISP team and other stakeholders were aiming at standardizing and improving HMIS in Zanzibar by revising the entire system. They started revising data collection tools that were already being used by the vertical programs. They aimed at improving data accuracy by reducing duplication and redundancy and by doing so; they had to form one common data pool for all the information from all sources.

In the new data collection and reporting structure, all the facilities in a district will collect and collate data using the standardized tools, which will be sent to the district office, and the District Health Management Team (DHMT) will enter the data in the DHIS. Aggregated reports from all the districts will be sent to the zonal office, and then entered in DHIS to produce reports to be sent to the HMIS unit at the MoHSW and to the vertical programs.

In October 2005, the HISP team started to pilot DHIS and data collection tools in three districts (North A, North B and Micheweni) and one referral hospital (Mnazi Mmoja). During the pilot, they were revising and testing the forms and the software. Early 2006, the HISP team started to circulate the new forms in all facilities and install the software in districts in all the districts in Zanzibar. This process was done in hand with training and supporting health workers.

1.6. Related Literature Concepts and Theoretical Focus

This section explains the theoretical concepts and focus that were reviewed in the research in analyzing and discussing the findings. The reviewed literature included research on health information systems in developing countries, concepts on learning theories and social cognitive theories, organizational learning and information infrastructure concepts.

1.6.1. Health Information Systems in Developing Countries

Health Information Systems in developing countries are characterized by many challenges, which are in one way or another affecting its performance. In this study, I have focused on literature discussing challenges related to human capacity building, learning and training. I review literature on the educational backgrounds of health workers, on different learning and training strategies used, on access to Information and Communication Technology (ICT) and on different cultures of using health information.

These theoretical concepts helped me to understand different characteristics of health information systems in developing countries and different strategies used in conducting training and support for its sustainable development.

1.6.2. Learning Theories

I have reviewed various theories that attempt to define the way people come to understand and remember information, as they perceive, process, store, and recall what they are attempting to learn. In this study, I have looked at the way learning is theorised by behaviourists, constructivists and social-cultural perspectives.

Learning theories have given me an understanding of ways of facilitating training through carefully arranging the environment within which learning will occur and in designing materials that contain features, which optimise certain learning outcomes.

1.6.3. Social Cognitive Theory

The theory explains that interaction between a person and behavior involves the influences of a person's thoughts and actions, and the interaction between the person and the environment

involves human beliefs and cognitive competencies that are developed and modified by social influences and structures within the environment. In addition, the interaction between the environment and behavior involves a person's behavior, determining the aspects of their environment and in turn, that environment modifies their behavior.

Theorizing these concepts, I gained an understanding on what environments or practices encourage individuals to change and to cultivate people's attitudes to learn.

1.6.4. Learning in Organizations

A number of studies indicate that users learn best when they collaborate in solving real life problems through sharing knowledge and challenging each other (Gallivan et al. 2005; Boddy et al., 2005; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; Østmo, 2007). In this research, I have used organizational learning theoretical concepts to explain the way people learn in organizations and the use of new technologies are influenced by organizational culture, user training, social influences on users, users' involvement and participation, and user interactions with the system, affect the. The concepts were also used elaborate how to conduct on-job training using informal learning and Learning-by-Doing methods in organizations.

Using organizational learning concepts have helped me in understanding factors that affect the use of new technologies in organization and ways of conducting training to improve skills, behaviors and performance of learners.

1.6.5. HMIS as an Information Infrastructure

In this study, I also draw on the Information Infrastructure (II) perspective. HMIS in Zanzibar has been conceptualised as an II by Sheikh (2005) because it is a shared, evolving, open, standardised and heterogeneous installed base. According to Hanseth (2000), II are never developed from scratch but "through extending and improving the installed base" (p. 60) and one way of doing so is cultivation. Cultivation strategies have been used to describe how training and support can be organized for the sustainable the implementation of HMIS infrastructure.

The theoretical ideas and concepts gained in this perspective have helped me in understanding the installed-base and conduct training and support as cultivation strategies to develop the HMIS infrastructure for the sustainable implementation of HMIS in Zanzibar.

1.7. Research Contributions

The study contributes to theoretical, methodological and practical knowledge on arranging training and support for health facility workers in collecting, analysing, reporting and using health data. Similarly, for district workers in using DHIS as a reporting and decision making tool for the improvement of quality of health services. This contribution was based on experiences learned in Zanzibar and it could be applied in other developing countries with a similar context characterized by low education level, little degree of computer literacy and weak motivation among health workers.

Theoretically, this study contributes through conceptualising training and support as cultivation strategies in implementation of HMIS in Zanzibar. The study has also contributed to the use of Compeau et al. (1995) training and learning framework through extending it also for training computer and non-computer use through informal training.

The study gives a methodological contribution on using quantitative approach in evaluating training. Through training and supporting health workers in the facilities and districts, this research has also contributed to the practical knowledge.

1.8. Structure of the Thesis

The thesis is organized as follows; chapter 2 presents the relevant theoretical concepts and literature review, chapter 3 give details on research methodologies used. Chapter 4 explains the research settings. In chapter 5, I present my research findings from the health facilities and in chapter 6 the findings from the districts. Chapter 7 contains the analysis and discussion, and chapter 8 is the conclusion.

2. CHAPTER 2: Related Literature Concepts and Theoretical Focus

This chapter presents a review of related literature concepts and theoretical focus used in this study. Section 2.1 present characteristics of health information systems in developing countries, focusing on health workers' educational background, access to information and communication technology, culture of using information, and different learning and training strategies used. Learning theories are presented in section 2.2 where I focus on behaviorists, constructivists and social-cultural perspectives. Social cognitive theory is presented in section 2.3. Theoretical concepts on learning in organizations are presented in section 2.4, where I focus on organizational learning, factors affecting the use of new technologies in organizations and the way training is conducted in organizations. Section 2.5 presents concepts on the HMIS as an information infrastructure looking at training and support as cultivation strategies.

2.1. Characteristics of Health Information Systems in Developing Countries

Health Information Systems in developing countries are characterized by many things, which are in one way or the other affecting their performance. Some of these characteristics are health workers' educational backgrounds, different levels of access to ICT, different cultures of using health information and different learning and training strategies used.

2.1.1. Educational Backgrounds of Health Workers

Health sectors in developing countries extend to the most marginal areas of the community where the majority experience poor living conditions including poor access to education. For new technologies to be adopted there is a need for institutional capacity building by involving health workers in addressing their needs. Lippeveld (2001) emphasizes that, "introducing computer technology is not necessarily the silver bullet that creates effectiveness and efficiency in health services. On the contrary, lack of appropriately trained staff and hardware and software problems

sometimes result in the decay and obsolescence of expensive computer equipment, without any gains in decision-making" (p. 24).

In the RHINO discussion (RHINO, 2001) on how information can be used to improve health status, they learnt that there are difficulties in conveying technical information effectively whereby low numerical skills limit the extent to which percentages, rates, and ratios can be used. Low literacy levels may limit acceptance, understanding, and use of information and messages are misunderstood if they are not adapted to appropriate culture and language. This depicts that the success of training and support is to a high degree affected by the health workers' educational backgrounds.

2.1.2. Access to Information and Communication Technology

The implementation of revised HMIS in Zanzibar has included improving the manual system by revising the data collection tools and procedures for collecting, processing and reporting data as well as computerizing some functions at the district level. On one hand, Wilson & Smith (1991) suggest that creative use of computer technology can be a promising means of improving the quality, timeliness, clarity, presentation, and use of relevant information for PHCU management. However, Wilson (2000) argues that, "because majority of information users in developing countries have no access to computer technology, the development and improvement of manual system for the collection and analysis of data should be the primary focus" (p. 199).

On the other hand, access to information and communication technologies is poor in most developing countries because the ICT infrastructure in terms of human and technical capacity are poorly developed as shown in the study of ICT in Mozambique (Braa et al., 2001). As a result, most health workers lack skills to analyze, interpret and turn information into action at health facilities and district levels.

However, Braa & Hedberg (2002) suggest developing sustained and intensive action over time across the multiple levels of the health sector, there is a need of taking proper training and supporting mechanisms and developing strong communication ties among health workers.

2.1.3. Culture of Using Information

Although there is no single understanding of culture, most definitions centre on the notion of shared beliefs, values, customs, and meanings that distinguish one group of people from another (Hofstede, 1991). The culture of using information is an incentive to use information in everyday activities. However, Chambers (1994) argues that, most health sectors in developing countries collect a lot of data which "much of the material remains unprocessed, or, if processed, unanalyzed, or, if analyzed, not read, or, if read, not used or acted upon" (p. 53). In addition, it is an essential function of the health information system to "collect data that can and should be used" (Kleinau, 2000, p. 177).

However, different and complex aspects of history, geography, culture, infrastructure, inadequate skill levels and pressure of everyday work characterize HMIS in developing countries. "The culture of information and communication typically reflects the practice of collecting and sending it upwards to satisfy the needs of the bureaucracy, rather than to support action at the local level where the information is needed most"(Bayrne & Sahay, 2003 p. 238). Furthermore, Lippeveld (2001) in his study of routine health information systems, he elaborates that, most developing countries have centralized systems where information use is weakest at the district level where the main public health interventions are planned, and monitored, and the health unit level where individual health decisions are made.

Lippeveld (2001) suggests mechanisms that can be used to improve information use, some of them are to improve ownership and relevance of the information among potential users of the information, to ensure appropriate quality of data, and to encourage data to be produced in a timely manner. Informative feedback is another thing that can be used to improve the culture of using information. Neame & Boelen (1993) argue that, "it is only when those providing the data begin to receive meaningful and useful feedback that they will begin to appreciate the value of data and will therefore take appropriate steps to improve the quality, timeliness of the data they provide" (p. 13).

During the RHINO discussion (RHINO 2001), they suggested that encouraging managers to support and follow-up information use at facility levels could improve information use. Doing so,

the managers need to provide training and motivation to health workers to help them interpret data and respond to it accordingly. Managers themselves have to understand their own database that is when they will be able to use information to identify and address the root problems facing them.

Another argument made by the RHINO discussion (RHINO 2001, p. 73) is that "information does not become valuable to health workers if they do not understand the reason for collecting it". This is because, "health workers often perceive that the information they collect responds to demands made by those at higher levels, or even by donors, but is of little value to them". They feel that they collect too many data and are overworked and this can result to low data quality.

Zheng (2005) argues that, people will use information in a certain way if there is a culture of using information in that way. Thus, health workers will use information if there is a culture of using information in the health sector or government as a whole. However, this culture cannot be crated but it can be nurtured as Zheng (2005) argued that, "it is deeply rooted in historical and social settings, yet is constantly evolving over time. It can be cultivated, developed or shaped subject to appropriate management and institutional formulation." (p. 3)

2.1.4. Different Learning and Training Strategies

In this research, learning was facilitated by helping health workers to understand their learning preferences and by providing them with sufficient opportunities to meet those preferences.

Olow & Ladipo (2002) argue that, in most African country, training infrastructures were put in place to develop skills in the public sector but "training has had a rather limited impact, quantitatively or qualitatively" (p. 99). Quantitatively, only a small percentage of African public servants are exposed to any training and qualitatively, with the exception of a few outstanding cases, training as currently practiced in many countries does not seem to add much value. Some of the problems include the way training is perceived and conducted. They continue to argue that, "training is often treated as a discrete event, not part of an overall program of organizational improvement. Many trainees are selected based on bureaucratic politics and patronage rather than on the greatest need. Training evaluations are usually limited to assessing happiness levels rather

than the impact on knowledge, attitudes, behaviors, and job performance. Most training institutions are poorly financed and managed and are usually heavily dependent on government" (p. 99).

In addition, Lippeveld (2001) argues that, health care providers receive little if any training in data collection methods and they are rarely given standardized instructions on how to collect the data. They are poorly motivated to produce quality data, because most of the data they collect are irrelevant to their own information needs. They rarely receive any feedback on data reported to higher levels, so they have little incentive to ensure quality of the collected data and comply with reporting requirements

In this research, I have adopted and extended the training framework described by Compeau et al. (1995) to arrange training for health workers at health facilities and districts. In their study, they stated that, the goal of training "is to produce a motivated user who has the basic skills needed to apply what has been learned and then to continue to learn on the job" (p. 24). Compeau et al. (1995) and Sein et al. (1997) have reiterated this approach and suggested it to be used as a basis for developing training strategies.

The framework as depicted in Figure 2.1, Compeau et al. (1995) give details that it highlights the factors to be considered by the management on end-user learning and training. The framework consists of three main phases: initiation, formal training and learning, and post-training.

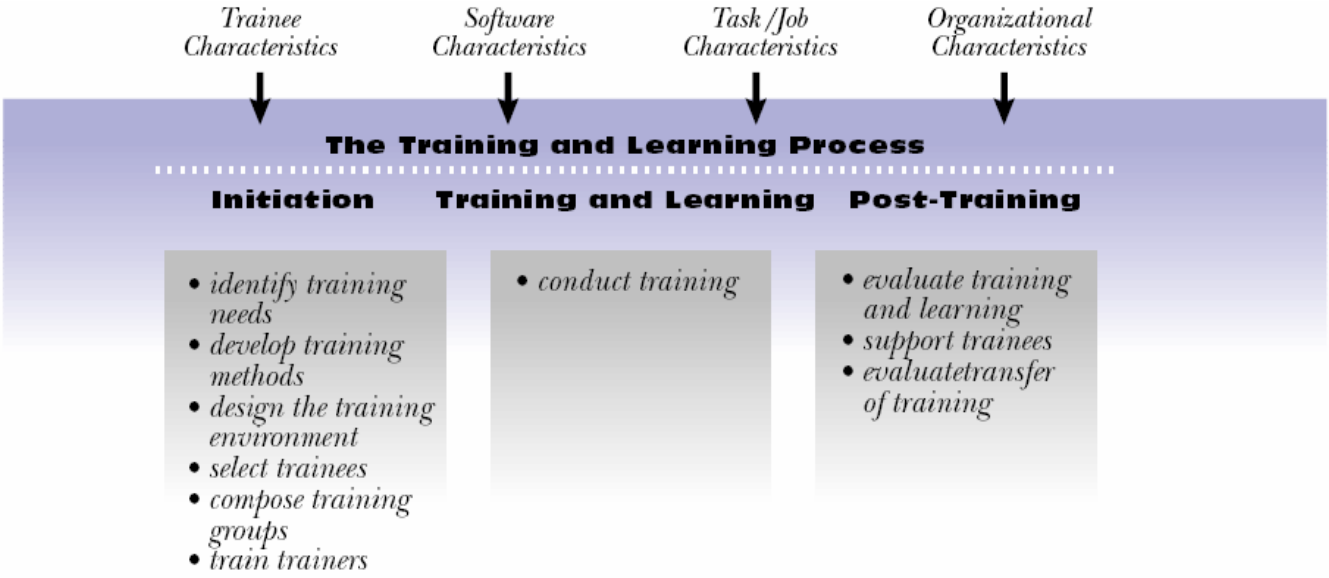


Figure 2.1: A Framework of Training and Learning Process (source: Compeau et al. (1995))

Additionally, trainee, software, task/job and organizational characteristics influence decisions about training design, delivery, and effectiveness as Compeau et al. (1995) describe.

In the initiation phase, according to Compeau et al. (1995), training material and methods are developed in this phase, which need be evaluated in the later evaluation stage. The most important thing for managers to questions themselves during this phase is the determination of training needs. The framework present that actions in this stage are to identify training needs, develop training method, design the training environment, select trainees, compose training groups and train trainers.

The formal training and learning phase focuses on the action of conducting training. Important rules to consider are to give trainees a strong grounding in conceptual understanding, emphasize motivation, and aim at building accurate and flexible mental models. Compeau et al. (1995) suggest that, appropriate methods that can be used in delivering training are; methods that incorporate hands-on use, behavior modeling, good conceptual models and manuals that encourage exploratory learning should be provided to the learners. At this phase Compeau et al. (2005) suggest managers to question on, "who will facilitate the training" (p. 24).

According to Compeau et al. (2005), the post-training phase recognizes that learning does not stop at the end of a training session, and points to the need for evaluating and supporting it. What is of interest to the organization at this point is to see if training has been transferred to the workplace, and whether learning continues after training has ended.

Training experience and outcome must always be evaluated with respect to both its immediate and longer-term impacts. In his study of evaluating training in health information systems, Williamson (2000) argues that, training evaluation determines its effectiveness and ways of improving it. Carroll & Rosson (1995) suggest evaluating training's immediate experiences and long-term to identify its effect on knowledge and skills. Furthermore, Kirkpatrick & Kirkpatrick (2006) suggest evaluating training in order to justify how it contributes to organizational objective, to decide whether to continue or discontinue training program and to gain information on how to improve future training.

This study adopted the Kirkpatrick's (1996) proposed four levels of evaluating training by looking at evaluation of reaction to training, evaluation of learning, evaluation of behavioral change and evaluation of result or outcome of training. The first level evaluates reaction to training by focusing on the way course design, structure, content and presentation can influence trainee motivation for and interest in the learning process. Evaluation of learning is in the second level where knowledge, skills and attitudes are evaluated. The third layer evaluates behavioral change, and it aims at determining whether participants apply the new knowledge and skills gained in training in their daily activities. Training result and outcomes are evaluated in the forth level to determine changes in organizational performance (Kirkpatrick & Kirkpatrick, 2006).

Training and Learning Experiences from HISP country members

According to Williamson et al. (2001), an evaluation of HISP training initiatives, conducted in 1999 in South Africa, demonstrated that while courses were well received, training did not result in change in practice. They revised the HISP training strategies and formulated action led strategies as part of the overall DHIS implementation strategy. The training strategy involves careful selection of target groups from all levels and categories of health workers and the courses contextualise health information systems within a broader health and social development

perspective by incorporating generic and skills training components. To develop full potential in analysing, interpreting and using information, ongoing training and support of staff are crucial.

In India, HISP conducts training programmes regularly on health care, for various sections of society so that they can participate in the ongoing developmental process. Participants range from individuals to organisations, which are involved in some way or the other with developing health care facilities in the rural areas of India. Training programmes have impart certain skills with regard to healthcare by incorporating awareness, information technology and management training into one wholesome package, which is of utmost importance in effective healthcare delivery (www.hispindia.org).

In Malawi, they employed cascading training approach whereby a group of trainers were prepared for each district and each central hospital. These in turn trained other health personnel within their jurisdiction in the design and implementation of HMIS. District Health Management Team (DHMT) members from all districts were trained information management and data utilization (Chaulagai et al., 2005).

In Tanzania mainland, training on using MTUHA system has not been fruitful for many reasons some of them being that, training was not given to those responsible, as a result most health workers responsible for data collection and reporting have not received training. Changes are made in the system without informing or training users on new features, these resulted to incorrect, inaccurate, untimely and non-utilization of information (Mukama, 2003).

2.2. Learning Theories

This section explains three learning theories, behaviorism, constructivism and social cognitive theory. These theories give details on how people learn and respond toward the gained knowledge.

2.2.1. Behaviorism

Behaviorists define learning as an unspecified internal change brought about by definable events or experiences in the learners' environment. Chance defines learning as "a relatively stable,

unspecified change within an organism that makes a change in behavior possible" (Chance, 1979, p. 17).

The theory focuses on observable behavior whereby a learner is seen as an organism responding to conditions set by the environment and these conditions can cause unconditional or conditional reflexes (Pavlov, 1927; Skinner, 1947). It also assumes that the consequences of an action determine behavior. Skinner (1947) described that actions of human beings are governed by rewards and punishments and their motives are governed by behaviors to seek pleasure (food, sex, companionship) and avoid pain (social rejection, physical harm, lack of food). Accordingly, learners will seek out experiences that have been rewarding in the past and avoid those that have not been rewarding. Motivation as one of the rewarding experiences can drive learners towards goals and negative incentives such as failure, physical pain, and inadequate reward can drive them away from their goals (Pavlov, 1927).

Skinner (1953) continues to argue that, stimulus following a response and if a stimulus is a positive or negative reinforcement, it can increases or decrease the probability for different responses to occur in the future. This is elaborated in Table 2.1.

Application of an Event to a Situation		
Event	**Added to the Situation**	**Removed from the Situation**
Wanted	Positive Reinforcement (Strengthens Learning)	Punishment (Weakens Learning)
Unwanted	Punishment (Weakens Learning)	Negative Reinforcement (Strengthens Learning)

Table 2.1: Application of an event to a Situation

From the Table 2.1, positive and negative reinforcement can strengthen learning if 'a wanted event is added to a situation' or 'an unwanted event is removed from the situation' is informative. Conversely a learner feels punished when 'a wanted event is removed from the situation' or 'an unwanted event is added to a situation' without any information, such conditions weakens learning.

2.2.2. Constructivism

Constructive theory refers the way learners receive, store, retrieve, transform and transmit information. It suggests that new skills and knowledge are based on what we already know and we cannot learn anything in a vacuum. According to Piaget (1960), learning can be experienced through interactions with other learners, the teachers, computers and/or books. We learn through our reflection on experience then we construct our own knowledge but we do not copy the teacher's understanding.

Jonassen (1994) illustrates that, learning can be facilitated by "constructing knowledge and not by reproducing it" (p. 35). The instructions must provide multiple representations of reality by representing the natural complexity of the real world and support collaborative construction of knowledge through social negotiation. Learning environments have to be real-world environments that employ the context in which learning is relevant and training has to focus on realistic approaches to solving real-world problems. Murphy (1997) argues that, to ensure authenticity and real-world complexity, primary sources of data should be used and the learner's previous knowledge constructions, beliefs and attitudes have to be considered in training.

2.2.3. Social-cultural Perspectives

Socio-cultural perspectives describe how one acquires and integrates knowledge through the influences of culture, environment and experiences. Knowledge is understood as the ability of a community to perform social practices and the individual's ability to participate in these culturally situated practices. In this sense, individual learning can be seen as the appropriation, or transformation, of external activities into internal ones (Fjuk et al., 2006).

Knowledge is thus embedded in the social activities and actions performed, but it is at the same time a product of this social activity as Fjuk et al. (2006) argue. The utterance becomes a knowledge product for others, to which they can respond to by asking questions, rejecting or extending. It also becomes a knowledge product for the individual subject who can consider her/his current understanding in externalized form. In general, in the socio-cultural perspectives,

learning takes place in socially and culturally shaped contexts, which are themselves constantly changing.

2.3. Social cognitive Theory

Social cognitive theory provides a framework for understanding, predicting, and changing human behavior. The theory identifies human behavior as an interaction of personal factors, behavior, and the environment (Bandura, 1977; Bandura, 1986).

Through one's self-efficacy, one has the power to produce changes by her/his actions. It is people's perception of their ability to plan and take action that makes them reach a particular goal as thus, people act on their beliefs about what they can do as well as their beliefs about the likely outcomes of performance. As a result, efficacy beliefs regulate motivation as it enables people to create beneficial environment known to cultivate valued potential lifestyles that modifies and controls them (Bandura, 1999).

Bandura continues to argue that, self-efficacy can be enhanced by creating supportive relationships whereby supporters can "model effective copping attitudes and strategies for managing problem situations, demonstrate the value of perseverance, and provide positive incentives and resources for efficacious coping" (Bandura, 1999, p. 31).

In addition, people working collectively in a group can develop a collective-efficacy whereby, "the stronger the beliefs people hold about their collective performance, the more they achieve" (Bandura, 1999, p. 34). Furthermore, individuals can develop computer self-efficacy when they judge themselves on their capabilities to use computers in diverse situations (Compeau & Higgins 1995b).

2.4. Learning in Organizations

This section presents the theoretical focus on the way people learn in organizations. The theoretical focus presents focus on organization learning, factors affecting the use of new technologies and the way training is conducted in organizations.

2.4.1. Organizational Learning

Organizational learning is a process through which a group (organizational members) acquires new knowledge and then uses it to make better strategic decisions, improve the organizational ability to develop and apply specific tactics, and increase its chance to succeed in its operations. An organization has been conceptualized in different studies as a system that structures, stores, and influences what and how its members learn (Fiol & Lyles, 1985; Shrivastava, 1983). In this research, I consider HMIS an organization.

Most of the definitions of organizational learning entail the aspects of both cognitive and behavioral changes. The cognitive aspect is concerned with knowledge, understanding, and insights. The change required can be actual and/or potential behavior whereby the lessons learned by an organization would have impact upon its future behavior.

From a cognitive and actual behavior perspective, "organizational learning means the process of improving actions through better knowledge and understanding" (Fiol & Lyles, 1985, p. 803). From actual behavior perspectives, organizational learning means, "the changing of organizational behavior" (Swieringa & Wierdsma, 1992, p. 33). The cognitive perspective of organizational learning "refers to the process by which the organizational knowledge base is developed and shaped" (Shrivastava, 1981, p. 15).

Cognitive psychology argues that users learn best when they collaborate with others through solving real-life problems. Individuals learn better, when there is a social component to learning as they share insights and challenging each other. Lave & Wagner (1991) in their study of communities of practice argue that, learning occurs in a social context where people share information related to their knowledge, value and intentions to behave in specific ways.

Most organizations when they introduce new technologies, they train their users to shape their attitudes and intentions to adopt and use them. However, a number of studies show that training has not helped in making users adapt to the new technologies. Some of the reasons include budget prioritization, organizational strategies, the way training is conducted and users' perceptions and

expectations (Star & Ruhleder, 1996 p. 130; Olow & Ladipo, 2006). As a result, new technologies are abandoned, underutilized or used for what they were not intended to.

Apart from training, Boudreau & Robey (2005), argue that, people can improvise themselves to enact on new technologies as they gather different knowledge, from their social spheres and or peer support, by reinventing workarounds that allow them to overcome their ignorance of the system and to compensate for its perceived limitations.

2.4.2. Factors affecting Use of new Technologies in Organizations

This section describes the way organizational culture, user training, social influences on users, users involvement and participation, and users interactions with thee system can affect the use of new technologies in organizations.

i. Organizational Culture

Organizational culture binds an organization and it develops as members work together in solving problems, as a result, they "establish shared beliefs about their world and espouses common values about their organization"(Boddy et al., 2005, p. 149). Organizational culture affects the way people do what they do in organizations.

Boddy et al. (2005) argues that, "if people interpret a proposed system as being consistent with their culture they are likely to accept it with enthusiasm and commitment. If there is a mismatch between the culture and the proposed system users will resist it" (p. 151). This implies that health workers will use new technologies if they support them in exercising their culture.

On this account, when imposing changes in an organization, organizational culture is a very critical issue to handle because it determines how people will react towards the changes (Boddy et al. 2005; Walsham, 2001).

ii. User Training

As mentioned by different scholars, improved user attitudes, behavior, and performance are among positive outcomes afforded by user training. In addition, training methods can enhance motivation

to learn and use software (Creswell, 2003; Olfman & Bostrom, 1991). Training as a way of supporting learning in an organization can be facilitated by carefully arranging the environment within which learning will occur and/or designing materials that contain features which optimize certain learning outcomes.

In addition, Barki et al. (2003) argue that, to deliver effective training "requires an integrative and comprehensive set of strategies" (p. 75). In their research, they found out that many organizations had no such kind of training strategy. They conclude that, training can be improved by integrating it with the overall organizational activities by making it a part of the organization's objectives. As it becomes part of the organizational strategies, training can improve users' skills and knowledge and make them evolve along with the system.

Although training plays a major part in organizational learning, no agreement exists either in the literature or in practice on how to organize the training resources (Englehardt & Simmons, 2002; Olfman & Bostrom, 1991; Barki et al., 2003). Barki et al. (2003) conducted a study in 16 organisations that were regarded as using 'Best Practices' but not one of them has strategies for organizing training resources. In their study, they integrated the best practices they found and combined them with prior literature and their own experiences to propose a normative framework composed of learning and a training strategy, the two models combine to form a comprehensive strategy together with the overall organizational strategy. They concluded by proposing a strategy formulation model that integrated training with the overall organizational objectives in IT learning.

For the introduction of the use of computer systems for example, Venkatesh (2000) suggests that, organizations should consider putting in place general computer training programs that target increasing computer awareness, enhancing computer self-efficacy, and reducing computer anxiety among employees. Such training programs combined with appropriate facilitating conditions should pave the path for acceptance and usage of new systems. In fact, organizations will benefit particularly from system-specific training interventions that enhance user perceptions about the specific system and their general beliefs about new information technologies (Compeau, 1992).

Kirkpatrick & Kirkpatrick (2006) give details that for the effectiveness of training programs, "they must meet the needs of the participants" (p. 4). To do so the organization has to set training objectives that meet those needs of the trainees and these objectives should be set for three aspects of the training program. First the results to be accomplished, second, the behavior needed to accomplish desired results and third, skills, knowledge and attitude necessary to achieve the desired behavior. In addition, training places should be both "comfortable and convenient" (p. 12). Negative factors such as "noise or other destructions, inconvenience" (p. 12) etc. should be avoided. The selection of training material should also be considered in training. Kirkpatrick & Kirkpatrick advise trainers to ask themselves "what topics should be presented to meet the needs and accomplish the objectives?" (p. 9).

iii. Social influences on Users

Social influences are daily pressures that a user encounters from coworkers and the society as a whole. Such environments affect the way she/he will participate in using the system.

Prasad (1993) argues that, as users learn new technologies, they strive to interpret and to assign meanings to its capabilities. At first, they experience uncertainty about the value of the new technologies for their work. In struggling to acquire new knowledge, they gather different information from personal, institutional or social sources that will help them in creating meaning to the use of new technologies. Such information can affect the way a person will respond to the use of new technologies.

In addition, research indicates that, others with whom users interact with can influence individual IT beliefs and IT use (Gallivan et al., 2005). In their study, Gallivan et al. (2005), concluded that, "having coworkers that are knowledgeable and confident IT users does positively influence an employees IT usage" (p. 179). Peer beliefs, norms, and verbal comments shared among users can influence a person's belief and intention to use a specific technology (Gallivan et al., 2005). In their study on analyzing social influences on IT uses in work place they have shown that, users learn to use IT on-job by collaborating with their coworkers because "learning is deeply embedded in doing" (p. 58).

Boddy et al. (2005, p. 241) argue that, ”as people work together to solve problems they may reflect on what they can learn in their experience and perhaps see how they could do the job differently next time”. Users learn to use new technologies when they work in well-organized teams.

iv. User Involvement and Participation

User involvement and participation in system development and adoption were identified in literature as factors affecting system use and success (Baroudi et al., 1986; Swanson, 1974). In this research, I have focused on additional factors such as different backgrounds, practices, attitudes, intentions, and beliefs of technology users, and the management of the system as precursors of system utilization.

There are debates on how far should a user be involved to improve her/his performance in using the system. Ives & Olson (1984) ague that, user involvement plays a role in better defining user requirements, providing better understanding on how to use the system in the organization, avoiding inappropriate features, and enhancing the user’s knowledge of the system. User participation leads to increased user acceptance and use by encouraging realistic expectations, facilitating the user’s system ownership, decreasing resistance to change, and committing users to the system. In this research, I have focused on users’ involvement and participation on training.

Lorenzi et al. (1995) argue that, it is crucial for organizations to establish a well-defined and communicated vision that sets the direction when establishing a change. This will help in allocating resources to different strategies set to avoid issues such as shortening training or not conducting it all because of budget shortage. Such vision gives the people in the organization a context that helps in understanding the probable directions of change and the desired outcomes.

Another thing that will drive users to adopt changes is the way they are incorporated within the change process. The management and users have to be open to change. Organizations have to treat users with respect through honesty and trust regardless of their diverse backgrounds, educational levels or disciplines, hierarchical levels, or ethnic groups (Lorenzi et al., 1995).

v. User interaction with the system

Users interact with the system as they participate actively in their daily activities. In this research, I have concentrated on the way health workers at the health facilities interact with the system by filling in daily registers and tally sheets and monthly reports, using DHIS at the districts and using data collected at the facilities and districts. The layout of the forms or design of the software can affect the way they use the system in a number of ways.

In a routine Information System, as Lippeveld (2000) argues, "the quality and ultimate use of the data collected will depend substantially on the relevance, simplicity and layout of the data collection instruments." However, in most systems, "forms are rarely self-explanatory" and training and instruction manuals are not available (p. 95).

By layout, it means the arrangement of columns in the registers and open spaces on the tally sheets, abbreviations and formulas on the forms and the sequence of data flow. Lippeveld suggests that, when designing data collection tools, there should be, "sufficient space to record the required data, headings of the columns should clearly indicate what data item need to be filled in and the order of the data on the record forms and registers should take into account the sequence of procedures" (Lippeveld, 2000, p. 103).

He continues to argue that when the system introduces new forms or modify it, "training on data collection procedures is mandatory and the training program should not only explain to fill in the forms but also focus on how to use the information generated through the forms (Lippeveld, 2000, p. 109).

2.4.3. Conducting Training in Organizations

Nadler (1970) defines training, as "activities that are designed to improve job performance by introducing a new behavior or modifying existing behaviors, consideration must be given to the impact that attitudes have in contributing towards positive changes in practice. Developing knowledge and skills in training is a collaborative process that involves mutual learning and cooperation."

Olfman and Bostrom (1991) identified four components of software training where the sessions are delivered in a seminar or classroom setting. These include overview, presentation material, exercises and documentation/handouts. The overview consists of introductory information, presentation of basic concepts of the software to be learned, and a brief demonstration of the software capabilities. Presentation material is about specific procedural and usage information about the software, and is delivered by the trainer during the seminar. Exercises follow the presentation and help the trainee to practice the material to be learned. These exercises could be performed with or without the aid of the computer. Documentation and handouts are provided to assist the trainee during the seminar and for later reference. They continue to suggest that hands-on use of computers, one-on-one tutorial assistance and problem solving exercises should be employed in software training as they reduce computer anxiety.

Furthermore, research has shown that people learn in different ways and they have individual preferences of how they perceive and process information. These individual preferences of learning are called learning styles. Grasha (1996) defines learning styles as "personal qualities that influence a student's ability to acquire information, to interact with peers and the teacher, and otherwise to participate in learning experiences" (p. 41). Researchers have derived many ways of training to create long-term learners, in this research; I have used informal learning and learning-by-doing methods.

i. Informal Learning

Unlike formal learning, informal learning can be either planned or unplanned and structured or unstructured. In the context of teaching, examples of such activities include talking and sharing materials with other teachers, searching the Internet for instructional content, and experimenting with new instructional strategies. Researches have indicated that as much as 90% of new learning is acquired through informal learning activities in the workplace, rather than organizationally planned or sponsored activities away from the workplace (Brinkerhoff & Gill, 1994; Lovin, 1992). As Livingstone (1999) points out that, informal learning can be defined as "any activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies" (p. 51).

Informal learning is an important way that individuals construct meaning from their experiences (Daley, 1997; Lovin, 1992). Wilson points out that, adults do not learn from experience, they learn in it and for them to learn, they "must become embedded in the culture in which the knowing and learning have meaning" (Wilson, 1992 p. 77). In addition, Greeno (1997) argues that, people improve by becoming more attuned to constraints and affordances of different real situations. As thus, training adults need a careful arrangement of environment, groups and training materials to help them participate meaningfully in the training. However, Lohman (2000) argues that, lack of time for learning is the most common inhibitor to informal learning.

Generally, educators can improve the learning process by recognizing that learners come with a set of assumptions about their life purposes about which they very likely are not even aware. To do so Fenwick (2000) suggests that, educators should consider setting learning environments and interactions between participants, tools and objects in a way that leads to successful accomplishment of learning goals.

ii. Learning-by-Doing

Learning is embedded in doing, as people engage in their daily activities they encounter different problems and challenges and as they engage in solving them, they improve their knowledge. In this research, health workers learnt through solving problems facing them.

Greeno (1997) argues that, during the process of solving problems people learn to notice how specific properties and relations influence their possibilities for acting in one situation. They can more easily transform that activity in a wider range of situations. Furthermore, Østmo (2007) argues that, individual's social settings and social constructs of learning are revealed as the learners interact with each other and with the trainer and the way they deal with elements of attention, emotion and valuing.

Problem-Based-Learning (PBL) is a pedagogical technique that situates learning in complex problem-solving contexts. It is an active learning method based on the use of ill-structured problems as a stimulus for learning as Barrows explains (Barrows, 2000). Ill-structured problems as defined by Hmelo-Silver & Barrows (2006) are complex problems that cannot be solved by a

simple algorithm. Such problems do not necessarily have a single correct answer but require learners to consider alternatives and to provide a reasoned argument to support the solution that they generate.

This method is characterized by three things, as Hmelo-Silver, explains. First, learners are responsible for their own learning. Second, the trainer is facilitating learning, and third, learning is carried out in small, facilitated groups and takes advantage of the social aspect of learning through discussion, problem solving, and study with peers (Hmelo-Silver, 2004).

In PBL as Hmelo-Silver & Barrows (2006) elaborate, learning occurs as learners collaboratively engage in constructive processes provided by the facilitator. For the facilitator to do so, s/he has to be able to model good strategies for learning and thinking, rather than providing expertise in specific content. Using this method, learners develop effective problem-solving skills, becoming effective collaborators and are intrinsically motivated (Hmelo-Silver, 2004).

PBL provides students with opportunities to consider how the skills they acquire relate to a specific problem at hand. It offers the potential to help learners become reflective and flexible thinkers who can use knowledge to take action. By developing effective problem-solving skills, the learners acquire the ability to transfer reasoning strategies to new problems and develop self-directed learning skills (Hmelo-Silver, 2004). To develop problem-solving skills, first the learner has to identify knowledge deficiencies relative to the problem, and then derive possible solutions. The facilitator helps learners learn the cognitive skills needed for problem solving and collaboration. As a result, learners become self-directed and they acquire the skills needed (Hmelo-Silver, 2004).

Hmelo-Silver (2004) continues to explain that, intrinsic motivation occurs “when learners work on a task motivated by their own interests, challenges, or sense of satisfaction”. Different researchers argue that, “students are more motivated when they value what they are learning and when their educational activity is implicated in personally meaningful tasks (Ferrari & Mahalingham, 1998; Leontiev, 1978). In addition, students are also more motivated when they believe that the outcome

of learning is under their control (Bandura, 1997; Dweck, 1991). Solving problems intrinsically motivates students as they apply their knowledge to solve them.

2.5. HMIS as an Information Infrastructure

HMIS in Zanzibar is conceptualised as an information infrastructure by Sheikh (2005) because it is a shared, evolving, open, standardised and heterogeneous installed base. According to Hanseth (2002), information infrastructures will not work without support nor will they work if users are not using it properly. Furthermore, Hanseth (2000) argues that information infrastructures are never developed from scratch but "through extending and improving the installed base" (p. 60) and as the installed base grows, its development and further growth becomes self-reinforcing.

Infrastructures can be successful developed by using cultivation strategies to create and manage such a self-reinforcing process (Hanseth 2002). Cultivation strategies proposed by Hanseth are bootstrapping a self-reinforcing installed base, Managing lock-ins and guidelines for supporting infrastructures. In this research, training and support as a boot strapping strategies were used as cultivating strategies in the implementation of HMIS in Zanzibar.

Training and Support as a Cultivation Strategies

The information infrastructure theory discusses that, infrastructures are designed and not constructed, and cultivation approach is used in this design (Ellingsen & Monteiro 2001, Hanseth & Aanestad, 2003; Hanseth & Monteiro, 1997). The cultivation approach emphasizes on the power of the material, as Dahlbom and Janlert describe that, "the tomatoes themselves must grow, just as the wound itself must heal" (Dahlbom & Janlert, 1996, p. 6)

The implementation of HMIS in Zanzibar has brought many changes in the infrastructure. To keep the infrastructure grow along with the changes, cultivation approach can be used to make it a self-reinforced infrastructure. By training and supporting health workers to adopt with the changes and use new technologies, they improve their knowledge and gain skills that will help them to develop along with the infrastructure.

In addition, Ciborra et al. (2005) argues that, "technology tends to drift" and infrastructures are not stable, as thus they need to be cultivated constantly. Due to the complex nature of heath sector, health workers have to be trained and retrained and be supported in order to make them adopt with the momentum of change.

3. Chapter 3: Research Setting

This chapter is co-authored by Caroline Ngoma and Edwin Nyella. It presents the settings where we conducted the research. The research was conducted in Zanzibar, which is a semi-autonomous region of Tanzania. The situation analysis of Zanzibar is presented in section 3.1 where the country's geography, political history, demography, education and socio-economic profiles and the health sector status are described. Section 3.2 presents the structure of the healthcare system in Zanzibar, the Health Management Information System is presented in sections 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. Then 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 and socio-economic profiles, which I believe have direct impact to the delivery of healthcare 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 square kilometers), 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 and Social Welfare (MoHSW) has a head office in Wete district, in Pemba, with some vertical

programs having their offices in Chake Chake district. Figure 3.1 presents 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. It became independent on December 10, 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 healthcare delivery 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 a 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 620,957 inhabitants (63.2%) and 360,797 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. The State of Education in Zanzibar

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. This duration of schooling, forms basic education in the Zanzibar context. To enter into the second cycle of the secondary education

the Ministry of Education institutes special examinations. However, most people especially in the rural areas end up on the first cycle of secondary education.

There are a reasonable number of schools and adult education programs 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.

Kiswahili 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 in primary school. In the post primary school level, English is the language of instruction and Kiswahili is taught as a compulsory subject. 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 (ADEA, 2003).

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 due to 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 support adequately 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. This is 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 urban areas and many of the poor could not 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 on 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, the African Development Bank, and the United States government. 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, period 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 (MoHSW 2003). 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 (MoHSW 2003).

3.2. Zanzibar Healthcare System Structure

Public healthcare services in Zanzibar are organized and offered by the 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 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. Figure 3.2 presents the Zanzibar healthcare system structure.

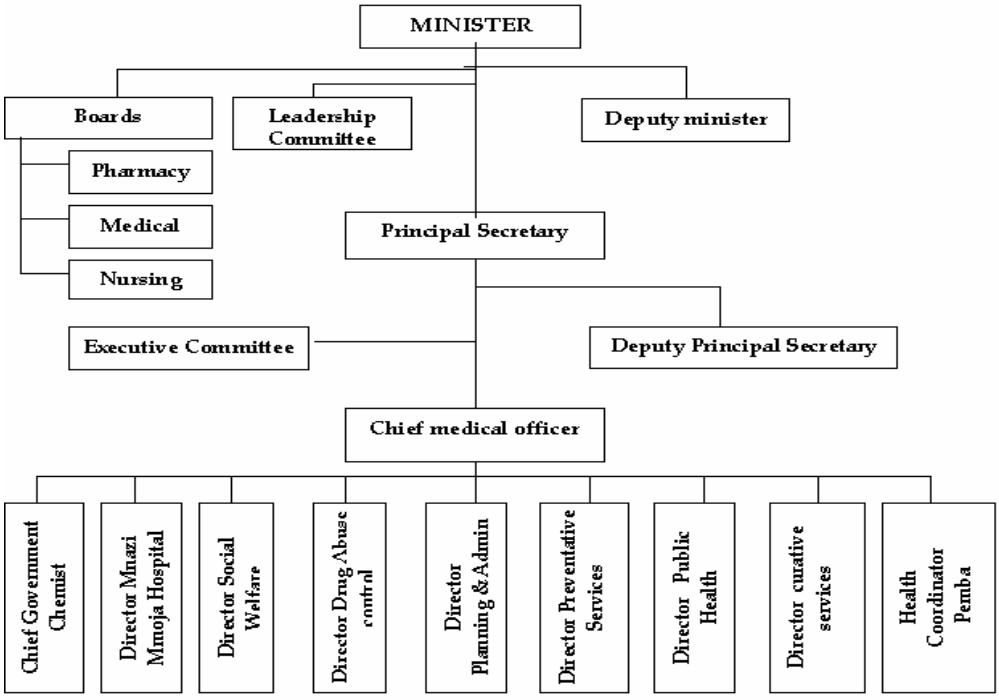


Figure 3.2: Structure of the Ministry of Health. (Source: Hamad (2003))

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 (DHO) 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. These are:

Primary healthcare unit (PHCU) 1st line

These are healthcare units with normal clinical investigation but they cannot perform 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 PHCU 1st and 2nd line, with services such as minor operations and X-rays. In total, there are four cottage hospitals in Zanzibar, 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 in each district in Pemba only, where there are three district hospitals: Abdullah Mzee Hospital, Chake Chake Hospital and Wete Hospital.

3.2.3. Tertiary healthcare services

These services are only available in Unguja 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 hospital. The hospital provides referral services for the whole population of Zanzibar. It also provides the secondary healthcare services for the Unguja.

3.3. Zanzibar Health Management Information System (HMIS)

Prior to the restructuring process described in this section, the health information system in Zanzibar was poorly organized, and mainly shaped by fragmented vertical programs' reporting systems. The vertical programs include Extended Programme for Immunization, 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 merging 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 were 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 (Hamad, 2005). 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 health 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.

3.4. Overview of the Districts Studied

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

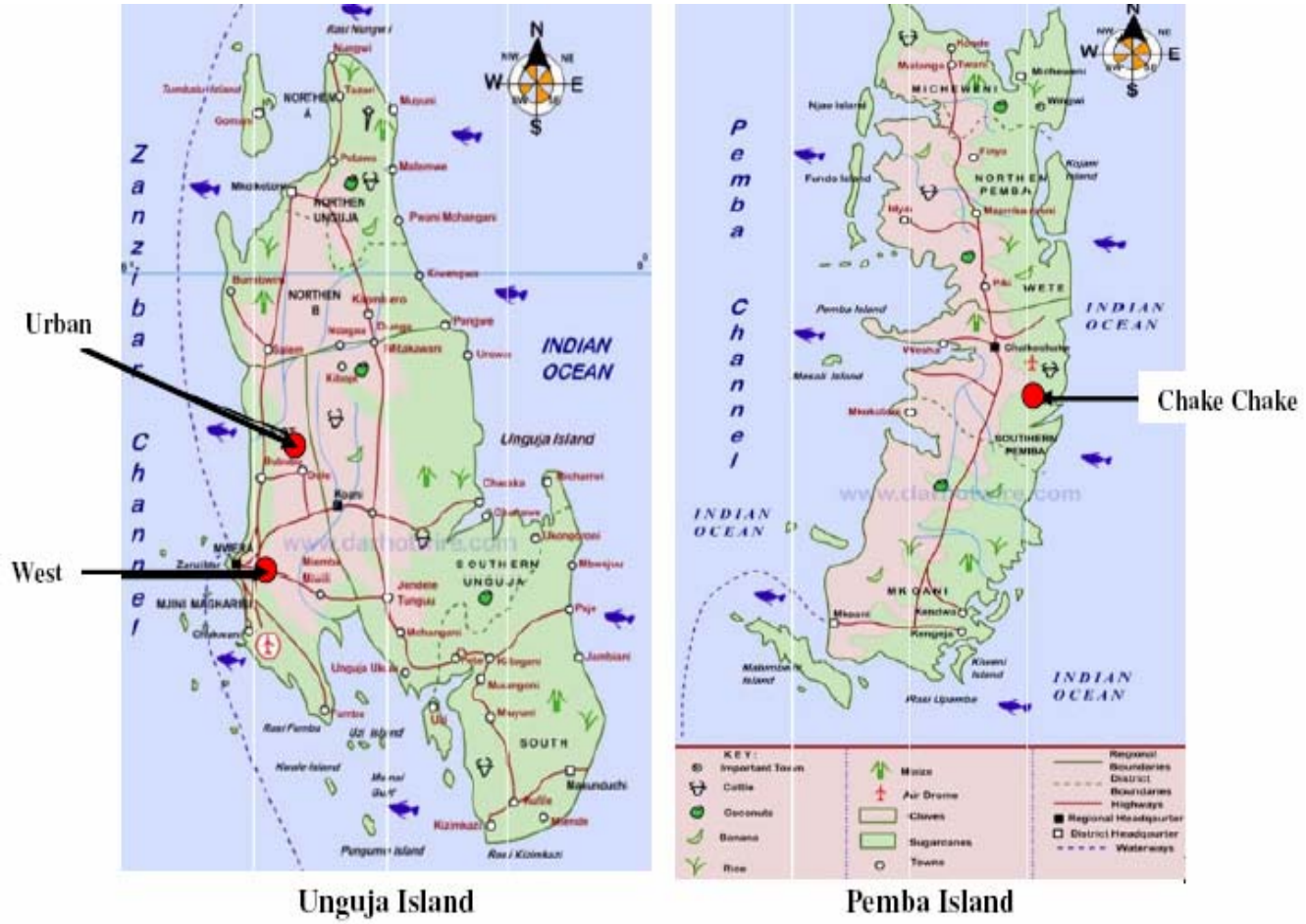


Figure 3.3: Maps for Unguja and Pemba indicating the districts where this study was conducted

Table 3.1 presents 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 three, second line), two secondary level hospitals and one tertiary hospital as presented in 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 health offices.

West 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 (14 first line and three, second line). This research was conducted at district level health office together with six PHCUs namely, Kiembe Samaki (K/Samaki), SOS, Fuoni, KMKM, Welezo Camp (Welezo) and Magogoni.

Chake Chake District

Chake Chake district is divided into 21 Shehias and it has the total population of 83,351 people, among them 49% are male and 51% are female (2002 population censers). As presented in Table 3.1, the district has 13 PHCUs (11 first line and two, second line), one PHCC and one 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 (V/Cottage) and SDA.

4. CHAPTER 4: Research Methodology

The methodology used in conducting this research is presented in this chapter. Research methodologies used are presented in section 4.1 and section 4.2 present the research design. Action research approach used is explained in section 4.3 and data collection methods are presented in section 4.4 which were interviews, document reviews and observations. Methods used for analyzing qualitative and quantitative data are elaborated in section 4.5. Validity and reliability of the research are presented in section 4.6, research ethics in section 4.7 and study limitations in section 4.8.

4.1. Research Methodologies

Information Systems research methods are classified in many ways one of them being qualitative and quantitative. Quantitative research methods were used to study natural phenomenon developed in the natural sciences (Myers, 1997). Commonly used quantitative research approaches as described by Straub et al. (2005) are field study, case study, laboratory experiment, and field experiment.

Myers argues that, qualitative research methods were developed to enable researchers to study social and cultural phenomena in social sciences. Examples of qualitative methods are action research, case study research, ethnography and grounded theory. Qualitative data sources include observation and participant observation, interviews, questionnaires, documents and texts, and researcher's impressions and reactions. These methods help researchers understand people and the social and cultural contexts within which they live (Myers, 1997).

Action research as described by Rapoport, "aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" (Rapoport, 1970, p. 499). Baskerville (1999) has also described action research as a technique characterized by intervention

experiments that operate on problems or questions perceived by practitioners within a particular context.

Case study research is a widely used qualitative method in information systems as Myers (1997) describes it. Yin (2002) defines case study as 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.

Ethnographic research was dominantly used in the social and cultural anthropology disciplines whereby an ethnographer is required to spend a significant amount of time in the field by immersing themselves in the lives of the people they study (Lewis 1985) and seek to place the phenomena studied in their social and cultural context. Ethnography is widely used in the studies of work practices informing design and development of information systems in organizations (Myers, 1997).

Grounded theory is a research method that seeks to develop theory that is grounded in data systematically gathered and analyzed. According to Martin & Turner (1986), grounded theory is a theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data. The method has been used in the Information Systems research literature because of its usefulness in developing context-based, process-oriented descriptions and explanations of the phenomenon.

Qualitative and quantitative methodologies can be combined in one study to form a methodology called triangulation. They can be mixed within a stage of the study or across two of the stages of the research process. However, applying either of the two methodologies should strongly be based on the research objectives rather than on the ideology of the superiority of either method as Silverman (2005) argues. Espeleta (2006) explains six strategies of triangulation methodology, these are; sequential explanatory, sequential exploratory, sequential transformative, concurrent triangulation, concurrent nested, and concurrent transformative strategies

In the Sequential explanatory strategy, data collection and analysis is done first quantitatively and then qualitatively, giving more priority on quantitative data, this means that, qualitative results are used to assist in explaining and interpreting the findings of a primarily quantitative data. Sequential exploratory strategy is the reverse of the sequential explanatory strategy where more priority is given on qualitative data and its primary focus is to explore a phenomenon. The sequential transformative strategy involves two phases of data collection and either of the phases can be used first or both can be used at the same time. Data collection and analysis either begin with quantitative and then followed by qualitative or it can be the other way around (Espeleta, 2006).

Concurrent triangulation strategy gives priority to either quantitative or qualitative data, where data is collected and analyzed quantitatively and qualitatively concurrently in one phase of the research. The concurrent nested strategy uses one data collection phase, during which both quantitative and qualitative data are collected simultaneously with one predominant method guiding the research. In the concurrent transformative strategy, qualitative and quantitative data are collected at the same time and they both have equal priority (Espeleta, 2006).

The choice of Methodology

In this research, I employed concurrent triangulation strategy. Using this strategy, data was collected and analysed qualitatively and quantitatively concurrently, giving priority to the qualitative data. This methodology was chosen to help me to confirm, cross-validate and corroborate my findings (Creswell 2003). The methodology also gave me a chance to integrate the results of the findings from qualitative and quantitative data as a way of strengthening the knowledge claims of the study

According to Myers (1997), qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live. Adopting this methodology in collecting and analyzing data, helped in answering how and why certain events occur by getting closer to the health workers' perspectives through interviews, observations and document reviews. These helped me in learning the way health workers create and give meaning to

their social experiences. Having the main priority in qualitative data, this research has taken an action research approach.

Quantitative methodology was adopted in collecting and analysing numerical data in the field. The results obtained helped in interpreting different relationships between variables and further confirming and validating the findings.

4.2. Research Design

This research was done as part of an ongoing initiative of restructuring and implementing HMIS carried out by the HISP in collaboration with the Ministry of Health and Social Welfare (MoHSW) and other health stakeholders in Zanzibar. HISP is a global research and development network on health information systems coordinated by the University of Oslo in Norway. It started in South Africa in 1994 and thereafter spread to other developing countries such as 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 Systems to support local management of health care delivery and information flows (Braa et al. 2004). In 2004, Zanzibar became a node in the HISP network.

The program has undertaken a number of activities in Zanzibar, such as standardization of the data sets, redesign of data formats and standards, adaptation of a DHIS software standard, and institutionalization of these standards at different levels of the health system.

Training as one way of institutionalizing these standards, has been conducted to health workers at various levels of the health system. For the sustainable implementation of HMIS, there was a need of retraining and supporting health workers whenever they had problems in the adaptation of the reformed system. This need was perceived as I observed and worked with the HISP team, HMIS management and health workers in field visits before this study was conducted. Taking part of this intervention, I aimed at researching on ways of arranging training and supporting health workers that could be used to cultivate an evolving HMIS infrastructure. As the emphasis of HISP on using health data for action (Braa & Hedberg, 2002), this research has also aimed at initiating and suggesting way of building health workers' capacity of understanding and using information.

The research concentrated at the district and facility levels where I worked in three districts one in Pemba, Chake Chake district, and two in Unguja, West and Urban districts, together with twelve health facilities, six in Chake Chake district and six in West district. Training and support were conducted in these areas, although we supported other facilities and other districts as well.

This research was done from June to November 2006 and I was alternating from one district to another for a period of three weeks to one month depending on the requirements of the health workers.

4.3. Research Approach

In this research, I took an action research approach that aimed at solving current practical problems while expanding scientific knowledge of health workers at the facility and district level. Baskerville & Myers describe action research as an "iterative research process that capitalizes on learning by both researchers and subjects within the context of the subjects' social system" (p. 330). In addition, the research provides the way groups of people can organize the conditions under which they can learn from their own experiences and make this experience accessible to others as Robin (1991) argues.

Action Research

Baskerville argues that, action research originates from social and medical sciences and it began to become popular in the studies of investigating information systems in late 1960s (Baskerville, 1999). The approach "produces highly relevant research results, because it is grounded in practical action, aimed at solving an immediate problem situation while carefully informing theory" (Baskerville, 1999, p. 2).

Action research is based on the assumptions that reality is situated and social systems are self-referencing. As Baskerville (1999) argues that, "the researcher cannot acquire the depth of understanding that client professionals will have already achieved through years of living within the social context under study" (p. 18).

As a researcher, I had a practical background in computer science and a theoretical background in the field of health care, and health information systems and the health workers had the practical background in the health care field. Working together in the action research has helped in bringing about changes as we shared our experiences.

I addition, I adopted action research to get a better understanding of the problems in the field in order to bring about desired changes. Due to the complexity of HMIS in Zanzibar, to develop an understanding of its interaction with the health workers and other stakeholders call for an action research in introducing changes. Baskerville (1999) describes that; action research adopts qualitative data as a medium to the empirics with key assumptions that "social settings cannot be reduced for study, and action brings understanding" (p. 5). Thus, it approaches information systems research as social enquiry rather than social science. It has an interventionalist's viewpoint where the researcher both observes and participates in the phenomena under study

Furthermore, the gained knowledge during the action research whether the action was successful or unsuccessful can be useful in three things as Baskerville (1999) describes. First in restructuring of organizational norms to reflect the new knowledge gained by the organization during the research, Argyris and Schön (1978) call this the 'double-loop learning'. Second, where the change was unsuccessful, the additional knowledge may provide foundations for diagnosing in preparation for further action research interventions. Third, the success or failure of the theoretical framework provides important knowledge to the scientific community for dealing with future research settings.

Generally, this research was done out of scientific interest to help the HMIS itself to learn by formulating training and supporting strategies. I actively got involved in training and supporting health workers, with expected benefits for both the researcher and the HMIS. The knowledge obtained has been immediately applied in twelve health facilities and three districts and it can be utilized in other places with similar contextual characteristics. As action research has a cyclic nature, this knowledge can be valuable to other researchers wishing to utilize it for further improvement of the theories and practices.

Action Research Phases

Due to the cyclic nature of action research, this section describes the actions taken, in training health workers at the health facilities and districts, in each phase of the training cycle. The training cycle involves training conducted in twelve health facilities and three districts. These actions were carried out simultaneously whereby facility workers were trained at their respective facilities and district workers at their respective districts. I adopted the five phases of action research as elaborated by Susman and Evered (1978): diagnosing, action planning, action taking, evaluating, and specifying learning. Figure 4.1depicts the action research's structural cycle (as cited in Baskerville, 1999).

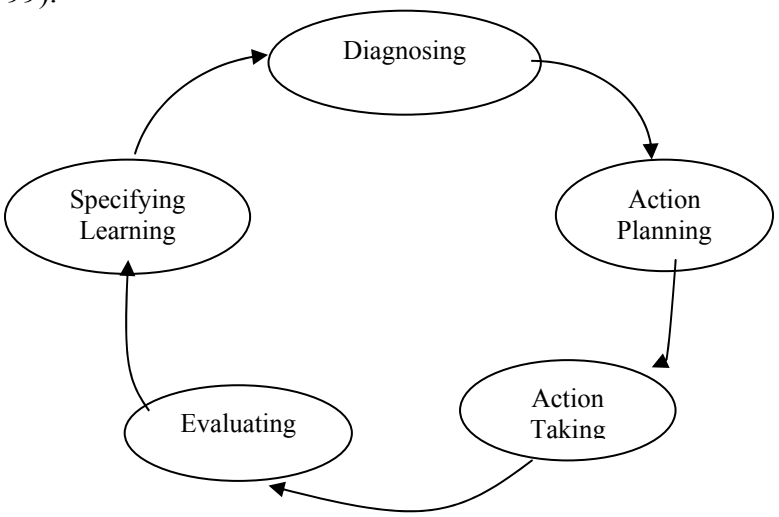


Figure 4.1: Action research Cycle

Taking into consideration the focus of this thesis, I now describe the phases focusing on the training cycle. The actions during the training cycle were hand-in-hand with interview sessions, observations and document reviews.

Training Cycle in the Health Facilities and Districts

i. Diagnosing Phase

Diagnosing corresponds to the identification of the primary problems that are the underlying causes of the organization's desire for change. Baskerville (1999) describes this phase as a self-interpretation of the complex organizational problem, not through reduction and simplification, but rather in a holistic fashion. This diagnosis will develop certain theoretical assumptions (i.e., a working hypothesis) about the nature of the organization and its problem domain.

During this phase, I determined health workers' needs, expectations for training and their perceptions about the HMIS and training in general. In addition, I assessed their education background, understanding of health data and indicators, understanding of the functioning of the health information system, arithmetic skills, and English language proficiency.

In the facilities, I concentrated on problems facing health workers in data collection, processing, reporting and using the collected data. At the district level, I focused on health workers' understanding on data collection tools and problems facing them in using DHIS for data entry, analysis, import/export, and using the generated information. In addition, I assessed the aspect of computer literacy because at this level they use computer software (DHIS)

ii. Action Planning Phase

This activity specifies actions that should relieve or improve problems identified in the diagnosing phase. The discovery of the planned actions is guided by the theoretical framework, which indicates both some desired future state for the organization, and the changes that would achieve such a state as Baskerville (1999) argues. The plan establishes the target for change and the approach to change.

To plan the action, I analyzed the determined health workers' needs, expectations for training and their different perception, and combined with what we (me and health workers) can offer each other as we shared our experiences during training. Focusing on the identified training needs, I formulated training objectives with the health workers. These objectives guided us in preparing training places and identifying training groups and timetable to use. The objectives also guided me in choosing training methods and designing training materials to be used.

iii. Action Taking Phase

The researchers and practitioners collaborate in the active intervention causing certain changes to be made in this phase. In this stage, several forms of intervention can be adopted; Baskerville (1999) gives two examples, directive and non-directive intervention where directive interventions direct the change and in non-directive, "the change is sought indirectly" (p. 16). In this research,

the intervention strategy adopted was directive whereby the intervention training and support directed the change.

The actions taken to implement the planned actions were training and support. Training was conducted in group discussion, where in the facilities, there were groups of two to eight health workers and the interactions were between themselves and with the trainer. In the districts, there were groups of two to ten health workers interacting with themselves, the trainer and with computers.

iv. Evaluating Phase

After the actions are completed, the collaborative researchers and practitioners evaluate the outcomes. Evaluation includes determining whether the theoretical effects of the action were realized, and whether these effects relieved the problems. Baskerville (1999) gives details that where the change was successful, the evaluation must critically question whether the action undertaken was the sole cause of success.

In this phase, I supported health workers and evaluated training. In supporting them, I was giving them informative feedback on their performance and I worked with them in solving problems that faced them after training.

To evaluate training, I adopted Kirkpatrick's (1996) four levels of evaluating training. This framework concentrates on evaluation of training reactions, evaluation of learning, evaluation of behavioral change and evaluation of result or outcome (Kirkpatrick, 1996). The levels are depicted in Figure 4.2.

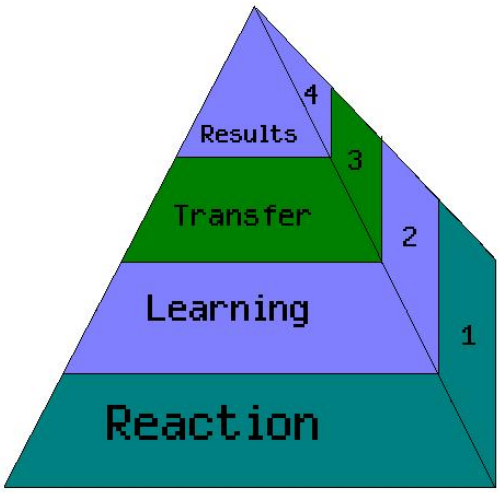


Figure 4.2: Kirkpatrick's Four-Levels of Training Evaluation

Evaluation of Training Reaction

The first level evaluates the reactions towards training. Kirkpatrick & Kirkpatrick (2006) explain that training reactions can be evaluated by focusing on the way course design, structure, content and presentation influence trainee motivation for and interest in the learning process.

In this research, to evaluate training reactions I observed and interviewed health workers after training. The evaluation focused on identifying shortcomings in the training methods and materials used.

Evaluation of Learning

Kirkpatrick & Kirkpatrick (2006) define learning as the "extent to which participants change attitudes, improve knowledge, and/or increase skill as a result of attending the program" (p. 22). This level evaluates knowledge, skills or attitudes.

This study has evaluated learning by assessing health workers' knowledge and skills in using data collection tools, DHIS and collected data by given health workers assessment exercises to be done, which targeted the areas that had problems before training. The exercises I gave them in the health facilities were on filling in data collection tools given different scenarios, calculating indicators and drawing graphs and tables. In the districts, the exercises were on using Ms. Word, MS. Excel

and DHIS for data entering, importing/exporting, generating reports and using the information generated for further analysis.

Evaluation of Behavioral Change

The third level of evaluation evaluates behavior change. Kirkpatrick & Kirkpatrick (2006) explain that, this level evaluates "what change in job behavior occurred because people attended the training program" (p. 52). The evaluation determines whether participants apply new knowledge and skills gained from training in their daily activities.

To evaluate behavior change, in this research, I observed and interviewed health workers on the way they have been able to change their practices and applied the trained skills and knowledge in their activities after training. Comparing the situation before and after training, in the facilities, I assessed the way they were filling in their data collection tools and using collected data for three months after training. In the districts, I assessed the use of DHIS for data entry, analysis, import/export and generating reports. I also assessed the way they create their monthly and quarterly reports.

Evaluation of Training Result or Outcome

The forth level of evaluation according to Kirkpatrick & Kirkpatrick (2006) is to evaluate results or outcomes of training by determining whether results occurred because the participants attended the training. The aim of evaluating training results is to determine whether training has brought changes in organizational performance.

In this research, to evaluate training three actions were performed. First, I compared the health workers' performance in data collection, processing, timely reporting and use in the facilities before and after training. In the districts, I compared performance in using DHIS for data entry, analysis, import/export and use of generated information before and after training. The second action performed was to compare the performance of facilities and districts that participated poorly in training and those that participated well. Third, I compared the performance of facilities that received training and those that did not receive training in terms of completeness and accuracy of reported data.

v. Specifying Learning Phase

This is an ongoing process of gaining knowledge whether the action is successful or unsuccessful as Baskerville (1999) explains. In this phase, I reflected on the learning aspects of the research and the knowledge gained was used to suggest appropriate training and support strategies that can be used in sustaining the implementation of HMIS.

4.4. Methods used to gather data

In this research, I adopted qualitative methods of data collection. Data was collected using interviews, observations, and document reviews. Table 4.1 summarizes the data collection methods used in each of the four phase of training cycle: Diagnosing, Action Planning, Action Taking and Evaluating.

Data Collection Methods Used in Each Phase of Training Cycle			
Phase	**Interviews**	**Document Reviews**	**Observations**
Diagnosing	√	√	√
Action Planning		√	
Action Taking			√
Evaluating	√	√	√

Table 4.1: Data collection method used in each phase of action research

Diagnosing Phase

In this phase, as indicated in Table 4.1, data collection methods used were interviews, document reviews and observations.

i. Interviews

Interviews were conducted to different health workers in the health facilities, districts, zones, HIMS management, HISP team, vertical programs managers and DANIDA coordinator. The interview sessions were conducted for the period of one hour to two hours. These interview sessions aimed generally at determining the needs and expectations for training from the health workers at all levels of the HMIS and health stakeholders' point of view. Table 4.2 presents the summary of interviewed people.

Interviewed People during the Diagnosing Phase		
Place	**Position**	**Number**
Health Facilities	Medical Doctor	3
	Senior Nurse – STI	1
	Senior Nurse in charge	3
	RCH in charge	1
	Senior Nurse Midwife	1
	Nurse Midwife	7
	Public Health Nurse	10
	MCH aid	8
	Orderly Nurse	4
Districts	District Health Officer	2
	District Medical Officer	3
	RCH Coordinator	2
	HMIS Focal Person	1
	Office Secretary	1
Zones	Zonal Health Administrator	1
HMIS management	HMIS Officials	3
HISP Office	HISP Team	2
Vertical programs	Vertical program manager	2
DANIDA	Zanzibar Coordinator	1
Total		**56**

Table 4.2: Interviews Conducted in the Diagnosing Phase

Referring the Table 4.2, in the health facilities, I interviewed different medical doctors and nurses. These interviews were conducted in groups of health workers in each facility. The aims of the interviews were to identify health workers' education backgrounds; the level of their understanding on health data, functioning of HMIS and data collection tools; and problems facing them in data collection, processing, reporting and use. Some of the findings obtained from the interviews are summarized in Appendix B.

In the districts, I interviewed some District Health Management Team members (District Medical Officer, District Health Officer and Reproductive and Child Health Coordinator) and HMIS focal person. In Chake Chake district they were interviewed in a group in Urban and West districts, they were interviewed individually. The interviews conducted had the same aim as in the facilities with an addition aim of identifying health workers' computer literacy levels and problems facing them in using DHIS for data entry, analysis, import/export and using the information generated from

DHIS. The interviews also focused on identifying ways that district workers were using for delivering feedback and support to the facilities.

In the zones, I interviewed the Zonal Health Administrator of Unguja zone to gain an understanding of what was going on in the field and their point of view on training and the whole implementation process that was taking place.

The HMIS officials were interviewed with the aim of gaining an understanding of the context and the implementation of HMIS from the management point of view. I focused on gaining an understanding on the way they manage the implementation process, their sustainability after HISP team handles over the project, their strategies for training, their guidelines for handling and using data, motivating, supervision and giving feedback to health workers and ways of maintaining data quality.

HISP team members were interviewed to gain an understanding of the whole implementation process, as they were the main drivers of the process. I also aimed at understanding the technical part of DHIS and its functionalities, the way the training on the use of DHIS was conducted, support and giving feedback to the HMIS management and health workers.

Vertical programs managers were interviewed to identify their opinions on the quality of data before and after the implementation, their perception on training, and their understanding of the data collection tools that incorporates their data. I interviewed Pemba and Unguja program managers of the Expanded Programme for Immunization.

Lastly, I interviewed DANIDA official, who are funding the ministry of health for the reformation of HMIS, to get his opinion on the sustainable implementation of HMIS and their priorities for funding HMIS in training and supervision.

ii. Document Reviews

For better understanding of different aspects of the research, different documents were reviewed in this phase. These documents were obtained from HISP office, health facilities, districts and HMIS office. These are summarized in Table 4.3.

Documents Reviewed during the Diagnosing Phase		
Place	**Documentation**	**Subtype**
HISP office	HMIS Data collection tools	Immunization and Cold Chain Monitoring (ICCM)
		Reproductive and Child Health Services (RCHS)
		Monthly Disease Surveillance Report (MDSR)
		Zero Zero form for Reproductive Health
		Zero Zero form for Immunization and Vitamin A Supplement
		Zero Zero Form for Children Nutrition Status
		OPD tally sheet
	Manual	DHIS training Manual (under construction)
Health Facilities	Reports (three months)	Monthly reports (ICCM, RCHS and MDSR)
		Zero Zero forms (Reproductive Health, Immunization and Vitamin A Supplement, and Children Nutrition Status)
		OPD Tally Sheet
		OPD Register
Districts	Reports	District monthly reports (three months)
		District quarterly reports (first and second quarter)
	Plans	District Implementation Plan
HMIS office	Zanzibar's country health profile	
	Zanzibar health sector reform strategic plan (II) (2006 –2010/11).	

Table 4.3: Documents Reviewed in the Diagnosing Phase

With the HISP team members, I reviewed seven HMIS data collection tools, as indicated in Table 4.3 (see samples in Appendix D). The aim was to gain an understanding on how and what to fill in each tool. I also reviewed DHIS training manual, which was under construction, to gain an understanding on using DHIS.

In the facilities, I reviewed three-month data (May, June and July in Pemba and April, May and June in Unguja) of each facility on their monthly reports, zero zero forms, OPD tally sheets and OPD registers. Doing so, I wanted to identify practices they used and problems facing them in using these tools. The reviews also gave me an opportunity to capture the magnitude of completeness and accuracy problems in filling in monthly reports by comparing what was filled in

the secondary tools (reports) to what was collected in the primary tools (zero zero forms, OPD tally sheets and OPD registers). Some of the findings obtained are summarized in Appendices C.1 and C.2 under the column of '**Before Training**'.

In the districts, I reviewed their quarterly and monthly reports and District Implementation Plans with the District Health Management Team members. The reports were reviewed to see what is being reported, the extent of usage of collected data for reporting and problems facing them in preparing reports and using data. District implementation plans were reviewed to get an understanding of their plans and to see the usage to data in generating such plans.

In the HMIS office, I reviewed Zanzibar's country health profile and Zanzibar Health Sector Reform Strategic Plan (II) (2006 –2010/11). The country profile was reviewed to gain an understanding of the field settings; and the strategic plan was mainly reviewed to get an understanding of how training and support have been included in the strategies regarding the reformation of health sector.

iii. Observations

In the diagnosing phase, observations were carried out in field visits, meeting and in parallel with the interviews and document review sessions. I participated in HISP team field visits to several districts and health facilities where I got opportunities to observe the way they were conducting training and support and the responses of health workers.

I attended different quarterly meetings in Pemba and Unguja conducted by HMIS management and HISP team. In these meetings, I observed and participated in the discussions carried out. Our main objective was to gain a better understanding of the overall ongoing implementation from different districts and facilities and to observe the way HMIS management was giving feedback to health workers. Some of the pictures taken from the meetings attended are presented in Figures 4.3 and 4.4.

Figure 4.3: 1st Quarter meeting in Pemba

Figure 4.4: 2nd Quarter meeting in Pemba

During the interviews and document reviews session in the facilities and districts, I observed health workers' practices on data collection, processing, analyzing and the way they handled and perceived data they collect. I also observed their level of understanding English language and arithmetic skills.

Action Planning Phase

In the action planning phase, as indicated in Table 4.1, the data collection method used was document reviews.

i. Document reviews

In this phase, I reviewed HISP training manuals used in South Africa and Botswana and University of Botswana manuals for preparing and conducting in-service courses for HMIS personnel to get an understanding on how they prepare and conduct training. Then I used the knowledge gained from those documents to prepare my training and materials.

Action Taking Phase

Data collection method employed in this phase was observations, as indicated in Table 4.1.

i. Observations

During this phase, while training was conducted, I was observing the way health workers received training. I also observed their reactions toward different instructions and exercises given, and the way they interacted with each other, with the trainer and with the computers.

Evaluating Phase

During the evaluation phase of the training cycle, data collection methods used were interviews, document reviews and observations, as indicated in Table 4.1.

i. Interviews

In the evaluation phase, interviews were conducted to different health workers in the health facilities and districts with the sessions of one to two hours. The data collected through interview sessions aimed at determining the impact of training on health workers' performances, skills and behaviours. Health workers interviewed in this phase are the ones who received training. Summary of the interviews conducted is presented in Table 4.4.

Interviewed People during the Evaluation Phase		
Place	**Position**	**Number**
Health Facilities	Medical Doctor	2
	Senior Nurse – STI	1
	Senior Nurse in charge	3
	RCH in charge	3
	Senior Nurse Midwife	1
	Nurse Midwife	5
	Public Health Nurse	9
	MCH aid	9
	Orderly Nurse	6
Districts	District Medical Officer	2
	HMIS Focal Person	1
Total		**42**

Table 4.4: Interviews Conducted in the Evaluation Phase

As indicated in Table 4.4, in the facilities, different medical doctors and nurses were interviewed. The interviews aimed at evaluating their understanding on the subjects trained and their opinions on health data and training conducted. I also identified problems that were still facing them in data

collection, processing, reporting and using. Appendix B summarizes some of the findings obtained from these interviews.

District Medical Officers and HMIS focal person were interviewed in the districts aiming at evaluating their performances on using DHIS and data after training focusing on data entry, analysis, import/export, and report creation.

ii. Document Reviews

Several documents were reviewed in the facilities and districts in the evaluation phase to further evaluate training and learning. Documents reviewed are summarized in Table 4.5.

Documents Reviewed during the Evaluation Phase		
Place	**Documentation**	**Subtype**
12 Health Facilities Trained	Reports (three months)	Monthly reports (ICCM, RCHS and MDSR)
		Zero Zero forms (Reproductive Health, Immunization and Vitamin A Supplement and Children Nutrition Status)
		OPD tally sheets
		OPD registers
	Exercises	Tables and graphs drawn
6 Health Facilities not Trained	Reports (six months)	Monthly reports (ICCM, RCHS and MDSR)
		Zero Zero forms (Reproductive Health, Immunization and Vitamin A Supplement and Children Nutrition Status)
		OPD tally sheets
		OPD registers
Districts	Reports	District monthly reports (three months)
		District quarterly reports (third quarter)
	Exercises	Tables and graphs generated from DHIS

Table 4.5: Documents Reviewed in the Evaluation Phase

Documents reviewed in the facilities, were three months data (August, September and October in Pemba; and July, August and September in Unguja), zero zero forms, OPD tally sheets, OPD registers and exercises as shown in Table 4.5. Reviewing reports, I aimed at identifying if the problems in using these tools, which were revealed in the diagnosing phase, are still there and to what extent. I reviewed the exercises for drawing tables and graphs using data from January 2006. The exercise I gave them after training in order to assess their understanding.

For further evaluation of training, I evaluated the magnitude of completeness and accuracy problems in filling in reports by comparing what was filled in the secondary tools to what was collected in the primary tools. Some of the findings obtained are summarized in Appendices C.1 and C.2 under the column of '**After Training**'.

In addition to that, I reviewed reports, as indicated in Table 4.5, from the six health facilities that did not receive training for the period of six months (June to November 2006). The results are presented in Appendix C.4. The magnitude of incompleteness and inaccuracy in filling in the reports was compared with that of the health facilities that received training.

The percentage of incompleteness was identified by looking at how many fields on the reports were left blank compared to all the fields. Percentage of incompleteness was obtained by comparing the number of incorrectly filled in fields on the report compared to all the fields.

One way of identifying inaccurate data was looking at the incorrect values and blank fields. The incorrect data was identified by going through all the fields on the reports, and comparing the values to what was written in the primary tools (zero zero forms, OPD tally sheets and OPD registers). If the value on the report was not the same as in the primary tools, then it was incorrect, however there was no way I could justify the correctness of data on the primary tools. Another way of identifying incorrect values by looking at the extremes of data, the procedure used to collect it, as the health workers explained, and the fields that were left blank, crossed out or filled in dash.

In the districts, I reviewed their quarterly and monthly reports and the exercises as shown in Table 4.5. Three months (July, August and September 2006) reports were reviewed to assess the extent of usage of collected data for reporting and problems that still faced them in preparing reports and using data. I also reviewed exercises they were given, of generating different reports from DHIS and using these reports to create different tables and graphs in Ms Excel, to see the impact of training.

iii. Observation

In the diagnosing phase, observations were carried out in the facilities and districts during the document review and interview sessions. These aimed at evaluating health workers' understanding on the subject trained and their perceptions on training conducted and health data focusing on the change of performance, behaviors and attitudes. I also observed the way they reacted when I was assessing the exercises they did.

4.5. Method of data Analysis

To increase validity and reliability of the research as well as richness, depth and scope of the findings, different ways of analysing data were used. In the fieldwork short notes were made on observations and interviews conducted. Notes were also taken on problems and ideas that arose during the fieldwork, and on the documents reviewed. These notes were analysed and documented in memos. At the end of the fieldwork day, the memos were expanded, well organized, analysed and documented into transcripts. This was done to keep a good memory of what was discussed and observed in the field in a particular day. By analysing the transcripts, they helped me to question on how much is the collected data answering the research questions. This realization gave me a way forward on making follow up on what was overlooked or what was not clear. The documented transcripts were analysed qualitatively and quantitatively using Content analysis.

4.5.1. Analysing Qualitative Data

Analysing qualitative data as Hancock (1998) argues, it is done by counting how often something appears in the data and comparing one measurement with the others and come up with the major findings. In this research, I used content analysis procedure for analysing data. Hancock (1998) defines content analysis as a "procedure for the categorization of verbal or behaviour data for purpose of classification, summarization and tabulation" (p. 17). Content analysis helps the researcher to create a "truthful and accurate reflection of the findings" (p. 18) as it gives the researcher a chance to summarise categories and describe the findings by continually revisiting the data and reviewing the categorization of data. Using content analysis, I identified and extracted data that was informative in the same way from the transcripts and sorted out the messages hidden in each interview, observation and document review.

Going through the transcripts, I noted the nature of relative information and noted them in categories. I categorised different types of information noted in each phase of the training phase forming minor categories. Minor categories formed were health workers' perceptions toward training; similar problems in different facilities and districts in using data collection tools, DHIS and data collected; health workers' education backgrounds; their perceptions on using collected data before and after training; their reactions toward training after training; changes in health workers' performance, behaviours and attitudes before and after training.

Going through these categories, I came up with two major categories, one with major findings from the health facilities and the other from the districts. Reviewing the major categories, I came up with two themes, one on the situation before this research intervention and the other on the research intervention.

4.5.2. Analyzing Quantitative Data

In analyzing quantitative data, I also used content analysis as described in analyzing qualitative data. I analyzed data gathered from reviewing data collection tools in health facilities, as documented in Appendices C.1 and C.2, to obtain the magnitude of completeness and accuracy problems, in filling in monthly reports, timely reporting and data usage problems.

Using content analysis, I formed minor categories of each facility looking at the magnitude of completeness, accuracy, timely reporting, and data use problems in each in each of the three data collection tools (Reproductive and Child Health Services, Immunization and Cold Chain Monitoring and Monthly Disease Surveillance Report). Then I grouped these categories to form three major categories of each data collection tools looking at the combined magnitude of each problem from all the facilities. Having the major categories, I grouped the data to form four themes, which looks at the overall magnitude of completeness, accuracy, timely reporting, and data use problem in each of the data collection tools.

4.6. Validity and Reliability

According to Hammersley (1992), validity is "interpreted as the extent to which an account accurately represents the social phenomena to which it refers" and "reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions" (p. 67).

The quantitative and qualitative methodologies employed and different ways of data collection, helped me to increase the validity of my findings and to ensure their reliability. In addition, the period of six months spent in the field helped in further confirming my findings through informal and formal discussions with different health workers and stakeholders.

4.7. Research Ethics

To maintain the ethical issues in this research, I acquired a research permit from the Zanzibar research board, which gave me an introduction letters to the HMIS and districts that I worked with. The copies of the research permits and letters are attached in Appendix H. The purpose of the research was made clear to all the involved partied before I started the research.

In addition, I maintained health worker's trust by not mentioning their names in this research as for our prior agreement of the research.

4.8. Study Limitations

I faced a number of limitations in this research, one of them being poor involvement of health workers in the districts. Most of the health workers I intended to train did not show up in the training and at the end, I had to work with another district for findings on answering research questions.

There was also a problem of electric power in Pemba. Due to power rationale, most of the times there was power at night and no power during the day. During these times, I was forced to work at night and it was not easy for many health workers to participate in the training at night.

Transport to the health facilities was another problem in Pemba where there was no reliable public transport and due to few or no taxis, getting one to hire was a problem. This has made it difficult to support health facilities on regular bases as it was in Unguja.

Finally yet important, time was a limitation for further evaluation of training and supporting health workers to further motivate them and improve their practices. These study limitations, however, have not violated the validity of findings of this research.

5. CHAPTER 5: Research Findings from the Health Facilities

The empirical findings of this research from the health facilities are presented in this chapter. I elaborate the findings from the five phases of the training cycle in the health facilities. Sections 5.1 presents the findings from the diagnosing phase, section 5.2 presents the findings from the action planning phase, section 5.3 presents the findings from the action taking phase, section 5.4 presents the findings from the evaluation phase and section 5.5 presents the findings from the specifying learning phase.

5.1. Diagnosing Phase

Background information on previous training

During the HMIS implementation process, the HISP team and the HMIS management trained health facilities workers on filling in data collection tools. They used the training of trainers (ToT) approach whereby they trained the District Health Management Team members on data collection tools so that they go to train those at the health facilities. The District Health Management Team member were trained on data collection tools, indicated in Table 5.1, in a one-day seminar. Unfortunately, the District Health Management Team members did not get time to train the health facilities workers what they have been trained hence, HISP and HMIS changed the training strategy. They prepared a seminar where they invited all the health facilities' in-charges, and Mother and Child Health (MCH) nurses and it was one-day session in Pemba and two days session in Unguja. During the seminar, they introduced eleven data collection tools and trained all of them.

After the training, HMIS distributed all the data collection tools and they started to be used right away as explained by the HMIS coordinator. Table 5.1 presents the data collection tool introduced in the facilities.

Data Collection Tools Introduced in the Facilities	
Tool Type	**Tool Name**
Primary Tools (for Routine data)	OPD Tally Sheet
	Hali ya Lishe ya Watoto
	Huduma za Chanjo na Nyongeza ya Vitamin A
	Huduma za Afya ya Uzazi
	OPD Register
	Daily Dispensing Register
Secondary Tools (for Monthly Reports)	Monthly Disease Surveillance Report
	Immunization and Cold Chain Monitoring
	Reproductive and Child Health Services
	STI and HIV/AIDS Management
	Maternity Ward
	Drugs Stock for Cottage Hospitals
	Drugs Stock for PHCU
	Drug Return
	Community Outreach Assessment
	Health Education Assessment

Table 5.1 : Data collection tools introduced in the facilities after HISP training

The HMIS management, HISP team, vertical programs managers and health workers themselves realized that there was a need to retrain health workers because the previous training was short and brief and as a result, most health facilities reported inaccurate and incomplete data. However, the HMIS coordinator explained that there was a shortage of funds, which made the retraining process to delay.

As an action research, in the diagnosis phase of this research, I determined health workers' needs and expectations for training. In addition, health worker' education background; understanding of health data and indicators; understanding of the functioning of the health system; numerical skills; English language proficiency; and their perceptions about training in general were assessed. These findings were helpful in planning, conducting and evaluating the training.

5.1.1. Identify Training Needs

To identify training needs, I attended several meetings at the ministry and districts, and field visits to the facilities. Interviews were conducted with different health workers at the facilities and districts, HMIS management, HISP team members, vertical programs managers and DANIDA officials to determine the needs and expectations for training. In addition, I reviewed eight data

collection tools using health facilities' three months data together with facility workers to identify the different problems facing them in data collection, processing, reporting and using. Data collection tools reviewed among the ones that were used are indicated in Table 5.2 (see samples in Appendix D).

Reviewed Data Collection Tools		
Tool Type	**Tool Name**	**Tools Reviewed**
Primary Tools (for Routine data)	OPD Tally Sheet	√
	Hali ya Lishe ya Watoto	√
	Huduma za Chanjo na Nyongeza ya Vitamin A	√
	Huduma za Afya ya Uzazi	√
	OPD Register	√
	Daily Dispensing Register	
Secondary Tools (for Monthly Reports)	Monthly Disease Surveillance Report	√
	Immunization and Cold Chain Monitoring	√
	Reproductive and Child Health Services	√
	STI and HIV/AIDS Management	
	Maternity Ward	
	Drugs Stock for Cottage Hospitals	
	Drugs Stock for PHCU	
	Drug Return	
	Community Outreach Assessment	
	Health Education Assessment	

Table 5.2: Data Collection Tools Revised and Retrained in this research

We did not revise the STI and HIV/AIDS Management and Maternity Ward tools because they were used in few health facilities, the ones that were not in the research sample. The other tools were not trained even though they were used because they were still undergoing major revisions as explained by HMIS coordinator.

During the session of reviewing data collection tools, health workers identified what they filled in wrongly and what they did not fill in at all by passing through each report, zero zero form, tally sheet, and OPD registers and discuss what and why they wrote or not on each field. We identified and discussed all the problems facing them during data collection, data processing, timely reporting at the end of the month, and using the collected data. Observations were carried out together with interviews and document review sessions.

The tables in Appendix B shows the responses from the interviews in each facility and problems identified. These responses are summarized in Table 5.3.

Identified Problems Before Training						
Health Facility	**Interviewed Health Workers**	**PROBLEM**				
		NOT Received Previous training	**Completeness**	**Accuracy**	**Timeliness**	**Data use**
PEMBA						
ZIWANI	3	1	YES	YES	NO	YES
GOMBANI	2	0	YES	YES	YES	YES
CHAKE CHAKE	4	2	YES	YES	YES	YES
NDAGONI	4	2	YES	YES	NO	YES
V/COTTAGE	4	2	YES	YES	YES	YES
SDA	2	2	YES	YES	NO	YES
TOTAL	19	9				
UNGUJA						
K/SAMAKI	4	2	YES	YES	NO	YES
SOS	1	0	YES	YES	NO	YES
FUONI	4	2	YES	YES	YES	YES
KMKM	3	1	YES	YES	NO	YES
WELEZO	3	1	YES	YES	YES	YES
MAGOGONI	4	2	YES	YES	YES	YES
TOTAL	**19**	**8**	**YES=12**	**YES=12**	**YES=6**	**YES=12**
GRAND TOTAL	**38**	**17**	**NO=0**	**NO=0**	**NO=6**	**NO=0**

Table 5.3: Identified Problems before Training in the Health Facilities

Table 5.3 indicates that thirty-eight health workers were interviewed from twelve health facilities and among them seventeen did not received previous training on data collection tools. All twelve facilities had completeness and accuracy problems in collecting and processing monthly reports and not using their health data. Six out of the twelve facilities had a problem of timely reporting their monthly reports to the districts.

All the findings obtained from interviews, observations and document reviews indicated that the data collection tools were not clearly understood; and there was a need for retraining health facility workers. This section describes problems identified in data collection, processing, reporting and using.

i. Problems in Data Collection and Processing

In identifying problems in data collection and processing, I looked at the magnitude of incomplete and inaccurate data in the monthly reports. I also identified difficulties that lead to incompleteness and inaccuracy of the data collected in collecting and processing it.

Table 5.4 presents the summary of percentages of incompleteness and inaccuracy in filling in monthly reports identified before training in each of the reports in each facility for three months data, i.e., May, June and July in Pemba and April, May and June in Unguja. These were derived from Appendices C.1 and C.2 under the column of '**Before Training**'.

Percentages of Incompleteness and Inaccuracy Identified Before Training								
Health Facility	**Percentage of Incompleteness**				**Percentage of Inaccuracy**			
	ICCM	**RCHS**	**MDSR**	**Average**	**ICCM**	**RCHS**	**MDSR**	**Average**
PEMBA								
ZIWANI	1	0	26	**9**	11	20	28	**20**
GOMBANI	0	5	45	**17**	1	25	46	**24**
CHAKE CHAKE	6	13	n/a	**10**	12	20	n/a	**16**
NDAGONI	1	0	0	**0**	9	15	3	**9**
V/COTTAGE	6	0	19	**8**	7	10	19	**12**
SDA	17	15	1	**11**	18	22	5	**15**
AVERAGE	**5**	**6**	**18**	**10**	**10**	**19**	**20**	**16**
UNGUJA								
K/SAMAKI	4	3	n/a	**4**	15	14	n/a	**15**
SOS	10	14	n/a	**12**	30	17	n/a	**24**
FUONI	4	12	2	**6**	13	23	4	**13**
KMKM	14	6	n/a	**10**	19	28	n/a	**24**
WELEZO	6	24	n/a	**15**	17	35	n/a	**26**
MAGOGONI	1	3	0	**1**	3	10	3	**5**
AVERAGE	**7**	**10**	**1**	**6**	**16**	**21**	**4**	**14**

Table 5.4: Percentages of Incompleteness and Inaccuracy before Training

The overall percentage of incompleteness in filling in all the reports derived from the data indicated in Table 5.4 was 8% (10% in Pemba and 6% in Unguja). The percentage of inaccuracy was 15 % (16 % in Pemba and 14 % in Unguja). This is a large amount of incorrect and inaccurate data collected, and it affected the whole reporting system.

Reasons raised by most facility workers for doing so were little understanding on data collection tools, design of data collection tools, changing versions of the form and previous practices used in data collection. Carelessness was another reason raised.

Little Understanding of data collection tools

This problem was identified in all the health facilities whereby all health workers said that they did not understand data collection tools completely. Most of the reasons raised were as follows:

- Don't know what to fill in

This was a major problem explained by majority and was also revealed when reviewing the previously filled in reports. This was because most of health workers did not receive previous training but for those who received training complained that it was not enough for them to start using new data collection tools.

For example, in the RCHS form, there is a section of Delivery services as indicated in Figure 5.1. This section was not filled in by most facilities because they do not provide Delivery services. Most health workers did not understand what to fill in or not in this section since it was not indicated what to fill in if certain services were not provided by the facility.

Delivery services

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

Figure 5.1: Delivery services in the RCHS form

- Don't know where to get data values

Most of the fields on the reports that were left blank are those that were not in the old forms, and they were not given written instructions on how to fill in after training. Most health workers explained that they did not know where to get the data values. For example, the infant/maternal deaths in RCHS form and Reported deaths in MDSR form as presented in Figures 5.2 and 5.3

respectively were not filled in most facilities because such information was not reported to the health facilities.

Infant / Maternal deaths

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

Figure 5.2: Infant and Maternal Deaths in RCHS form

Deaths (Reported deaths in the hospital / catchment area)

Diseases	No. of deaths reported		Diseases	No. of deaths reported	
	< 5 years	≥ 5 years		< 5 years	≥ 5 years
Malaria			Measles		
Cholera			NNT		
Yellow fever			Tetanus		

Figure 5.3: Deaths Reported in MDSR form

- Little Understanding of English language

Most health workers faced some difficulties in understanding complicated English phrases and as a result, it was difficult for them to understand what to write in some sections. For example, most of the forms were not filled in the '**Fully immunized under 1 year**' and '**No. of children born protected**' sections in the ICCM form as shown in Figure 5.4. This was because the information is collected from the zero zero form for Immunization and Vitamin A Supplements (Figure 5.5), which is in Kiswahili, and they did not understand if it was the same thing they have to fill in the ICCM form. This was revealed when one health worker said,

> "*I did not understand if 'fully immunized under 1 year' meant 'watoto waliokamilisha chanjo chini ya mwaka 1' in Kiswahili and if 'children born protected' meant 'watoto waliozaliwa na mama waliokamilisha chanjo 2 za pepoppunda na zaidi' in Kiswahili*"

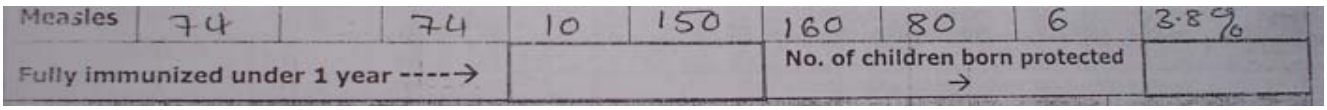


Figure 5.4: Fully immunized and No. of children born protected in the ICCM Report

Watoto waliokamilisha chanjo Chini ya mwaka 1	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Watoto waliozaliwa na mama Waliopata chanjo 2 za pepopunda na zaidi	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	

Figure 5.5: Children Immunization section from zero zero form for Immunization and Vitamin A Supplements

Similarly, the sections, '**Total headcounts**' and '**Total headcounts under 5 years**' in the MDSR form, as shown in Figure 5.6, were incorrectly filled in by most health facilities. When I asked what the values filled in reflected, one health worker explained that they were not sure if they understood it correctly.

Researcher: *"The number you wrote [*pointing on the report indicated in Figure 5.6*] here, what does it reflect?"*

Respondent: *"I wrote the total number of diagnosis made this month. I made 709 diagnoses for children under five years and the others (not under five years) were 480"*

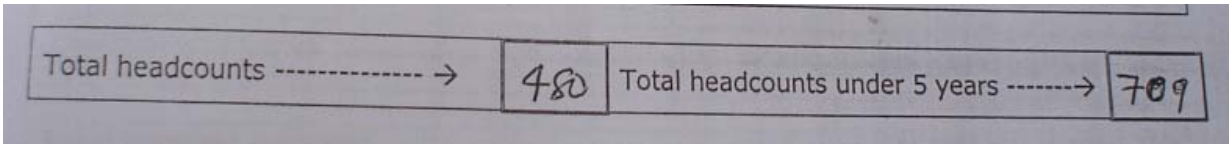


Figure 5.6: Total headcounts on the MDSR Report

Practically they understood the difference between the headcount and the diagnosis; they thought it meant headcounts also meant diagnosis in English.

Another example is in the RCHS form, in the Family planning services section as shown in Figure 5.7, the section which says '**No. of clients served by CDBs**' was not understood. Most health workers said,

"*It means the number of clients brought to the facility by CBDs*".

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						

Figure 5.7: Clients served by CBDs in RCHS form

Up to this point, the health workers were not happy about all the incorrect values they have written in their previous reports.

- Arithmetic problems

Arithmetic problems were caused by the formulas indicated on the form, lack of instructions and approximation errors.

Most of facility workers have the lowest education levels as elaborated in the Table 5.5. They explained that the formulas used on the ICCM form were too complicated for them to use for calculating '**Doses wasted**' and '**Total wastage %**' as shown in Figure 5.8.

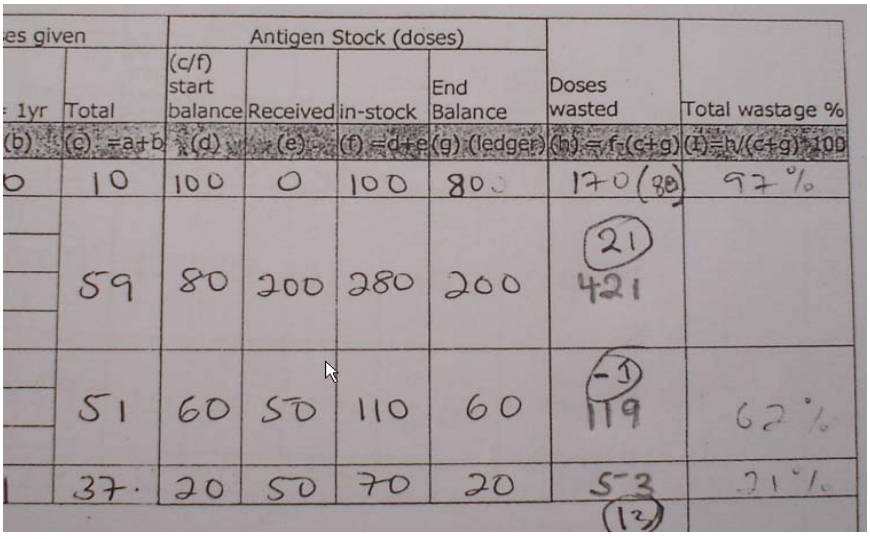


Figure 5.8: Mathematical Formulas in the ICCM Report

As indicated in Figure 5.8, using the formula, **h = f – (c + g)** most facility workers did not understand the meaning of the brackets, they used it as **h = f – c + g** and in the formula, **I = h /(c + g) * 100**, the / and * signs were not understood by most workers as division and multiplication signs. Most of these sections were wrongly filled in. The rounded values were corrected at the district.

In the ICCM report, the sections, which read '**End Balance**', as shown in, Figure 5.8 has to be approximated by counting the number of antigens in the fridge (ledger). As explained by one facility worker who said:

"It is not easy to get the exact approximation of what to write".

This was because the antigen doses given are taken from the bottles, which are in liquid form and at the end of the month it is not easy to look at the bottle and approximate how many doses have remained if they did not keep track of how many they have given.

Furthermore, to fill in the ICCM form on the '**Fully immunized under 1 year**' and '**No. of children born protected**' as shown in Figure 5.9, the values were obtained from the zero zero form for Immunization and Vitamin A supplements form, as indicated in the Figure 5.5,which is tallied daily during children visits in the clinics.

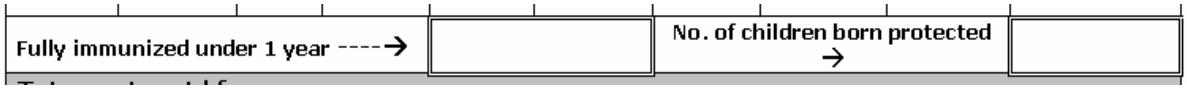


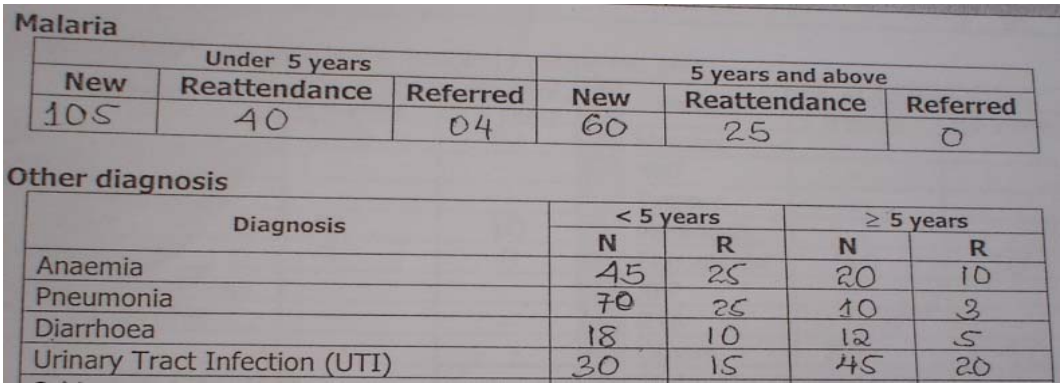
Figure 5.9: Fully immunized under 1 year and No. of children born protected in the ICCM form

Health workers were not given instructions on when they should tally the zero zero form that is, when a child is fully immunized and when a child is born protected. Most were not sure if it was every time a child comes to the facility or during the first visit. They were also not sure on how

they can avoid double counting because they do not note anything on the children and women cards when they have counted as fully immunized and born protected in the tally sheets.

- Filling in a wrong box

Carelessness and sometimes little understanding of English mostly caused this. For example, most facility workers thought, '**Other diagnosis'** in the MDSR report as shown the Figure 5.10 and '**Deaths'** in the MDSR report as shown the Figure 5.11, were the same thing thus they filled in the same values.



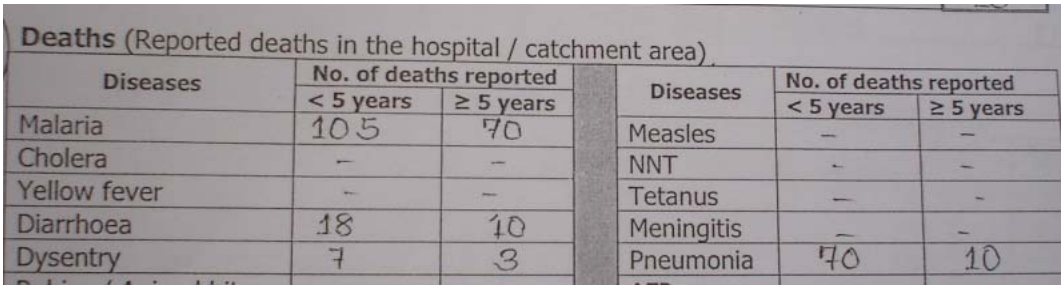
Malaria

Under 5 years			5 years and above		
New	Reattendance	Referred	New	Reattendance	Referred
105	40	04	60	25	0

Other diagnosis

Diagnosis	< 5 years		≥ 5 years	
	N	R	N	R
Anaemia	45	25	20	10
Pneumonia	70	25	10	3
Diarrhoea	18	10	12	5
Urinary Tract Infection (UTI)	30	15	45	20

Figure 5.10: Malaria and Other Diagnosis in the MDSR Report



Deaths (Reported deaths in the hospital / catchment area)

Diseases	No. of deaths reported		Diseases	No. of deaths reported	
	< 5 years	≥ 5 years		< 5 years	≥ 5 years
Malaria	105	70	Measles	–	–
Cholera	–	–	NNT	–	–
Yellow fever	–	–	Tetanus	–	–
Diarrhoea	18	10	Meningitis	–	–
Dysentry	7	3	Pneumonia	70	10

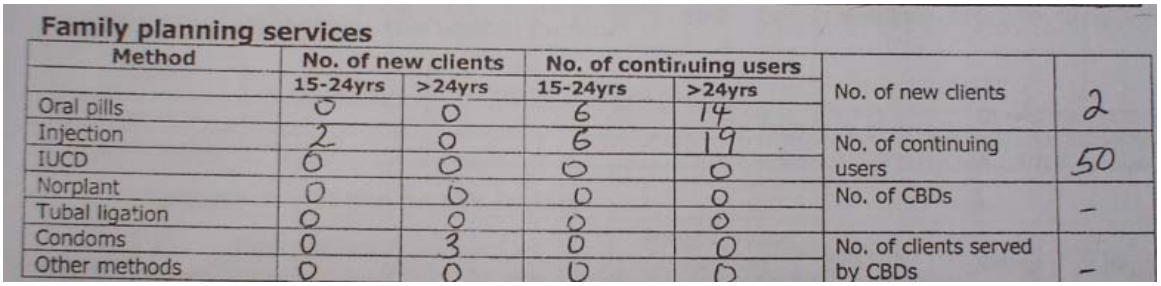
Figure 5.11: Deaths caused by diseases in the MDSR Report

Looking at the values filled in, in '**New**' '**Under 5 years**' of Malaria, Pneumonia and Diarrhea as indicated in Figure 5.10, they are the same values filled in, in Malaria, Pneumonia and Diarrhea death cases under five years, as indicated in Figure 5.11. This indicated that they did not understand the language used.

Design of data collection tools

The HMIS data collection tools are not designed for a specific facility and not all facilities provide the same services. However, there are no defined guidelines on what to fill in if a particular facility does not provide certain services. Most health facilities do not fill in the values on their reports if they do not provide such services and others write zero, dash or cross outs, which do not give any information.

In addition, there are some fields that require writing the total of what was written previously but it does not show explicitly on the form. For example in RCHS form in the Family planning services section as presented in Figure 5.12.



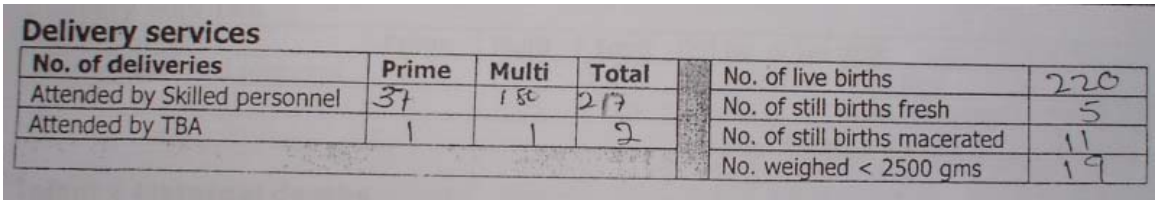
Family planning services

Method	No. of new clients		No. of continuing users			
	15-24yrs	>24yrs	15-24yrs	>24yrs	No. of new clients	2
Oral pills	0	0	6	14		
Injection	2	0	6	19	No. of continuing users	50
IUCD	0	0	0	0		
Norplant	0	0	0	0	No. of CBDs	-
Tubal ligation	0	0	0	0		
Condoms	0	3	0	0	No. of clients served by CBDs	-
Other methods	0	0	0	0		

Figure 5.12: Family planning section in RCHS form

The field to the right which reads '**No. of new clients**', is meant to write the total number of new family planning clients which are also mentioned in the second column which reads '**No. of new clients**' similarly, the **No. of continuing users'.** For example, the section **'No. of new clients'** to the right side should be 5 (2 + 3) and the '**No. of continuing users'** should be 45 (6+6+14+19). Most of health workers did not understand the connection between these sections (left and right columns), so they either filled in wrong values or did not fill in the total section.

Another example is the Delivery services section in the RCHS form as shown in Figure 5.13.



Delivery services

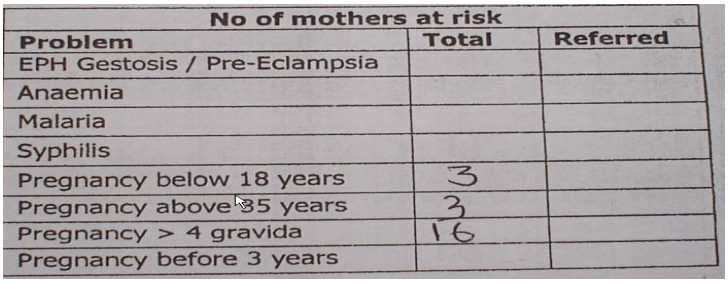
No. of deliveries	Prime	Multi	Total
Attended by Skilled personnel	37	180	217
Attended by TBA	1	1	2

No. of live births	220
No. of still births fresh	5
No. of still births macerated	11
No. weighed < 2500 gms	19

Figure 5.13: Delivery Services in RCHS form

In most facilities, the section to the right was either not filled in or filled in wrong values. Most facility workers did not understand that what is to be filled in the column to the right has to reflect the '**No. of deliveries**' filled in the section under the column '**Total**' to the left. Looking at the example from Figure 5.13, '**No. of live births**' should be 203, if the '**Total**' deliveries were 219 (217+2), '**No. of still births fresh**' were 5 and '**No. of still birth macerated**' were 11.

Furthermore, the Pregnant mothers section in the RCHS form is another example whereby in the section '**No. of mothers at risk**' as shown in Figure 5.14, the '**Total**' column was either not filled in or filled in wrong values. Similarly, the '**Referred**' column was either not filled in or filled in zeros by most health facilities.



No of mothers at risk

Problem	Total	Referred
EPH Gestosis / Pre-Eclampsia		
Anaemia		
Malaria		
Syphilis		
Pregnancy below 18 years	3	
Pregnancy above 35 years	3	
Pregnancy > 4 gravida	16	
Pregnancy before 3 years		

Figure 5.14: Pregnant Mothers attendance in RCHS form

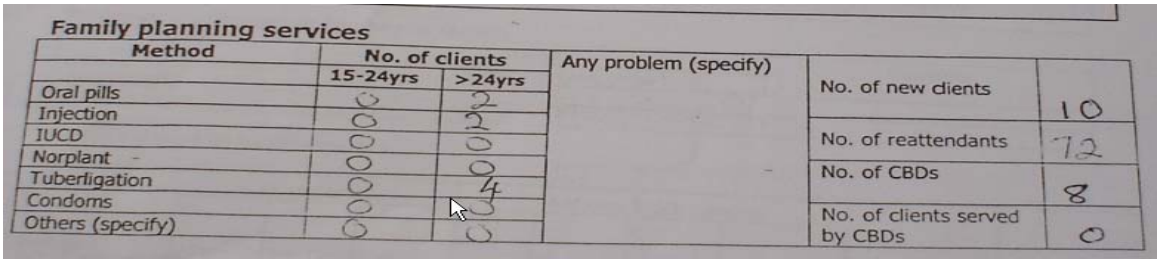
From health workers' explanations, the values on the '**Total**' column were either incorrect or left blank because they did not have an official primary tool to collect the data daily. They have reinvented their own ways of getting these values, for example, they tally in a separate piece of papers, which were sometimes lost before the end of the month or they find that they forgot to collect certain data on other values on the form. In the case of referrals, facility workers explained

that they were not writing official referral notes to refer mothers at risk to the hospitals but practically they did by merely telling them. They did not understand if they were supposed to record all these values.

Changing versions of the forms

Due to the ongoing implementation of HMIS, the contents of the forms have been changing from time to time and most of the changes were not communicated to the health facilities. As a result, things that did not exist in the previous version of the forms were either not filled in or filled in wrong values.

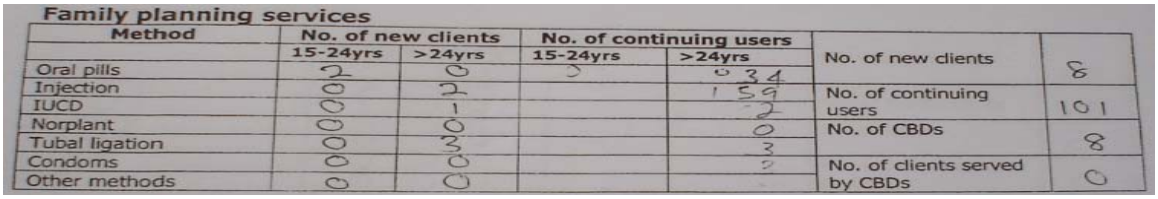
For example, in the Family planning services in the RCHS form, the section about '**No. of continuing users**', as shown in Figure 5.15, was not there in the 'old' forms which they were trained. Soon after training, this part was added on the form, as indicated in Figure 5.16. Most of the health workers did not understand what to fill in this section.



Family planning services

Method	No. of clients		Any problem (specify)		
	15-24yrs	>24yrs			
Oral pills	0	2		No. of new clients	10
Injection	0	2		No. of reattendants	72
IUCD	0	0		No. of CBDs	8
Norplant	0	0		No. of clients served by CBDs	0
Tuberligation	0	4			
Condoms	0	0			
Others (specify)	0	0			

Figure 5.15: Family Planning Services in RCHS form 'old' version



Family planning services

Method	No. of new clients		No. of continuing users			
	15-24yrs	>24yrs	15-24yrs	>24yrs		
Oral pills	2	0		034	No. of new clients	8
Injection	0	2		159	No. of continuing users	101
IUCD	0	1		2	No. of CBDs	8
Norplant	0	0		0		
Tubal ligation	0	3		3		
Condoms	0	0		2	No. of clients served by CBDs	0
Other methods	0	0				

Figure 5.16: Family Planning Services in RCHS form 'new' version

Another example was the Postnatal services in the RCHS form whereby it had three postnatal visits when health workers were trained but some months after training, a new section (14th day)

was added, as indicated in Figure 5.17. Previously, the health workers were recording three (7th day, 28th day and 42nd day) visits only in their registers they were not recording the 14th day visit as a result this field was either not filled in or filled in the same value as in the '**7th day**'.

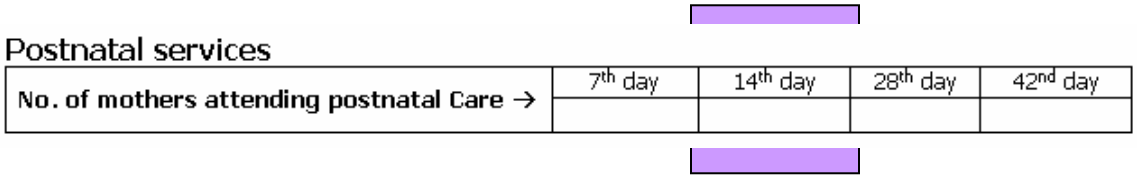


Figure 5.17: Postnatal Services in the RCHS form

Furthermore, values for total headcounts in the MDSR form as shown in Figure 5.18 were not filling-in by most health facilities because it did not exist during the training and those who were filling in, it was wrongly filled because they did not understand exactly what it meant as explained by most health workers.

Figure 5.18: Total Headcounts in the MDSR form

Moreover, health facilities, kept on using old versions of forms, which were missing some of the parts added in the recent versions. They made copies of these forms so that they can use them when the District Health Management Team brings new forms late, and they were not aware of the changes made. In addition, this problem existed because despite of the changes made on the forms, the District Health Management Team as well kept on supplying old forms to the health facilities. When I interviewed the district's HMIS focal person and District Health Officers, they said that they were not informed when changes were made and it was not easy for them to notice the changes because they were not using the forms.

Previous Practices

The revision of HMIS has changed some of the practices that were previously used in data collection, processing and reporting. Previously, in data collection tools, if the value was zero, they would either leave it blank or cross it out and it was understood as zero, as one facility worker explained. In the new system, no field on the reports is to be left blank or crossed out. However, these new practices were not documented, as a result health workers kept on using previous work practices and most of the values on the new forms that were supposed to be zero, were either left blank or crossed out.

In addition, most health workers did not fill in sections on the forms that did not exist before the reformation and the reasons they give are:

"I don't understand what to fill in; we were not trained on this section"

"I forgot to tally because we were not doing this before', 'I didn't know it was important."

Furthermore, before the reformation of HMIS, the only data collected that was supervised was Immunization, the other reports were being collected but there was no follow up on the submission of the other reports. As a result, health workers developed the idea that, the only important data was immunization, and they have to finish this report on time and accurately and the other reports were not important, so they either did not submitted them or submitted late.

Carelessness

The incompleteness and inaccuracy problems were also cause by carelessness, some of the health workers did not fill in all the fields on the reports and they did not have a reason why they did so. Sometimes they were filling in incorrect values while they were aware that it was wrong.

ii. Problems in Reporting Collected Data

Untimely reporting was a problem to some health facilities and the major reasons raised were workload and late supply of forms from the districts. From the observations, I observed that most facility workers did not recognize why they should report on time.

Work overload

Some health facilities explained that they cannot report timely because of work overload and they have to fill in many forms at the end of the month. As one explained that,

> "*We have many clients to attend to and at the same time we have to fill in many reports so we cannot guarantee to finish on time"*

When I asked them to show me the forms they were filling in monthly, they showed the 'old forms' (vertical program forms which were being used before the reformation of HMIS) and the 'new forms' (forms which were currently supplied by HMIS). Health workers explained that they were not informed to stop filling in the 'old forms' and the districts were demanding both old and new reports.

Late supply of forms from the districts

Health facilities were getting the forms from the district monthly. Sometimes they were getting them very late and sometimes they were not getting them at all, especially in Pemba. As a result, the forms were filled in late or not at all and this increased untimely reporting.

The concept as to 'Why should I report on time or not'

Most health workers did not understand why the information was needed in the higher levels or by themselves. As a result, they were not using the data they collect. They were also not receiving any feedback on the reports they send monthly to the districts. This made them feel that they were collecting data to satisfy the needs of the higher levels.

iii. Problems in Using Data

There was an evidence of using immunization data for calculating indicators and drawing graphs to see the deviation from different targets set in all the health facilities. However, other data were not used and according to health workers' views, this was because of the existing culture of using information and their understanding of health data.

Culture of Using Information

Most health workers perceive that immunization data was the most important data they collect and it was the only data set used. This was because the immunization activities were coordinated the by Expanded Program for Immunization (EPI) who supplies all the antigens and graph papers for the MCH nurses to indicate the monthly progress of all antigens given. They conduct monthly follow up in each facility and refresher training courses once every year. However, other data sets were not used and there was little monitoring on their collection and usage. Health workers did not devise any means of using it either.

In addition, all the health facilities have a timetable for health education that they give to the public. Unfortunately, they said that they did not use any judgment on deciding what subject to give and when. This shows that they did not use their data for this purpose. The following were some of the respondents' views on the use of data collected:

> *"To bring to the district and vertical programs"*
>
> *"To show visitors who will come and ask for data"*
>
> *"To see how we are performing in immunization because EPI follow up their performance reports monthly"*

Furthermore, due to a centralized management of the HMIS and the ministry as a whole, most of the operations are top down, and most of the decisions are made at these levels. These decisions are most of times not depending on the data from the health facilities, as explained by the HMIS coordinator. This was also evident when health workers explained the way they get medical supplies from the district:

> *"We make an approximation and send the requests and they have never questioned us and sometimes they bring less of what we have ordered"*

"Some of the medications the district supplies to us are not enough because we serve a large population"

This was evident that health facilities and higher levels were not using their data in decision-making and planning regarding facility or client management. Most of these decisions come from the management.

Understanding of Health Data

Most health workers did not know how to use the data they collect for calculating indicators and presenting in graphs. In calculating indicators, they had difficulties in knowing what indicators they needed and how to get the numerators and denominators to use. In drawing graphs, they had difficulties in the choice of scales to use.

As we were identifying training needs, I found out that health workers perceived the reports as a different thing from their daily practices. They collected data as a daily routine but when it comes to report writing, they did not connect it with their daily practice; they did it as a different thing. As a result, they ended up with incomplete, inaccurate, untimely reporting and unused data. There was a need to help health workers create meaning of what they were doing.

5.1.2. Identify Expectations for Training

Training was identified as one of the solutions for the mentioned problems. Training would help health workers to awaken their understanding on how to fill in reports completely and accurately, and eventually use the data for facility and patient management and finally report to the district on time. The need for training was expressed by health workers who said that:

"The training we received before was very short and very confusing and it was not enough to start using new tools, I need more training"

"I did not receive any training but I get the forms every month so I fill in what I understand, to fill in correctly I need more training"

"Training, because we don't like messing up the reports, but if we understand more we will do our job as needed"

"The forms are not clear; I am filling some parts just from my own understanding which could be wrong"

"Changing from one system to another is very confusing to me, I definitely need more training"

"If we understand well how to fill in the form, it will help us to fill it quickly"

"It will be a good idea if there was a fresher course every now and then to clarify our doubts"

Perceiving the need for training, the health workers and I laid down plans on conducting training. We proposed training session to be in discussion groups where they can contribute their views and build meaning on what they learn. The group discussions aimed at sharing each other's understanding and experience and to build teamwork among health workers so that they can work together in their daily activities. Most health workers were older than I was. They expected me to respect them, listen to them and learn new things from me and from them. We agreed that during the training, we would learn much from each other and engage fully in the discussions.

There was a 'culture' in Zanzibar of getting allowances and/or official certificates whenever there is a training session. However, in this research I agreed with the health workers that there would be no allowances or certificates issued, the training was purely our dedication to help each other and share experience in learning and improving their skills in data collection, processing, reporting and use.

5.1.3. Assess Educational Background, Arithmetic Skills and English Language Proficiency

Education background, arithmetic skills and English language proficiency of health workers in each facility were assessed during the interview and observation sessions and when reviewing data collection tools.

The education level of each health worker was identified during the interviews and the results are shown in Appendix B, these results are summarized in Table 5.5.

Education Level	Number of HW	Percentage
PEMBA		
Form 3 + Certificate	14	73.7
Form 4 + Certificate	3	15.8
Form 6 + Diploma	2	10.5
Total	**19**	100
UNGUJA		
Form 3 + Certificate	6	31.6
Form 4 + Certificate	12	63.2
Form 6 + Diploma	1	5.3
Total	**19**	100

OVERALL SUMMARY		
Education Level	**Number of HW**	%
Form 3 + Certificate	20	52.6
Form 4 + Certificate	15	39.5
Form 6 + Diploma	3	7.9
TOTAL	**38**	**100**

Table 5.5: Education backgrounds of Health Workers in each facility

Table 5.5 indicates that, the educational backgrounds of health workers in the health facilities were very low whereby 52.6% were in the Form 3 + Certificate level. The findings indicate that this was more a problem in Pemba than in Unguja whereby 73.3% of health workers were in Form 3 + Certificate level while in Unguja there were 31.6%**.**

I assessed the arithmetic skills and English language proficiency when we were reviewing monthly reports and during the interview sessions. Health workers identified areas on the reports where they made mistakes because they could not understand mathematical formulas and/or English. Table 5.6 indicates the findings derived from interviews, observations and monthly report reviews.

Education Background - Arithmetic Skills - English Language Proficiency		
Education Level	**Arithmetic skills**	**English language Proficiency**
Form 3 + Certificate	Poor	Very Poor
Form 4 + Certificate	Acceptable	Poor
Form 6 + Diploma	Acceptable	Acceptable

Table 5.6: Relationship between Education Background, Arithmetic Skills and English Language Proficiency

Table 5.6 shows that most health workers, as mentioned previously 52.6% have the Form 3 + Certificate education level, had poor arithmetic skills and were very poor in understanding English.

In general, the diagnosis phase gave me a chance to grasp an understanding on what was going on the field. The findings obtained also helped in preparing training. Actions taken in this phase have also gave me a chance to know the health workers I was going to work with in this research and build teamwork for carrying out further actions.

5.2. Action Planning Phase

In this phase, the determined needs and expectations for training were analyzed and combined together to formulate training objectives. Guided by the objectives, I prepared training materials, formulated training groups and timetable, and I chose training methods and places to be used.

Due to the identified needs for training in the diagnosis phase, I planned with health workers to work together in fill in the monthly reports, tallying the tally sheets, OPD registers and zero zero forms and workout examples on how to use data for calculating indicators, drawing table and graphs, and interpreting them for patient and facility management.

During the learning process, we planned to offer each other patience and understanding because we have different ages and educational backgrounds. Our major goal was to learn how to create meaning of what we do, and share that with each other.

5.2.1. Training Objectives

In the action planning phase, I formulated training objectives together with the health workers focusing on the identified training needs. Training objectives set were to improve levels of awareness, understanding and technical skills in relation to data collection, processing, reporting and utilization and to motivate the culture of using data collected for patient and health facility management.

These objectives guided me in selecting training methods to be used, training places, training groups and timetable and training materials to be used.

5.2.2. Training Methods

At this stage, I chose to adopt informal learning and learning-by-doing methods. Adopting informal learning, training was planned to be conducted in group discussions so as to involve everyone in the learning process. The ones who received training would be trainers of the other health workers who were not able to attend this training. Using the learning-by-doing method, we planned to learn through solving the problems identified in the diagnosing phase.

5.2.3. Training Places

Training sessions were planned to take place at the health facilities where facility workers chose the office to use. The sessions were planned to be conducted during the time when there were few clients in the facility, mostly after working hours in the afternoon or during the weekends.

5.2.4. Training Groups and Timetable

The health workers themselves formulated the training groups. They chose all of them; facility in-charge and all the nurses in the facility to be in one group so that everyone understands what is going on and can take over the work whenever someone else was absent. The training timetable used is presented in Appendix G.1. The sessions were planned to be conducted in one day for two hours each session.

5.2.5. Training Materials

In preparing training materials, the facility data was chosen to be used for examples and elaborations. Training materials prepared were posters, handouts and flip charts. Flip charts were used during the training sessions as a white board. Posters for each report (ICCM, MDSR and RCHS) were prepared to elaborate the areas that were not clearly understood (see samples in Appendix E).

The posters prepared, samples shown in Figures 5.19, 5.20 and 5.21, contained the reports with their corresponding tally sheets and they were used to elaborate fields on the forms that most health workers had problems understanding. The elaborations made were simplifying complicated formulas, translating difficult English phrases to Kiswahili and putting a proper arrangement on calculating the fields.

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR

IMMUNIZATION AND COLD CHAIN MONITORING

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

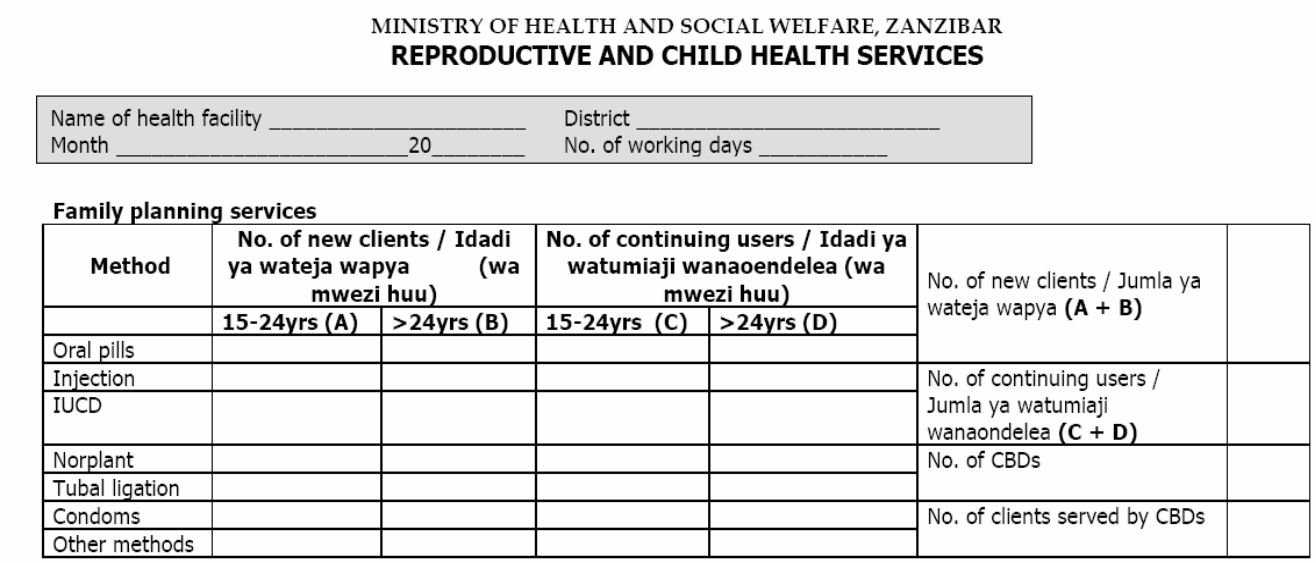
Status of equipment at the health facility

Item	Status		Remarks
	Working	Not working (how long)	
Refrigerator			
Thermometer			

Antigen use at the health facility

Antigen	Doses given / Dozi zilizotolewa			Antigen stock (in doses)				Doses wasted / Dozi zilizoharibika	Percentage wastage
	< 1 yr	≥ 1 yr	Total	Start balance / Zilizoko kwenje friji (mwanzoni mwa mwezi)	Received	In stock	End balance / Zilizobaki kwenye friji (mwishoni mwa mwezi)		
Guide	(a)	(b)	(C) = a+b	(d)	(e)	(f) = d+e	(g)	(h)=f-c-g	(i)= h / c+g * 100
BCG									

Figure 5.19: Sample of the Poster on ICCM Report



MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR

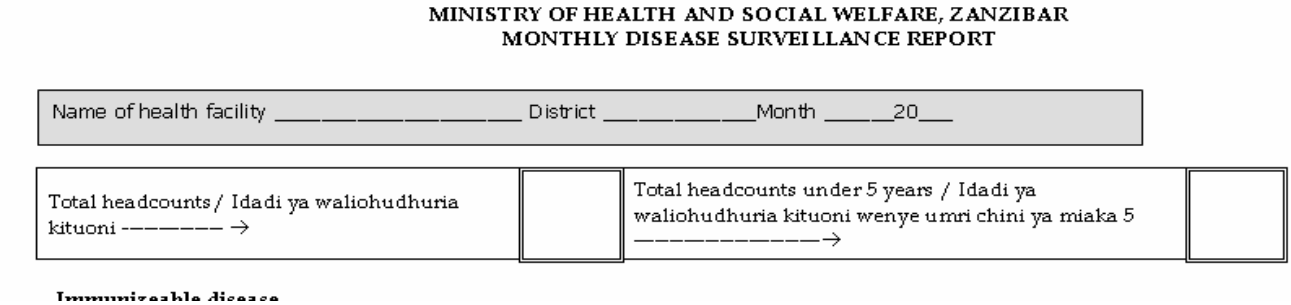
REPRODUCTIVE AND CHILD HEALTH SERVICES

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

Family planning services

Method	No. of new clients / Idadi ya wateja wapya (wa mwezi huu)		No. of continuing users / Idadi ya watumiaji wanaoendelea (wa mwezi huu)		No. of new clients / Jumla ya wateja wapya **(A + B)**	
	15-24yrs (A)	**>24yrs (B)**	**15-24yrs (C)**	**>24yrs (D)**		
Oral pills						
Injection					No. of continuing users / Jumla ya watumiaji wanaondelea **(C + D)**	
IUCD						
Norplant					No. of CBDs	
Tubal ligation						
Condoms					No. of clients served by CBDs	
Other methods						

Figure 5.20: Sample of the Poster on RCHS Report



MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
MONTHLY DISEASE SURVEILLANCE REPORT

Name of health facility _____ District _____Month _____20___

Total headcounts / Idadi ya waliohudhuria kituoni --------- →		Total headcounts under 5 years / Idadi ya waliohudhuria kituoni wenye umri chini ya miaka 5 ----------→	

Immunizeable disease

Figure 5.21: Sample of the Poster on MDSR Report

Handouts prepared were on the course to be trained, on basic concepts about HMIS and facility data quality management. The last two were prepared to elaborate important parts of the course to help health workers understand better the importance of collecting data and further processing it while ensuring quality so as to make it useful for the facility. These concepts were obtained from the HISP (Botswana and South Africa) training materials and from HMIS in-service course for facility personnel conducted at the University of Botswana. They were modified to suit the identified training needs. The handouts were given to each health worker after the training sessions (see samples in Appendices F.1, F.3 and F.4). Figures 5. 22, 5.23 and 5.24 present samples of the handouts.

Course Objectives

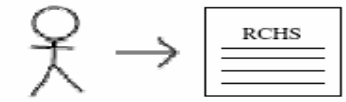
- To improve levels of awareness, understanding and technical skills in relation to data collection, processing, reporting and utilization and
- To motivate the culture of using data collected for patient and Health Facility management

At the end of the course, the Health Workers will be able to:

- Understand general concepts in HMIS
- Use the information cycle as a tool to understand health information management and to pinpoint problems and devise solutions
- Collect, process, analyze, Interpret, present analyzed data and utilize the information.

Course Details

Figure 5.22: Sample of Handout on the Course for the Health Facilities



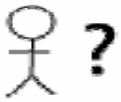
Process: The data is processed to ensure quality, consistency and accuracy.

Analyze: The data is analyzed using indicators and targets.

$$x = \frac{a}{b}$$

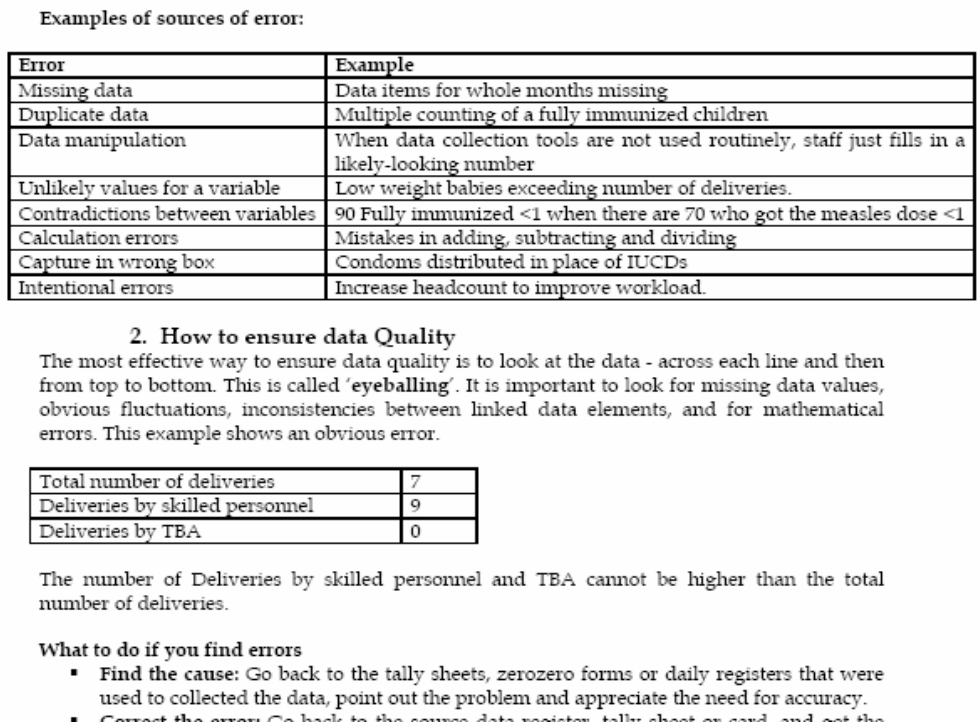
Present: The analyzed information is presented in the form of tables and graphs.

Interpret: The comparison, trends and epidemiological thinking are used to interpret the information.



Use: The information is used to improve health service delivery.

Figure 5.23: Sample of Handout on Basic Concepts about HMIS



Examples of sources of error:

Error	Example
Missing data	Data items for whole months missing
Duplicate data	Multiple counting of a fully immunized children
Data manipulation	When data collection tools are not used routinely, staff just fills in a likely-looking number
Unlikely values for a variable	Low weight babies exceeding number of deliveries.
Contradictions between variables	90 Fully immunized <1 when there are 70 who got the measles dose <1
Calculation errors	Mistakes in adding, subtracting and dividing
Capture in wrong box	Condoms distributed in place of IUCDs
Intentional errors	Increase headcount to improve workload.

2. How to ensure data Quality

The most effective way to ensure data quality is to look at the data - across each line and then from top to bottom. This is called '**eyeballing**'. It is important to look for missing data values, obvious fluctuations, inconsistencies between linked data elements, and for mathematical errors. This example shows an obvious error.

Total number of deliveries	7
Deliveries by skilled personnel	9
Deliveries by TBA	0

The number of Deliveries by skilled personnel and TBA cannot be higher than the total number of deliveries.

What to do if you find errors

- **Find the cause:** Go back to the tally sheets, zerozero forms or daily registers that were used to collected the data, point out the problem and appreciate the need for accuracy.
- **Correct the error:** Go back to the source data register, tally sheet or card, and get the

Figure 5.24: Sample of Handout on Health Facility Data Quality Management

Flip charts were prepared to be used as a white board because I observed that not all health facilities had either a white board or a black board to be used for training. Using flip chart would be easy to stick one on the wall and use it right away.

All the actions to be done were planned and documented in this phase, and everyone was aware of their roles to play in order to meet the objectives set.

5.3. Action Taking Phase

The planned actions were implemented in this phase. One day before training, the group members were reminded about the appointment to make them get ready to attend the session. On the training day, the turn up of health workers was as indicated in Table 5.7**.**

Training Attendance in the Facilities				
Health Facility	**No. of Interviewed health workers**	**No. of health workers in the planned group**	**No. of health workers who Turned up for Training**	**Comments**
PEMBA				
ZIWANI	3	3	2	Interrupted
GOMBANI	2	2	1	Bad Attendance
CHAKE CHAKE	4	4	4	No Involvement
NDAGONI	4	4	4	Good
V/COTTAGE	4	5	8	Good
SDA	2	2	1	Reasonable
TOTAL	**19**	**20**	**20**	
UNGUJA				
K/SAMAKI	4	3	3	Good
SOS	1	1	1	Reasonable
FUONI	4	5	4	Good
KMKM	3	6	6	Good
WELEZO	3	5	5	Good
MAGOGONI	4	4	0	Bad Attendance
TOTAL	**19**	**24**	**19**	
GRAND TOTAL	**38**	**44**	**39**	**Good**

Table 5.7: Training attendance at the health facilities

As shown in Table 5.7, I expected to work with 44 health workers in the health facilities but 39 of them participated with one facility not participating at all.

In Pemba, the prepared timetable went on as planned. Facility workers learned on filling in data collection tools, data quality management, timely reporting and data use in all six health facilities. However, health workers learned how to calculate indicators and prepare graphs and tables in three health facilities: Ndagoni, Gombani, SDA and V/Cottage, due to time limitations, unappealing reception and interruptions. I brought calculators to the facilities that did not have and folders to store reports for all health facilities.

During the training and discussions in Ziwani PHCU, the World Food Programme (WFP) came to see the progress in some research they were working on. Their visit interrupted the training and discussion so I had to stop and let them finish. By the time they finished, the time had passed and the health workers were tired and not ready to continue. Therefore, we had to conclude the session.

In Gombani PHCU, only one health worker showed up who was the RCH nurse but the Clinical officer did not show up. I tried to get hold of him by telephone but he did not show up as he promised. The Clinical officer is the one who was responsible to fill in the MDSR and I needed to train him but it was not possible to get him. Instead, I trained the nurse and asked her to train him, but it did not happen because he had no time for the training.

I had an unappealing reception in Chake Chake PHCU where the health workers did not involve in the discussion, they were going in and out of the room, and at last, they were all gone before the session was over. The training session was not conducted as planned.

In SOS, the participation was reasonable though there was only one participant. The facility is a small RCH clinic with only one nurse working there. Similarly, in SDA there was only one participant because the facility had two nurses who work in shifts, only one at a time was available in the clinic.

Otherwise, the discussions went on smoothly in other facilities where everyone participated in the discussion, questions were asked and everyone was happy at the end of the session. Some pictures taken during the training sessions in Pemba are indicated in Figure 5.25.

Figure 5.25: Training Session in Ndagoni PHCU - Pemba

After the training, facility workers filed the reports using the folders I brought them to make it easy to access the reports anytime they needed them. We were thankful to each other and they were very grateful to have received a chance for learning, and getting calculators and folders.

In Unguja, the timetable went on as planned except for Magogoni PHCU where they cancelled the appointment. We rescheduled the timetable but they still cancelled, about three times. All they said was that they did not have time. Eventually in October 2006, I got time to train them where I trained them whenever I visited the facility and found a health worker ready for training. In all six facilities, health workers learned on filling in data collection tools, data quality management, timely reporting, and using data for calculating indicators and preparing graphs and tables. However, in Magogoni PHCU, they were not trained on data use, due to their bad participation in training and time limitation.

The discussions went on smoothly in other facilities and everyone participated in the discussion, questions were asked and we were all happy at the end of the session. We were appreciative to each other because we learned a lot from each other. The Pictures taken during the training sessions in Unguja are presented in Figures 5.26 and 5.27.

Figure 5.26: Training Session in Fuoni PHCU

Figure 5.27: Training Session in SOS PHCU

At the end of the session, health workers were given an assignment to work on which comprised of calculating indicators and drawing graphs. We planned to evaluate the exercise the next time we met. The next appointment was arranged and agreed on the phone.

During the discussions and data collection tools review sessions, health workers helped each other in understanding more, whenever one understood something and the others did not, it was easy for her/him to explain to the others and make them understand. There was an experience of learning to make meaning of what they do routinely.

However, not all health workers were keen to learn something; others did not participate in the discussions. Most of them were the ones who were not responsible for processing the reports at the end of the month.

5.4. Evaluating Phase

In this phase, I evaluated the impact and outcomes of training which took place in the previous phases focusing on the training objectives. To evaluate training, I used the Kirkpatrick's (1996) four levels of evaluation where I evaluated training reactions, learning, behavior change and results of training.

i. Evaluating Training Reactions

In the first level of evaluation, I evaluated the health workers' reactions towards training in order to gain valuable feedback that will help me to evaluate training and get comments and suggestions for improving it. Through interviews and observations after training, I identified health workers' reactions focusing on the training presentation, methods and materials used. Some of the reactions given in the interviews were:

> "*I liked the way you conducted training, the discussions have helped me to understand faster and better*"
>
> *"What is data?"*

"Is it this simple?"

"I wish I had known earlier I wouldn't have been making these mistakes"

"I understood it differently"

"Please, go slow because I want to grasp everything you are teaching, I don't want to mess up again"

"It's just like what we are doing everyday"

In addition, health worker raised some comments on areas that needed further elaborations regarding the handouts given. Using their comments, I revised them and gave them other copies that were more elaborative.

After evaluating training reactions, I found out that most health workers were happy after training and they contributed to some of the contents on the training materials to be modified.

ii. Evaluating Learning

Evaluating learning as the second level of evaluation, I evaluated improvements in health workers' knowledge and skills in using data collection tools and collected data. To do so, I evaluated their performances in the given exercises on filling in data collection tools, calculating indicators, and drawing graphs and tables by concentrating on repeated mistakes.

The results indicated improvements in some facilities where they attempted the exercises. Health workers were able to fill in data collection tools correctly given different scenarios for collecting data. The exercises were also done with mistakes in the first time especially in drawing graphs where most health workers had problems in estimating scales. However, through my support they managed to draw good graphs and interpret them. In calculating indicators, most health workers had problems on choosing the denominators and numerators to use, but after training, they were able to formulate their own indicators and calculated them.

These improvements in the knowledge and skills in filling in data collection tools and using data for calculating indicators and drawing graphs indicated that health workers have learned.

iii. Evaluating Behavior Change

I evaluated behavior change in the third level of evaluation by comparing the way health workers were applying their knowledge and skills in their daily activities before and after training. The results have indicated changes in health workers' behaviors in relation to data collection, processing, reporting and using the collected data after training.

In relation to data collection and processing, after training health workers started to ensure data quality by making sure they report accurate and complete data by applying the skills gained on filling in data collection tools and stopped using their old practices. Health workers have shown improvements on timely reporting after understanding that the data they collect is for them and higher levels and it has to be reported timely for it to be used in making effective decisions. There were also changed on health workers' behavior of not using their data other than immunization data. After training, they started to use all the data for their own facility purposes by applying the gained knowledge and skills.

The results have also indicated a change in behavior of handling reports in the facilities. After training, health workers started to file their reports and fill in two copies, one for the district and the other for the facility.

iv. Evaluating Training Results

The forth level of evaluation is to evaluate results or outcomes of training by compared the performance change in the facilities before and after training. Revisiting the problems identified during the diagnosing phase, as presented in Table 5.3, I evaluated the changes by comparing with the results obtained after training. Table 5.8 presents the results obtained from interviews conducted after training.

Identified Problems After Training						
Health Facility	**Interviewed Health Workers**	**PROBLEM**				
		Not Received Training	**Completeness**	**Accuracy**	**Timeliness**	**Data use**
PEMBA						
ZIWANI	3	0	YES	YES	NO	YES
GOMBANI	2	1	YES	YES	YES	NO
CHAKE CHAKE	4	1	YES	YES	YES	YES
NDAGONI	4	0	NO	NO	NO	NO
V/COTTAGE	4	0	NO	NO	NO	YES
SDA	2	1	NO	NO	NO	NO
TOTAL	**19**	**3**				
UNGUJA						
K/SAMAKI	4	0	NO	NO	NO	NO
SOS	1	0	NO	YES	NO	NO
FUONI	4	0	NO	NO	NO	NO
KMKM	3	0	NO	NO	NO	NO
WELEZO	3	0	NO	YES	NO	YES
MAGOGONI	4	2	NO	NO	NO	YES
TOTAL	**19**	**2**	**YES=3**	**YES=5**	**YES=2**	**YES=5**
GRAND TOTAL	**38**	**5**	**NO=9**	**NO=7**	**NO=10**	**NO=7**

Table 5.8: Results obtained after training

Table 5.8 indicates that, the number of health workers who have not received training has changed from nine to three in Pemba and from eight to two in Unguja making the total from seventeen to five, meaning that 70% of the problem has been solved.

Completeness in filling in monthly reports was a problem for all twelve facilities but it has changed to three facilities. Accuracy in filling in monthly reports was a problem to all twelve facilities but has changed to be a problem for five facilities. Timeliness was a problem for six facilities but has changed to be a problem for two facilities. Data use was a problem for all twelve facilities it has changed to be a problem for five facilities.

Studying each problem separately, the following is a detailed explanation the results obtained on evaluating the magnitude of each problem.

Data Collection and Processing

Findings presented in Appendices C.1 and C.2 under the column '**After Training**' are summarized in Table 5.9, which shows the percentages of incompleteness and inaccuracy identified after training in each of the reports in each facility for one-quarter data, August, September and October 2006 for Pemba and July, August and September 2006 for Unguja.

Percentages of Incompleteness and Inaccuracy After Training								
Health Facility	**Percentage of Incompleteness**				**Percentage of Inaccuracy**			
	ICCM	**RCHS**	**MDSR**	**Average**	**ICCM**	**RCHS**	**MDSR**	**Average**
PEMBA								
ZIWANI	0	1	26	**9**	0	2	26	**9**
GOMBANI	0	3	30	**11**	0	4	31	**12**
CHAKE CHAKE	14	0	n/a	**7**	14	1	n/a	**7**
NDAGONI	1	3	3	**2**	9	3	3	**5**
V/COTTAGE	0	0	0	**0**	5	0	0	**2**
SDA	7	0	0	**2**	8	2	0	**3**
AVERAGE	**4**	**1**	**12**	**6**	**6**	**2**	**12**	**7**
UNGUJA								
K/SAMAKI	0	0	n/a	**0**	1	1	n/a	**1**
SOS	0	0	n/a	**0**	6	2	0	**3**
FUONI	0	2	0	**1**	8	8	n/a	**8**
KMKM	0	4	n/a	**2**	0	9	n/a	**5**
WELEZO	0	0	n/a	**0**	2	14	n/a	**8**
MAGOGONI	1	0	9	**3**	3	3	9	**6**
AVERAGE	**0**	**1**	**5**	**2**	**3**	**6**	**5**	**5**

Table 5.9: Percentages of Incompleteness and Inaccuracy after training

From Table 5.9, the completeness problem in filling in monthly reports for all the facilities was 4% (6% in Pemba and 2% in Unguja). The accuracy problem was 6% (7% in Pemba and 5% in Unguja) for all facilities. Looking back at the situation before training, as presented in Table 5.4, the completeness problem in filling in monthly reports has changed from 10% before training to 6% in Pemba and from 6% to 2% after training in Unguja. The problem has reduced from 8% before training to 4% after training, meaning that 50% of the problem has been solved. The accuracy problem in filling-in monthly reports has changed from 16% to 7% after training in Pemba and from 14% before training to 4% in Unguja. The problem has reduced from 15% to 6%, 63% of the problem has been solved. These changes indicate that health workers have learnt and

they have applied their knowledge and skills in data collection and processing which has enabled them to improve their performance.

The changes on the percentages of incompleteness and inaccuracy before and after training in each facility are presented in Figures 5.28 and 5.29.

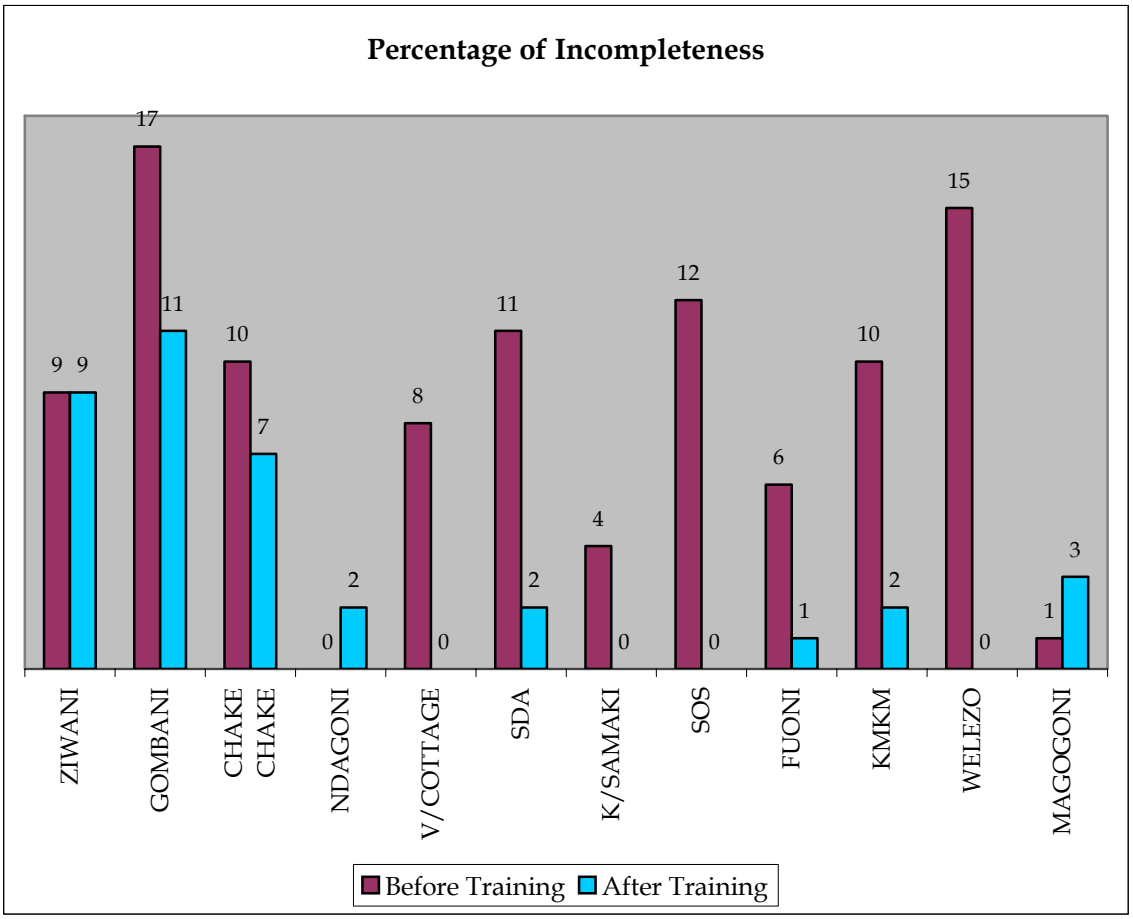


Figure 5.28: Comparison on the Percentage of Incompleteness Before and After Training

From Figure 5.28, the completeness problem has reduced in most facilities and completely eradicated in other facilities. However, there were no changes in Ziwani PHCU and there were small changes in Gombani and Chake Chake PHCUs. In Magogoni and Ndagoni PHCUs, the problem has increased. The reasons for the small changes and increase of the problem could be poor attendance in the training and interruptions during the training sessions. Looking at the

training attendance in Table 5.25, there was poor attendance in Ziwani, Gombani, Chake Chake and Magogoni PHCUs and there was good attendance in other facilities.

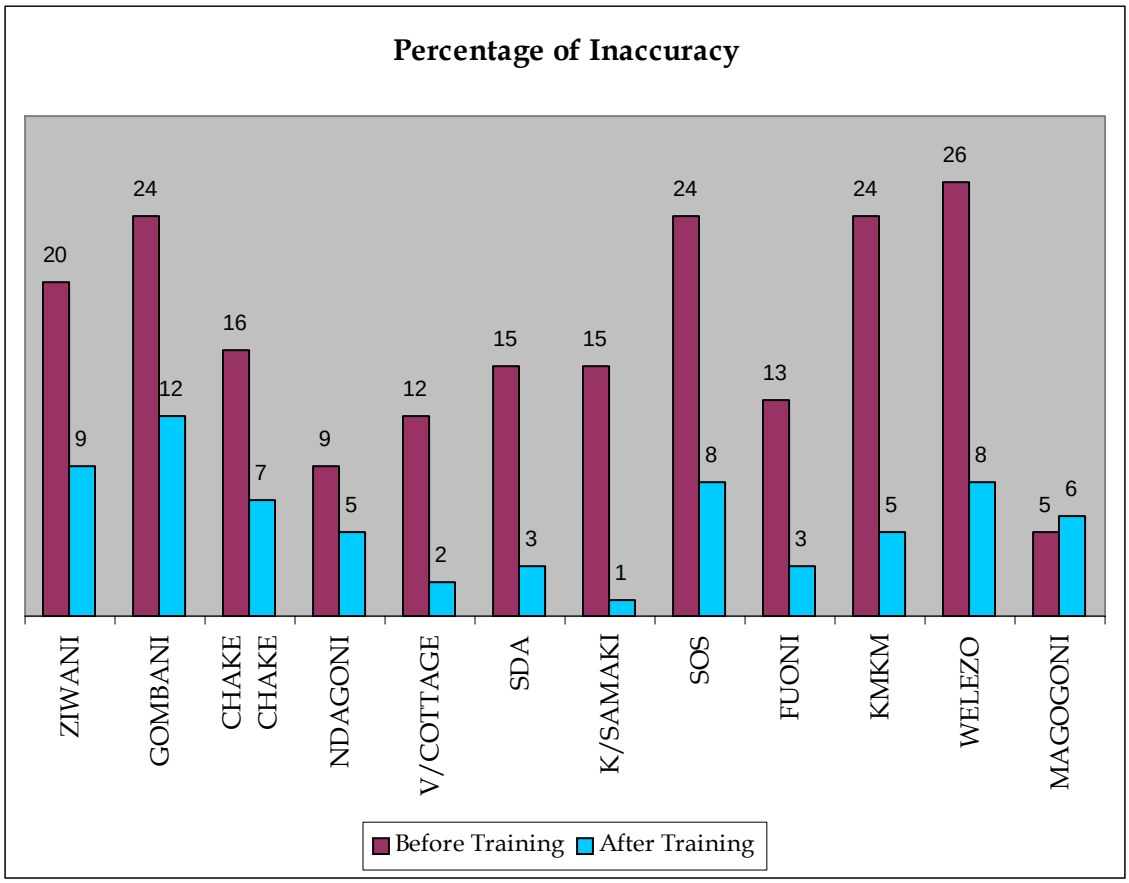


Figure 5.29: Comparison on the Percentage of Inaccuracy Before and After Training

Figure 5.29 shows that the accuracy problem has been reduced in most health facilities with exception of Magogoni PHCU. There were small changes in Ziwani, Gombani and Chake Chake PHCUs. The small changes and increase of the problem could be caused by poor participation and interruptions in training sessions. Most of the health facilities with poor participation, as shown in Table 5.7, are the ones that are still having high percentages of the problems.

In addition, health facilities that had good participation in the training as shown in Table 5.7 have been able to reduce the magnitude of completeness and accuracy problems compared to those that had poor participation. The improvements are as shown in Figure 5.30.

Figure 5.30: Comparisons of the magnitude of Completeness and Accuracy problems before and after Training between Health Facilities that had poor participation in training and those that had good participation

The graph in Figure 5.30 indicates improvements in the health facilities that participated well in the training, by attending and not being interrupted during training sessions, was higher than those that had poor participation.

Furthermore, to evaluate if the training has improves performance in the facilities, I assessed monthly reports for the facilities that I did not train for the period of six months (see results in Appendix C.3). Table 5.10 presents the situation before, from April to June 2006, and the situation later, from July to September 2006.

Percentages of Incompleteness and Inaccuracy Before and After Training								
Health Facility	**Percentage of Incompleteness**				**Percentage of Inaccuracy**			
	ICCM	**RCHS**	**MDSR**	**Average**	**ICCM**	**RCHS**	**MDSR**	**Average**
Situation Before								
SANASA	1	28	n/a	**15**	6	31	n/a	**19**
KIZIMBANI	2	2	3	**2**	17	28	4	**16**
SELEMU	2	2	40	**15**	6	24	41	**24**
BWEFUMU	5	2	27	**11**	14	16	35	**22**
KOMBENI	4	3	13	**7**	19	18	15	**17**
AVERAGE	**3**	**7**	**21**	**10**	**12**	**23**	**24**	**20**
Situation Later								
SANASA	0	16	n/a	**8**	3	40	n/a	**22**
KIZIMBANI	6	4	2	**4**	25	14	4	**14**
SELEMU	4	6	55	**22**	12	19	57	**29**
BWEFUMU	3	1	5	**3**	9	22	8	**13**
KOMBENI	5	4	18	**9**	18	11	20	**16**
AVERAGE	**4**	**6**	**20**	**9**	**13**	**21**	**22**	**19**

Table 5.10: Percentages of incompleteness and inaccuracy in facilities that did not receive training

Looking at the situation before and later, in Table 5.10, I studied the problems and compared them with the situation in the facilities that received training, before and after the training. The graph in Figure 5.31 indicates the comparisons.

Figure 5.31: Comparisons of the magnitude of Completeness and Accuracy problems between facilities that did not receive training and those that received training

The facilities that received training, as shown in Figure 5.31, have shown improvements more than the others since their percentages of incompleteness and inaccuracy have been reduced. However, in health facilities that did not receive training the problem was increasing, this could also be contributed by insufficient training they received before.

Problem of Reporting collected data

Timely reporting problem has changed from six facilities to two facilities as shown in Table 5.11. It was still a problem in Gombani and Chake Chake PHCUs probably because of the poor participation in the Training.

Untimely Reporting	
PEMBA	
No. of facilities Before Training	3
No. of facilities After Training	1
UNGUJA	
No. of facilities Before Training	3
No. of facilities After Training	1

Table 5.11: No. of health facilities with Timely reporting Problem

Problem of Using Data

In assessing some evidence of data use in the facilities, I evaluated the exercises left during the training session by looking at the reports created, indicators calculated and graphs and tables drawn. Seven facilities did the exercises and the other five (Ziwani, Chake Chake, V/Cottage, Welezo and Magogoni PHCUs) did not do. The results obtained are demonstrated in Table 5.12.

Data Using Problem	
PEMBA	
No. of facilities Before Training	6
No. of facilities After Training	3
UNGUJA	
No. of facilities Before Training	6
No. of facilities After Training	3

Table 5.12: No. of health facilities with Data using problem

For those who did the exercises I reviewed them together with health workers, some were well done and there were mistakes as well. We worked together to identify the mistakes and corrected them and redo the exercises. For the completed graphs, we interpreted them and pointed out some ways that they could be used the information to take different actions.

Health facilities that did not work on the exercises complained of work overload and others said they did not have graph papers to draw graphs. To avoid this excuse I gave every facility graph paper books to help them draw graphs, and we worked together on the exercise and I assessed their improvements on my next visit. Figures 5.32 and 5.33 indicate some of the graphs drawn in different facilities.

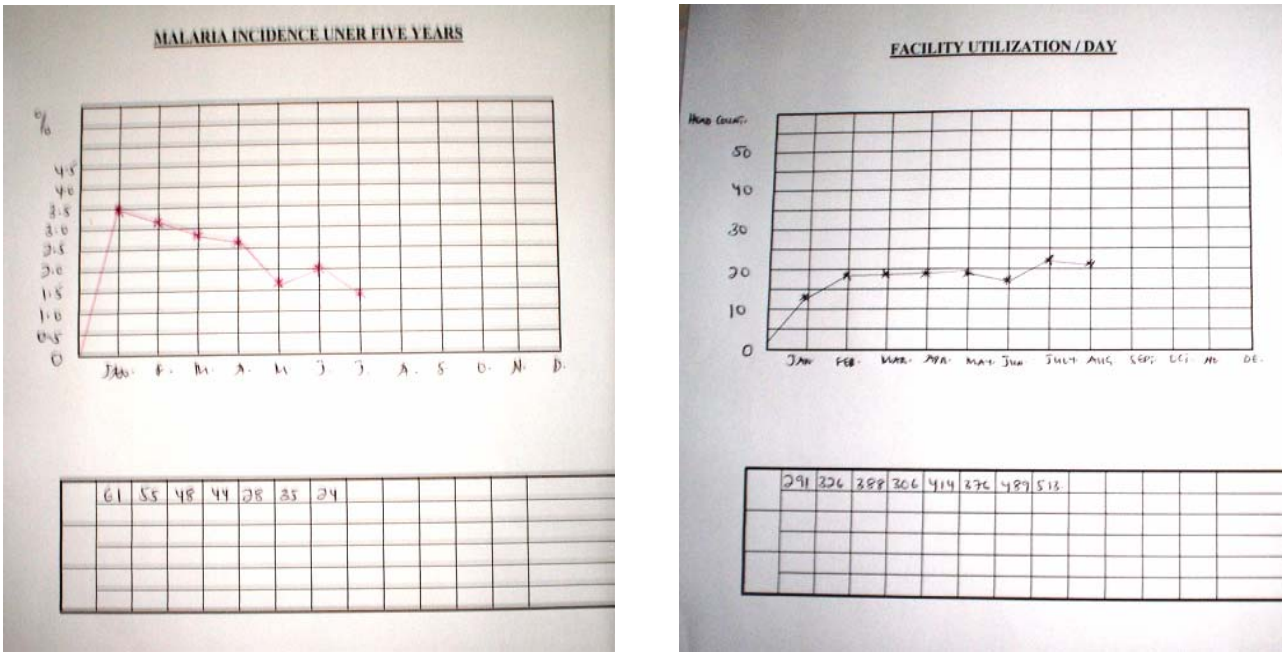
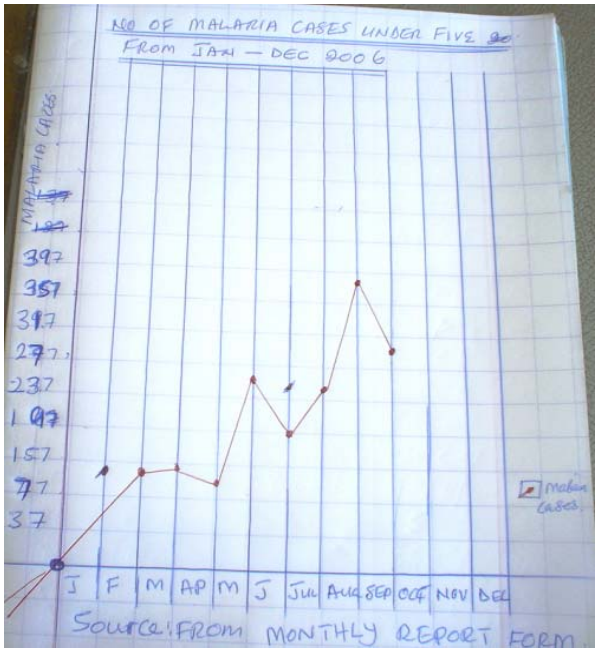


Figure 5.32: Samples of graphs drawn from SOS PHCU



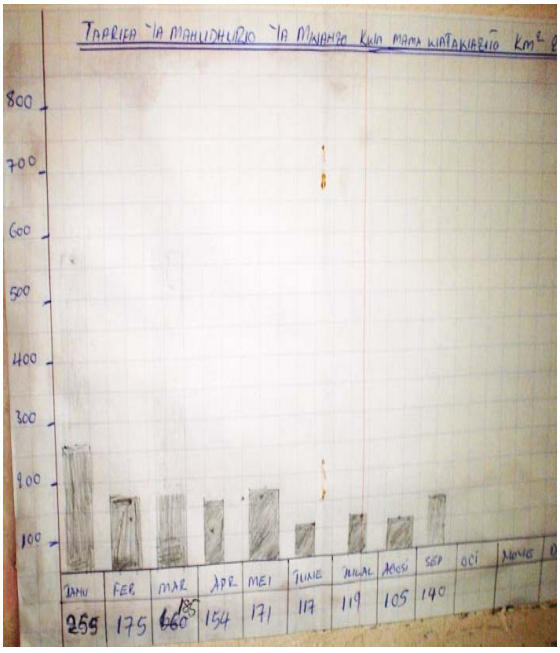


Figure 5.33: Sample graphs drawn from Fuoni and KMKM PHCUs

In general, health facilities that received training have improved in increasing the quality of collected data by reducing incomplete and inaccurate data. Timely reporting and data utilization have also been improved. I can conclude that definitely training has made a difference and improved health workers' performance.

5.5. Specifying Learning

In this phase, I reflected on the learning aspects of the research. The knowledge gained was used to improve the next phase of the cycle and make it an ongoing process, and further improve the actions. The research has also enabled me to learn on the achievements and failures in the whole process of training. This knowledge helped me in formulating training and supporting strategies that can be used in arranging training and improving the culture of using information in the health facilities for the sustainable implementation of HMIS in Zanzibar.

Interviews conducted and observations made during the diagnosis, action planning, action taking and evaluating phases, revealed the way most health workers perceived their daily routines. Most of them were not aware of why they collect data and those who were aware did not have courage to turn it into action. When I showed them reports and graphs they could make from their data and

how the reports and graphs could help them in planning and making decisions, they were keen to involve themselves in the training and learn how to do that.

Most health workers had low self-esteem and acquiring a new knowledge was not easy; they complained that, they were aged and their education levels were low. However, these were not obstacles in the learning process. Health workers that engaged themselves fully in the training with a goal of learning something to help them improve their skills in data collection, processing, reporting and utilization, were able to learn and change their perceptions about their work practices.

The results obtained in the evaluation of training have shown improvements in data collection and processing accurate and complete data timely reporting, and utilization of collected data. These were evidence that health workers have learnt the importance of data quality and have gained knowledge that improved their skills, performance and behaviors. To sustain the changes and improve them further, they needed proper supportive supervision from the District Health Management Team. The findings indicate progressive improvements on the health facilities' performance every month as I supervised and supported them.

Training in groups has also encouraged learning especially in improving teamwork. Most health workers used to work independently and as a result, not everyone else was aware of what the other one was doing. It was hard for them to work towards a common goal and achieve better results as a team. As we were discussing and working on examples together as a group, they were able to share everybody's understanding. They also learned to do the other person's work and work together in solving problems as a team.

In addition, I learnt that the whole implementation of HMIS process has brought changes in many ways and some health workers adapted quickly to new changes and sought them out while others were more reluctant and need time to understand and accept the changes before they committed to them. People have to absorb what the changes mean to them and make their own shift in attitudes and behaviors before the changes will take hold in their daily work.

The accomplishments achievements I as shown in the evaluation phase, indicate that health workers have learned and improved their behaviors and skills and they have applied them in their daily activities and improved their performance. I managed to train and support health workers in solving problems in data collection, processing, reporting and using data for calculating indicators and drawing graphs. I acknowledge the contribution of all health workers involved in taking part in this action and contributed in one way or the other in the learning process. I also regret to those who were not able to participate fully in the training sessions.

6. CHAPTER 6: Research Findings from the Districts

Empirical findings from the districts are described this chapter. I present the findings from the five phases of the training cycle in the districts. Sections 5.1 presents the findings from the diagnosing phase, section 5.2 presents the findings from the action planning phase, section 5.3 presents the findings from the action taking phase, section 5.4 presents the findings from the evaluation phase and section 5.5 presents the findings from the specifying learning phase.

6.1. Diagnosing Phase

Background information on previous training

In the implementation process, the HISP team and the HMIS management used the seminar in conducting training. They prepared one-week session in Pemba and one-week in Unguja to train the District Health Management Team on using DHIS. Unfortunately, they discovered, during the training, that most members of the District Health Management Team did not have basic computer skills. As a result, they spent four days training computer basics skills on how to move a mouse, creating folders and files and to use Ms. Word and MS. Excel applications. One day was used to train on using DHIS for data entry. The training budget was finished and the health workers were only trained on computer basic skills and data entry in DHIS.

After training, DHIS was installed in every district office and the District Health Officers were assigned to use it for entering data from facilities' reports and produce reports afterward for their own purposes and then send a copy of database to the respective zonal office and vertical programs.

During the diagnosis phase, I determined health workers' needs and expectations for training. In addition, the aspects of their education background, understanding of health data and indicators, understanding of the functioning of the health system, numerical skills, English language proficiency, computer literacy and perceptions about the system and training were determined.

6.1.1. Identify Training Needs

To identify training needs, I attended several meeting held by HMIS management in collaboration with the HISP team. I also conducted interviews to District Health Management Team at the districts and we reviewed three data collection tools (RCHS, ICCM and MDSR), district monthly and quarterly reports and their District Implementation Plan with health workers to determine what areas need to be trained. I assessed the use of DHIS in data entering and analysis. In addition, I analyses the results from interviews conducted to HMIS managements, HISP team members, vertical programs managers and DANIDA officials.

There were several meetings conducted by the HMIS management and HISP team to give feedback to the District Health Management Team concerning their progress in the first and second quarters (January to March and April to June 2006) on how much data has been collected and entered into DHIS. The health workers raised a number of problems and the major solutions suggested for solving those problems were the need for retraining and support.

The interviews were conducted at the district office and each session took one to two hours. The targeted group was the District Health Management Team (including DHO, DMO and RCH coordinator) and HMIS focal Person if she/he was not a member of the District Health Management Team.

In reviewing data collection tools we discussed and identified all the problems facing district workers in understanding them. To assess the use of DHIS, we worked together in data entering, analysis and creating reports.

Table 6.1 presents the health workers interviewed in each district and problems identified during the interviews and discussions.

Identified Problems Before Training							
Interviewed Health Workers	**Received previous training**	**PROBLEM**					
		Understand Data Collection Tools	**Computer literacy**	**Data Entry**	**Data Analysis**	**Data Import / Export**	**Data use**
CHAKE CHAKE DISTRICT – PEMBA							
District Health Officer	YES	YES	YES	YES	YES	YES	YES
District Medical Officer	NO	YES	YES	YES	YES	YES	YES
RCH Coordinator	YES	YES	YES	YES	YES	YES	YES
HMIS Focal Person	NO	YES	YES	NO	YES	YES	YES
WEST DISTRICT – UNGUJA							
DHO(HMIS Focal Person)	YES	YES	YES	YES	YES	YES	YES
District Medical Officer	YES	YES	NO	YES	YES	YES	YES
RCH Coordinator	NO	YES	YES	YES	YES	YES	YES
URBAN DISTRICT – UNGUJA							
District Medical Officer	NO	NO	NO	YES	YES	YES	YES
Office Secretary	NO	YES	YES	YES	YES	YES	YES
TOTAL INTERVIEWEES=9	**NO = 5 YES =4**	**YES=8 NO=1**	**YES=7 NO=2**	**YES=8 NO=1**	**YES=9 NO=0**	**YES=9 NO=0**	**YES=9 NO=0**

Table 6.1: Identifies Problems before Training in the Districts

Table 6.1 indicates that, nine health workers were interviewed from the three districts and five of them had not received previous training on data collection tools and DHIS. Eight out of nine interviewees had problems in understanding Data collection tools used by the facilities. Utilization of DHIS was another problem for most health workers. Seven of the interviewed health workers had either none or marginal computer skills while two had basic computer skills. Data entry to DHIS was a problem for eight health workers. All health workers had problems in data analysis, data import/export in DHIS and there was little if any data use of data for district management. This created a need for training health workers at the district level.

i. Understand Data Collection Tools

Most of the interviewed health workers at the district did not completely understand how to fill in the data collection tools. Some of them did not receive training and those who received training stated that the training was not enough. The ones who did not receive training were eager to get one because they faced problems when supervising the facilities because they failed to help them whenever they were approached for help.

ii. Computer Literacy

In Tanzania, from my experience, most of the public sector personnel are computer illiterate. Most people learn how to use computers at their work places if at all; they are lucky to have them. The public sector is now starting to use computers and most of the workers are now starting to learn to use computers. Those who can use computers took lessons either in private computer training centers, learnt by themselves or from friends and relatives. As a result, computer literacy levels among health workers ranged from none, poor to good.

There was a need to train computer basic skills in order to enable them in doing further analysis of data in DHIS.

iii. Data entry in the DHIS

The problem of entering data in DHIS was noted in all the districts and it was caused by different reasons. In the West and Urban Districts, the HMIS focal persons were the District Medical Officers and they were trained on DHIS, but they complained of mot getting time to use DHIS, as one explained that,

"I am very busy with other activities that I do not get time to enter data in DHIS"

In the Chake Chake district, the HMIS focal person who was not a member of District Health Management Team had no problem in entering data though she did not receive previous training, but whenever she was not in the office, no one handled this responsibility.

There arose a need to train other staff on data using DHIS to cater for up to date data entry in DHIS.

iv. Data Analysis

Data analysis was identified as a problem because all health workers claimed that they were not trained and they do not have enough skills on analyzing data from DHIS. One health worker asked,

"We have entered data to the computer for the last six months but how do we get out the reports?"

Another one complained that,

"During the manual system, we were able to produce our monthly and quarterly reports but now we cannot do that, we need help on this"

It was evident that there was an immediate need to train them on data analysis because health workers have to learn to use data from DHIS to make their reports. In both districts, they were manually creating monthly and quarterly reports using the data from facility reports though they have entered that data in DHIS.

v. Data Import/Export

The structure of data flow in HMIS shows that data has to flow from the districts to the zones then to the ministry, unfortunately this flow stopped after the computerization. The reason was that at the districts, they did not know how to export the database from their computers to the zones and at the zones, they did no know how to import data from districts and export to the ministry. At the zones, they complained that,

"It is a shame we do not have any data for the zone since January"

So far, the HISP team has been doing this exercise of exporting data from the districts and importing to the zones and ministry. This made health workers feel out of control of their own data. It was obvious that there was a need for training on data import and export to and from DHIS at district, zone and ministry levels.

vi. Data usage was very little if at all it existed

In the districts, there was an evidence of using data for creating monthly and quarterly reports. However, there was no evidence of taking action from the reported data for district and facility management. Different health workers indicated this as they said that

"We send reports to the zone office and vertical programs"

"When we get visitors who want to see reports such as top ten diseases or incidence rates of diseases, we show them"

"To measure our performance in immunization because Extended Program for Immunization follows up on their performance reports monthly"

It was evident that districts did not use their data in decision-making regarding district and facility management. As indicated from the interviews, observation and reviews, this was contributed by little understanding of health data, indicators, the importance of ensuring data quality, lack of teamwork and the HMIS management.

6.1.2. Identify Expectations for Training

Training was identified as one of the solution for the previously mentioned problems. All the interviewees responded that they needed training especially those who did not receive before. From the interviews, the responses given were as follows:

"If we understood clearly the data collection tools then we could support and make follow up in the facilities"

"I don't have enough skills to analyze data in DHIS, I need more skills"

"More training will help me because after entering the data in DHIS, I don't know how to get the reports out"

"We need to be trained to create districts reports monthly and quarterly because still we are doing it manually though we have entered data in DHIS"

From these responses and many others, most health workers and higher officials agreed that district workers needed to be trained in solving the problems they were facing.

Discussion groups were proposed to be used in the training sessions to make everyone contribute their views and build meaning on what they learn. We agreed that the training would not involve giving allowances and/or official certificates as they were used to. What was needed was their dedication to help each other and share experience.

6.1.3. Assess Educational Background and English Language Proficiency

Education background and English language proficiency were identified during the interview sessions, observations and the discussions on reviewing data collection tools and district reports. Table 6.2 indicates health workers' educational backgrounds.

Interviewed Health Worker	Education Background
Chake Chake District – Pemba	
District Health Officer	Form 6 + Diploma
District Medical Officer	Form 6 + Diploma
RCH Coordinator	Form 4 + Certificate
HMIS Focal Person	Form 4 + Certificate
West District – Unguja	
DHO (HMIS Focal Person)	Form 6 + Diploma
District Medical Officer	Form 6 + Diploma
RCH Coordinator	Form 4 + Certificate
Urban District - Unguja	
District Medical Officer	Form 6 + Diploma
Office Secretary	Form 4 + Certificate

OVERALL SUMMARY		
Education Level	**No. of health workers**	**%**
Form 3 + Certificate	0	0
Form 4 + Certificate	4	44
Form 6 + Diploma	5	56
TOTAL	**9**	**100**

Table 6.2: Education Backgrounds of Health Workers in each District

Table 6.2 indicates that, 56% of district workers are in the Form 6 + Diploma level and 44% are in Form 4 + Certificate level. All health workers have completes the second cycle of secondary education (Form 4). Their educational levels were higher than in the facilities.

Table 6.3 presents the findings derived from interviews and observations during the discussions concerning the relationship between English language proficiency and educational backgrounds of health workers.

Education background - English Language Proficiency	
Education Background	**English language Proficiency**
Form 4 + Certificate	Acceptable
Form 6 + Diploma	Acceptable

Table 6.3: Relationship between Education background and English Language Proficiency

Most of the health workers had an acceptable understanding of English, as most did not have problems in understanding the language used on the data collection tools and DHIS.

6.2. Action Planning Phase

The determined needs and expectations for training were analyzed and combined together to formulate training objectives. In this phase, I chose training methods, prepared training materials, formulated training groups and training timetable. I also prepared computers that were to be use during the training and booked the room to be used. All these activities were done to fulfill the training objectives.

Due to the identified needs for training in the diagnosing phase, I planned with the health workers to discuss on data collection tools and workout examples on how to use data from DHIS for creating different tables and graphs that could help them in district and facility management. Furthermore, I would improve their computer skills and the use of DHIS.

During the learning process, we planned to offer each other patience and understanding because we have different ages and educational backgrounds. Our major goal was to learn how to create meaning of what we do, and share that with each other.

6.2.1. Training Objectives

Training objectives set in this phase were to improve levels of awareness, understanding and technical skills in relation the use of DHIS for data collection, reporting, analysis and utilization and to motivate the culture of using data collected for health facility and district management.

6.2.2. Training Method

We planned to adopt informal learning and learning-by-doing methods as used in the facilities. Training was planned to be conducted as a group discussion where health workers interact with themselves, the trainer and computers. The discussions aimed at involving everyone in the learning process. Health workers that received training were to training those who did not attend the training. In learning by doing, we planned to do hands-on exercises in working with DHIS and further producing different graphs using MS. Excel.

6.2.3. Training Places

Training was planned to be conducted at the district office. In Pemba, I booked the conference room. In Unguja, I prepared with the health workers the computer room at the district health office. Training sessions were planned to take place on weekdays in the morning.

6.2.4. Training groups and Timetable

Training groups were formulated and we agreed that all the District Health Management Team would participate, especially the District Health Officers, RCH coordinators and HMIS focal persons. The training timetable to be used is shown in Appendix G.2. The sessions were planned to take two weeks for two hours daily.

6.2.5. Training Materials

Prepared training materials to be used were handouts, posters and flip charts. Posters for each report (ICCM, MDSR and RCHS) were prepared to elaborate areas that were not clearly understood (see samples in Appendix E). These are same as the ones used in the facilities. Flip chars were prepared to be used during training as white boards.

Handouts on computer course, Basic Concepts about HMIS and District Data Quality Management were prepared (see samples in Appendices F.2, F.3, F.5 and F.6). The concepts used in the handouts were obtained from different HISP (South Africa and Botswana) training manuals and University of Botswana HMIS courses, which I revised to suit the needs of health workers. We planned to use district data for examples and elaboration. Handout prepared on basic computer concepts was a guideline to help health workers to learn on how to use a computer and applications

such as Microsoft word, excel and internet, which would help them to use DHIS effectively. Handouts on Basic Concepts about HMIS and District Data Quality Management were prepared to elaborate further important concepts on the course. Samples of the handouts are presented in Figures 6.1, 6.2, 6.3 and 6.4.

Course Objectives

- To improve levels of awareness, understanding and technical skills in relation the use of DHIS for data collection, reporting, analysis and utilization and
- To motivate the culture of using data collected for health facility and district management

At the end of the course, the Health Workers will be able to:

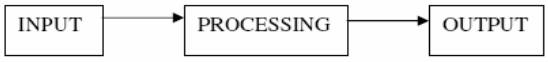
- Use DHIS
- Understand general concepts in HMIS
- Use the information cycle as a tool to understand health information management and to pinpoint problems and devise solutions
- Collect, aggregate, process, analyze, Interpret, present analyzed data and utilize the information.

Course Details

Figure 6.1: Sample of Handout on the Course for the Districts

1. INTRODUCTION TO COMPUTER

What is a computer?
It is a tool that will enable you to manipulate information rapidly, faster and accurately and it has a capability of storing data and retrieving them for use when needed.
It operates in three stages



The computer is comprised of two basic features, which make it operate. These are hardware and software.

Hardware includes physical features of a computer, such as screen, keyboard, mouse etc.

Software includes programs that carry out the instructions.

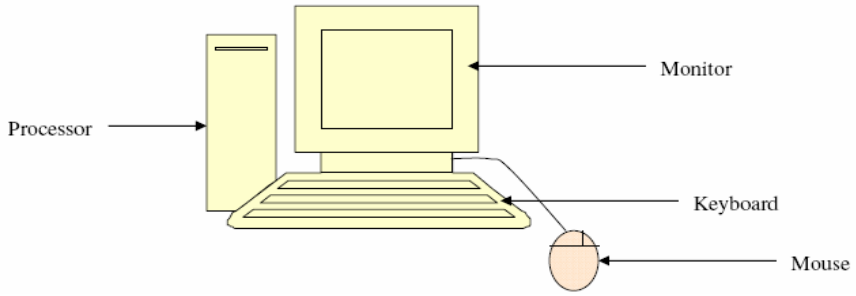
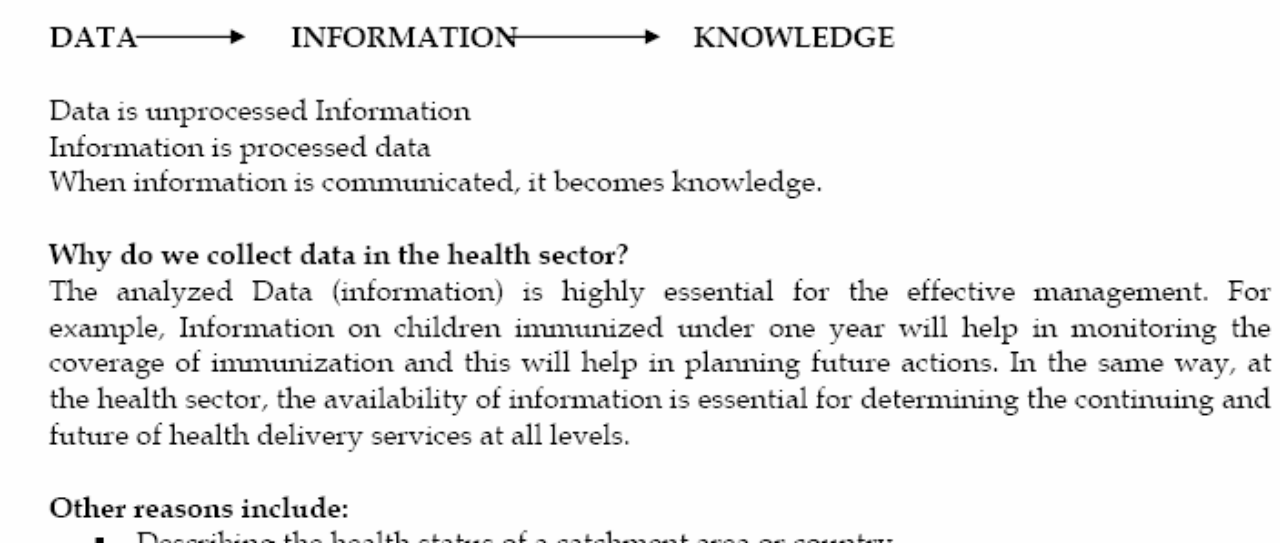


Figure 6.2: Sample of Handout on Basic Computer Concepts



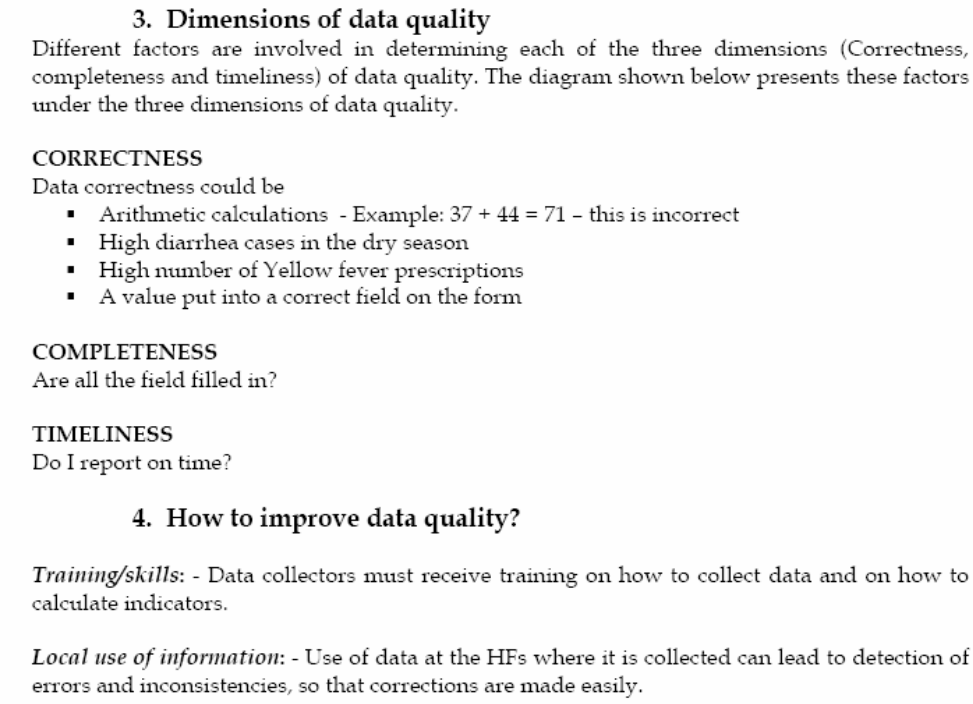
DATA ⟶ INFORMATION ⟶ KNOWLEDGE

Data is unprocessed Information
Information is processed data
When information is communicated, it becomes knowledge.

Why do we collect data in the health sector?
The analyzed Data (information) is highly essential for the effective management. For example, Information on children immunized under one year will help in monitoring the coverage of immunization and this will help in planning future actions. In the same way, at the health sector, the availability of information is essential for determining the continuing and future of health delivery services at all levels.

Other reasons include:
- Describing the health status of a catchment area or country

Figure 6.3: Sample of Handout on Basic Concepts about HMIS



3. Dimensions of data quality

Different factors are involved in determining each of the three dimensions (Correctness, completeness and timeliness) of data quality. The diagram shown below presents these factors under the three dimensions of data quality.

CORRECTNESS
Data correctness could be
- Arithmetic calculations - Example: 37 + 44 = 71 – this is incorrect
- High diarrhea cases in the dry season
- High number of Yellow fever prescriptions
- A value put into a correct field on the form

COMPLETENESS
Are all the field filled in?

TIMELINESS
Do I report on time?

4. How to improve data quality?

Training/skills: - Data collectors must receive training on how to collect data and on how to calculate indicators.

Local use of information: - Use of data at the HFs where it is collected can lead to detection of errors and inconsistencies, so that corrections are made easily.

Figure 6.4: Sample of Handout on District Data Quality Management

All the actions to be done were planned and documented in this phase, and everyone was aware of their roles to play in order to meet the objectives set.

6.3. Action Taking Phase

The planned actions were implemented in this phase whereby all the participants were informed one day before training. I called the group members to remind them to get ready for attending the training session. On the training day, the turn up of health workers was as shown in Table 6.4.

Training Attendance in the Districts			
District	**Interviewed health workers**	**No. of health workers in the planned group**	**No. of health workers who Turned up for Training**
PEMBA			
Chake Chake	4	5	1. HMIS Focal Person
UNGUJA			
West	3	4	1. District Medical Officer
Urban	2	2	1. District Medical Officer 2. Office Secretary
TOTAL		**11**	**4**

Table 6.4: Training attendance at the District

Table 6.4 indicates that, only 4 out of 11 expected health workers participated in the training. Training was targeted to at least two District Health Management Team members (District Health Officer and Reproductive Child Health coordinator) because they were data people in the district. Those who turned up were not the ones whom needed training especially in using data. The HMIS Focal Person was a data person but she was not involved on using the data for creating reports in the district.

In Pemba, the prepared timetable went on as planned but only one person, Chake Chake HMIS focal person who was not a member of the District Health Management Team, showed up for training. The District Health Management Team members were out of the office attending different seminars. Because only one person was ready for training and I prepared four computers and booked the conference room, I invited anyone who was interested from the district office and Chake Chake hospital to attend the sessions. As a result, I formed a group of eight health workers and continued with the training. Table 6.5 presents the previous computer skills those participants.

Previous Computer Skills of Participants	
Participants	**Computer Skills**
P1	I can work with computer but I don't have basics
P2	I can work with computer but I don't have basics
P3	I can work with computer but I don't have basics
P4	I don't know anything
P5	I don't know anything
P6	I can open but I have never used any applications
P7	I can open but I have never used any applications
P8	I can open but I have never used any applications

Table 6.5: Participants' Previous computer skills

The daily attendance was good but it was difficult to make everyone attend all the sessions. In the second week, as we arranged, we were going to learn HMIS and DHIS and only the HMIS focal person was interested in the topic. As a result, there was only one attendant in the training.

The discussions went on smoothly and everyone participated in the discussion, questions were asked and exercises were done. By the end of the second week, they have learnt many things and for those who worked with a computer for their first time, they were very happy to have gained the experience. Picture taken during the computer training session is presented in Figure 6.5.

Figure 6.5: Computer training session - Pemba

In Unguja, the timetable was cancelled and rearranged for about four times. The District Health Management Team members were always canceling the appointments whenever I called them to remind them and at last, they stopped answering their phones.

Eventually, I was able to start training the District Medical Officer in West district. The participant had basic computer skills so I started training DHIS. She learned entering data and creating reports on the first day and we arranged to continue the next day. Unfortunately, the appointment was canceled until a month latter. When we met for the session, she had never opened the computer since we left the other time. We had to start from the beginning again. We arranged to continue with further analysis in DHIS after two days but it was not possible, we could not meet again.

It became difficult for me to train all that I planned. As a result, I looked for another district where I could get District Health Management Team members to train. I got two health workers (District Medical Officer and District Health Management Team office secretary) from the Urban district. The secretary was computer illiterate and the District Medical Officer had basic computer skills but did not know how to use DHIS. We planned to have a two weeks session, as described in the action-planning phase, where by the participant with no computer skills attended both weeks and the other one attended the second week.

The participation was good in the first week, discussions were alive and questions were asked. During the second week, the secretary did not show up but the District Medical Officer did, so we went on with the discussion. He learned on data entry, analysis, report generation, data importing and exporting on DHIS and using the data to create official reports as needed.

At the end of the sessions, I prepared exercises to be done and evaluated the next time we met.

In Pemba, the HMIS focal person was eager to learn in order to improve her work performance. She was participating fully in the training by not missing any of the sessions, ask questions, involve in the discussions and work on the exercises given.

In Unguja, one of the District Medical Officers was not ready to learn, she agreed just because she was ordered by the HMIS coordinator to work with us. However, the District Medical Officer of another district was a very motivated participant and he was ready to learn and improve his work by involving in the training sessions.

6.4. Evaluating Phase

The impact and outcomes of training were evaluated in this phase to see if training has accomplished the objectives set. Kirkpatrick's (1996) four levels of evaluation were uses to evaluate training where I evaluated training reactions, learning, behavior change and results of training.

i. Evaluating Training Reactions

To evaluate training reaction as the first level, I aimed at getting feedback form health workers' reactions towards training in relation to training presentation, methods and materials used. The results indicated that most health workers were happy at the end of the training sessions and they contributed to some of the contents on the training materials to be modified.

ii. Evaluating Learning

Learning was evaluated in the second level of evaluation by assessing health workers' skills and knowledge on doing the exercises I gave them. This evaluation was done in two districts (Chake Chake and Urban). There were a number of mistakes identified and I supported on solving them.

The results have indicated improvements in the two districts although I did not get comments on improving the training material and presentation approach used. Health workers were able to enter data in DHIS, analyze it, import/export, generate reports and draw different graphs on Ms. Excel.

The results of learning evaluation has shown improvements in health workers' skills and knowledge after training and these indicated that health workers have learned to use DHIS and data generated from the reports.

iii. Evaluating Behavior Change

In the third level of evaluation, behavior change was evaluated by comparing the way health workers were applying their knowledge and skills in their daily activities before and after training. After training, the results have indicated changes in health workers' behaviors in relation to the use of DHIS and data generated from DHIS.

Before training, most district workers did not see a difference after the computerization of some of their functions because they continued to do those functions manually. After training health workers started to enter data in DHIS, import/export it, analyzed it and use it to create different graphs and tables and use them in their monthly and quarterly reports. In addition, they started to ensure data quality by making sure that the reports from the facilities were accurate and complete. As observed in Chake Chake district, the HMIS focal person started to question the facilities that reported inaccurate and incomplete data and asked them to correct the mistakes. This shows that there were changes in behavior, most health workers stated to apply the skills and knowledge gained from training.

iv. Evaluating Training Results

To evaluate training reaction as the third level, I assessed the use of DHIS on data entry, analysis, import/export, and reports creation for August, September and October 2006. I also evaluated the use of data generated from DHIS. The results obtained after training were compared with those before training. Table 6.6 presents the problems identified after training from interviews conducted, report reviews and observations made.

Identified Problems After Training							
Trained Health Worker	**PROBLEM**						
	Received Training	**Understand Data Collection Tools**	**Computer Literacy**	**Data Entry**	**Data Analysis**	**Data Import/Export**	**Data use**
CHAKE CHAKE DISTRICT – PEMBA							
HMIS Focal Person	YES	NO	NO	NO	NO	NO	YES
WEST DISTRICT – UNGUJA							
District Medical Officer	YES	NO	NO	YES	YES	YES	YES
URBAN DISTRICT – UNGUJA							
District Medical Officer	YES	NO	NO	NO	NO	NO	NO
Total Interviewees=3	**NO = 3 YES = 0**	**NO = 3 YES = 0**	**NO = 3 YES = 0**	**NO = 2 YES= 1**	**NO = 2 YES = 1**	**NO = 2 YES = 1**	**NO = 1 YES =2**

Table 6.6: Identifies problems after training

Comparing the results in Table 6.6 with those in Table 6.1, some of the problems have been resolved and others have not for different reasons. Before training Chake Chake and Urban district personnel had not received previous training on data collection tools and using DHIS, after training, the problem has been eliminated in both districts. The evaluations of the results of each problem are elaborated in the following sections.

i. Understand Data Collection Tools

Before training, the problem of understanding data collection tools was facing Chake Chake and West districts but after training it was eliminated in all districts as indicated in Table 6.6.

ii. Computer Literacy

Computer literacy was a problem in Chake Chake district before training but it was not a problem in all the districts after training as indicated in Table 6.6.

iii. Data entry in the DHIS

Data entry to DHIS was a problem in West and Urban district before training but after training, it was a problem in West district only, as shown in Table 6.6. In Chake Chake and Urban district, they entered data on time and cleared all the backlog of data that was not entered in DHIS in the past months. The West District Medical Officer still complained to be too busy to enter data in DHIS.

iv. Data Analysis

Data analysis was a problem in all the districts before training because they were not trained before. After training, as indicated in Table 6.6, the problem was solved in two districts, Chake Chake and West. This problem still existed in West district because I did not finish the training session. In Urban and Chake Chake districts, they started to analyze the generated reports from DHIS and they were able to identified data discrepancies and corrected them.

v. Data Import/Export

Before training data import/export was a problem in all the districts as they explained that, they were not trained. The results presented in Table 6.6 indicate that the problem was solved in two districts, Chake Chake and West after training. The West district had the problem because I did not train them on data analysis. In Chake Chake and Urban districts, they started to send the database to the zones, but still at the zones, they needed to be trained on using the databases.

vi. Data usage was very little if at all it existed

Data use was a problem in all the districts before training but after training, the problem was reduced in Urban district, as indicated in Table 6.6. In the West district, the problem was not solved because I did not train them. In Chake Chake district, it was still a problem because the HMIS focal person who attended the training was not the one who was preparing monthly, quarterly and yearly reports for the district. The ones who were the core users of the data, the District Health Officer and RCH coordinator, did not attend the training.

The problem of data use has not been solved but it has been reduced in Urban district. Urban district was the best-case scenario whereby the trained person has entered all the data in DHIS, generated reports from DHIS, and used the data for creating district reports. By October 10, 2006, all the data up to September has been entered in DHIS, the district monthly reports were all prepared and he was working on the quarterly report. However, the problem of using data for district management and planning was not resolved due to administration constraints. Figures 6.6, 6.7, 6.8 and 6.9 present some of the graphs and table used in the quarter reports, with the data obtained from DHIS

TOP TEN DISEASES – URBAN DISTRICT JULY - SEPT 2006

Top Ten Disease		
Disease	**Number**	%
Malaria	11033	42.2
ARI	4458	17.0
Pneumonia	4406	16.8
Diarrhoea	3129	12.0
Trauma / Injuries	543	2.1
Eye diseases	598	2.3
Anaemia	534	2.0
Scabies	577	2.2
UTI	751	2.9
Dental carries	138	0.5
TOTAL	26,167	100.00

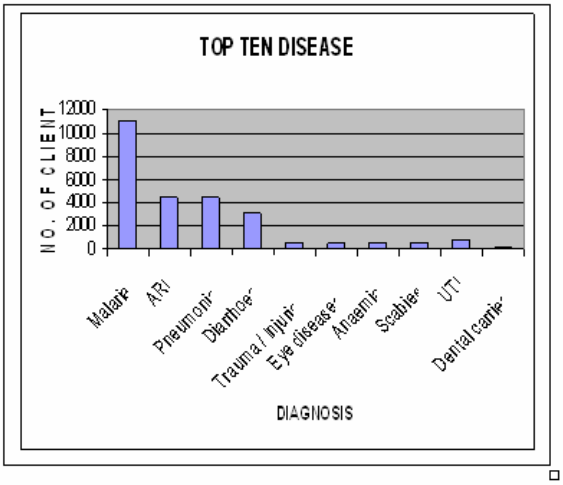


Figure 6.6: Sample of Top-ten Diseases Graph and table from Urban district Quarter Report

	JULY	AUG	SEPT	TOTAL
Vitamin A for child at 15 months	219	219	186	367
Vitamin A for child at 21 months	140	115	112	367
Vitamin A for child during measles vaccination	860	800	632	2,292
Vitamin A for Postnatal Mothers	398	346	333	1077

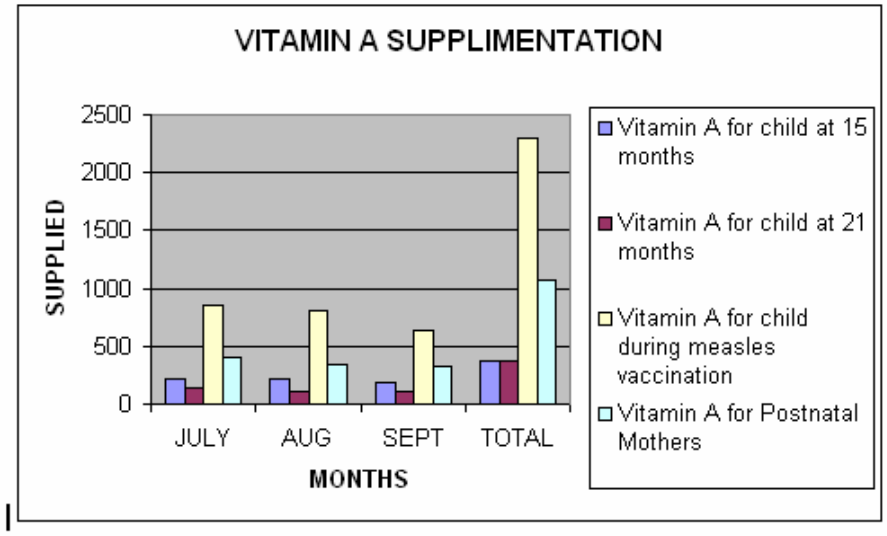


Figure 6.7: Sample of Vitamin A Supplement graph and table from Urban district Quarter Report

Postnatal attendances

	JULY	AUG	SEPT	Total
Mothers attending postnatal care at 7th day	337	248	161	746
Mothers attending postnatal care at 14th day	63	34	26	123
Mothers attending postnatal care at 28th day	67	70	59	196
Mothers attending postnatal care at 42nd day	18	38	25	81

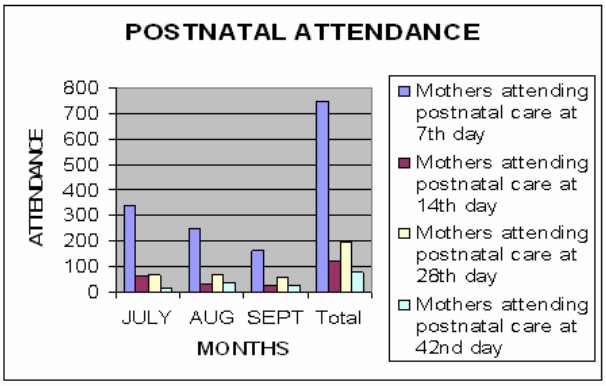


Figure 6.8: Sample of Post-natal attendance graph and table from Urban district Quarter Report

IMMUNIZATION INDICATORS

TARGET POPULATION IN QUATER	2460	
TARGET THIS QUARTER	VACCINATED	%
Measles coverage under one year	2308	94
BCG Coverage under one year	4446	181
Polio 3 coverage under one year	2096	85.2
DPT-Hep B 3 under one year	2085	85
Tetanus Toxoid 2+ dose to pregnant woman	1600	65
TARGET THIS QUARTER FOR WRA	9637	
Tetanus Toxoid 2+ dose WRA	2337	24.2

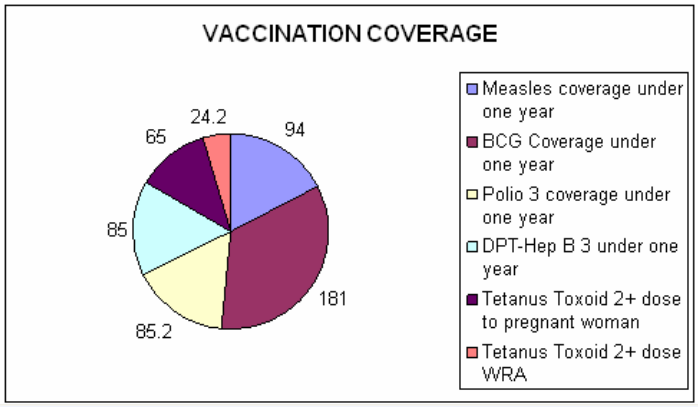


Figure 6.9: Sample of immunization coverage graph and table from Urban district Quarter Report

This shows the potential in utilizing DHIS; it was a good step though there were problems on the choice of the graph to use and accuracy of data. In addition, the data does not give a picture comparing to the previous quarters. To correct such mistakes, we worked together preparing comparison tables and graphs showing the situations in different quarters.

However, the district only prepares these reports but they did not utilize the data for action, as the District Medical Officer explained:

> *"We do not have the culture of analyzing the data we collect and use it for decision-making; all we do is to send it to the zonal office. But for me I think these data are very useful to us especially in decision-making but I cannot take any actions without the concern of the other team members and higher levels and because we lack teamwork, this will never happen"*

6.5. Specifying Learning

The specifying learning phase has given me an opportunity to reflect on the learning aspects of the research. Through this reflection, I gained knowledge that was used to improve the next phase of the cycle and make it an ongoing process, and further improve the actions. The research has also enabled me to learn on the achievements and failures in the whole process of training. This knowledge helped me in formulating training and supporting strategies that can be used in arranging training and improving the culture of using information in the districts for the sustainable implementation of HMIS in Zanzibar.

In the training and learning processes where I aimed at improving health workers' skills, performance and behavior in using DHIS, data analysis, interpretation and utilization, I learned that there was a gap between knowledge and skills and people's behaviors and attitudes. Most health workers knew what was right but they did not practice or apply that and some of them were not ready to contribute to make a difference in their work. This was a result of many things; some of them being poorly motivated and work overloads.

However, the implementation of HMIS has brought about a number of changes and some health workers have been able to adapt quickly to new changes and seek them out while others are more reluctant and need time to understand and accept the changes before they get committed.

We also learnt that, health workers who had basic computer skills had an added advantage in using DHIS. Instead of using too much time on learning how to read the cells on Ms. Excel sheet, for example, they spent much time on learning how to analyze data and manipulate it in different ways to obtain desired results. Due to time limitations, it was not easy for a health worker who was computer illiterate to learn how to hold a mouse and to use computer applications and at the end of the session create pivot tables, analyze the data and manipulate it to get desired graphs and tables. There was a need to spend more time in the districts whose District Health Management Team members had little computer skills so as to support and supervise them in improving their skills on using DHIS.

The obtained results after training have indicated improvements in using DHIS for data entry, analysis import/export and use. This shows that health workers have learnt and improved their behaviors and applied the gained skills and knowledge in their daily activities, which improved their performance.

7. CHAPTER 7: Analysis and Discussion

This chapter brings forward the analysis and discussion of the research. Section 7.1 presents the analysis, analyzing the situation before the intervention and the intervention. Section 7.2 presents the discussion of the major findings while answering the research questions.

7.1. Analysis

The analysis presents the details of the findings while illuminating the literature. This section looks at the situation in the HMIS Zanzibar before the intervention of this research and the intervention,

7.1.1. Situation before Research Intervention

This study was conducted after health workers were trained on using new data collection tools and District Health Information Software (DHIS) by the Health Information System Programme (HISP) team in collaboration with the Health Management Information System (HMIS) management and other health care stakeholders. This section describes the situation in the facilities and districts before the intervention of this research and after health workers were introduced to the use of new data collection tools, procedures and the DHIS. I focus on the changes that were required to be done in relation to new HMIS and difficulties that arose in the adoption of those changes.

Changes Required in relation to new HMIS

In this section, I explain the changes that were required to be done by health workers, HMIS management and other health stakeholders in using new data collection tools, DHIS and improving the culture of using information for the adoption of new HMIS.

During the reformation of HMIS, health workers at all levels were expecting that the changes would improve their working conditions. At the districts, they expected the use of DHIS would make them up to date technologically as they will start using computers. These expectations have also occurred in different organizations, as Boudreau & Robey (2005) give details on the situation

in the government agency after the introduction of an Enterprise Resource Planning (EPR) package. In the facilities, they did not have much to say about their expectations, as they had to work on whatever the management wanted.

When health workers started to use the new data collection tools and DHIS, they encountered a change shock, as most of what they expected turned out differently. At the facilities, they received new forms very late (weeks after the end of the month) and upon filling them in, they encountered a number of difficulties. At the districts, they received reports from the facilities and just filed them and wondered if they would get time and if they have enough skills to enter the data into DHIS. At the zones, vertical programs and ministry levels, they stopped receiving reports from the districts.

Some health workers were discouraged with the new system and continued using the old system. Others were struggling to adopt new changes by working in both systems and others were able to use the new system by reinventing their own practices to get the needed results. In general, most health workers kept using their old practices in data collection, analysis and reporting, as a result, the data collected was incomplete, inaccurate, untimely reported, and not used for action. DHIS was either not used or used for data entry only. Boudreau & Robey (2005) named this situation as inertia enactment where users choose to retain their existing practices after failing to apply new practices in their work.

i. Using new Data collection tools in the Facilities

In Zanzibar, previously before the reformation of HMIS, the only data collected that was supervised was Immunization. There was no follow up on other reports if they were submitted or not. Thus, health workers had in their minds that the only important data was immunization and they have to finish this report and submit it to the districts on time and it must be accurate. There was a need for changing such practice although Lippeveld (2001) argues that, changing people's beliefs, attitudes and practices will take time.

During the implementation of HMIS, health workers were introduced to new report forms, tally sheets and registers to use for data collection and reporting. There were new data elements and

new procedures for collecting data. The new tools and procedures started to be used after the HISP training. For the facilities, the introduction of new forms was an addition of workload since the vertical programs continued to supply their individual respective data collection tools. In the RHINO discussion, they also discussed that, health workers feel that their roles are clinical only and the responsibility in information and its use was an additional workload (RHINO, 2001).

After the HISP training, most facilities did not stop the use of old data collection tools. They filled in both new and old tools. Some stopped using the old tools but the vertical programs' personnel kept on demanding their old reports, so they had to fill in both reports. Most facilities continued to operate on both systems for more than seven months. Others stopped using the new system because they found that they did not understand what to fill in and the old reports were still required for the higher levels and vertical programs. The HMIS management was needed to set clear guidelines on which tools to stop being used and find a way to solve their conflicting interests with the vertical programs.

The RHINO discussion (2001) suggest that managers have to support facility workers, however in the case of Zanzibar, some health workers sought help, on using new data collection tools from the District Health Management Team, but they could not help them because they were not sure. This was evident that, the data people in the District Health Management Team, needed to have an understanding on data collection tools and then provide support to facilities.

The HMIS reformation process has also brought changes in the layout of data collection tools and practices in collection and aggregation of data; this has also brought changes in the way they operate. Sauerborn & Lippeveld (2000) explain that changing the way information is gathered, processed and used implies changing the way an organization operates. Despite of these changes, health workers did not change their practices and this has lead to confusions between old and new practices.

Most of the new data elements on the forms were left blank by most facilities and if they were filled in, the data was most of the time incorrect. They explained that they did not understand what

to fill in and if they filled in, they used their own imaginations either from their old practices or by guessing.

As a result, most of the data collected was not used at the facilities, with exception of immunization data. The reports were sent to the districts right away and other facilities did not bother having their copies at the facility. As Chambers (1994) explains that, in most health sectors much of the data collected remains unprocessed, unanalyzed, unread, unused and not acted upon. Such practices may result into a culture of poor utilization of data collected and this violates the meaning of collecting health data as Kleinau (2000) explains that data use is an essential function of health information systems. To improve the culture of using information, there was a need of building individual capacity for understanding and using data.

ii. Using DHIS in the Districts

Previously, before the reformation of HMIS, statisticians at the districts were involved with data aggregation from all the facilities and creating quarterly reports on disease surveillance to send to the zones. During the reformation of the HMIS, the statisticians' roles of aggregating data and preparing reports were assigned to the District Health Officers. However, the District Health Officers were not well informed by the HMIS management on the new assigned roles and the statisticians felt in a way that they were left out of the system.

During the training on using new data collection tools and DHIS, the statisticians were not included. After training, the District Health Officers were supposed to enter data in DHIS and overtake the responsibilities of the statisticians of data aggregation and writing reports to send to the zones. However, the District Health Officers did not understand what was expected of them from the statisticians' roles because previously they were responsible on vertical programs' data aggregation and reporting. The social cognitive theory explains that, people change if they perceive better outcomes of their actions (Bandura, 1999). Because the district workers did not understand the outcomes of using DHIS, it ended up not being used with exception of a few districts. They felt that it was not their responsibility to deal with DHIS, as they were responsible with other official works.

Olow & Ladipo (2002) argue that, training in most developing countries has added little or no improvement because of the way it is perceived. From my empirical findings, in Zanzibar, training was perceived as an opportunity of getting financial allowances. There have been several trainings on different projects at the districts and it was customary that everything is over after training and no one worked on what they have been trained. District Health Management Team members were the main attendants of these training but most of them have shown little or no improvements. After the training on using DHIS, the District Health Officers did not know it was a serious business and the ministry expected a lot of hard work and support from them, as HMIS coordinator explained.

Lippeveld (2001) argues that introducing the use of computers in health information systems is not necessarily a silver bullet that will create effectiveness and efficiency in health services. Health workers need to be trained and supported to acquire appropriate skills in adopting the use of new technologies. As the training resulted into poor or no skills in using DHIS in Zanzibar, there arose problems in data entry, analysis and import/export. Other districts did not use DHIS at all; those that used it only knew how to enter data, and no further analysis was done. For example, in one district in this study, they did not enter data in DHIS for more than three months and the person responsible complained to be busy with other responsibilities in such a way that he could not enter data in the DHIS. This shows that the District Health Officers were not ready to take that responsibility because they were not doing that before, however for all this period they have been reporting to the vertical programs every month by aggregating the data manually. This shows that training did not help them in changing their practices. In other districts where they had taken a step of entering data for all the months, they found the system as a 'black hole' since they could not get reports out of it.

Creative use of computer technology in health information systems has been described by Wilson & Smith (1991) to be a promising means of improving the quality, timeliness, clarity, presentation, and use of relevant information for Primary Health Care (PHC) management. However, this was not the case in Zanzibar, the data flow stopped at the district level and no data reached the zones and ministry levels, after the take off of the new system. The zonal officers were frustrated and felt out of control when the new changes could not produce immediate results.

As a result, the vertical programs abandoned the new system the first month they received untimely data. They decided to use their old system of collecting their data. They distributed their forms and continued to collect their reports. At the districts, they knew they were supposed to send data upwards but they did not know which data and how to get it from DHIS. Eventually the data flow was stuck at the district level and neither the old system nor the new was operating effectively.

The confusions faced by HMIS management, District Health Management Team, Zonal Health Management Team and vertical programs could be the result of HMIS management not establishing a clearly defined and communicated vision in establishing changes. Lorenzi suggests that, for the users to embrace changes, the management has to set a clear vision of the change that is well understood by all the involved parties (Lorenzi, 1995). This was not the case in Zanzibar. As a result, the District Health Management Team, Zonal Health Management Team and vertical programs were not sure of what was expected of them in the whole change process.

The HISP training emphasizes on starting initiatives for using data for action (Braa & Hedberg, 2002), however in Zanzibar, the training conducted by HISP team and HMIS management emphasized that health workers should use their data but they did not start any initiatives on making sure that health workers start to use their data.

The reformation of HMIS came with not only new data collection tools and DHIS but also with a package of new practices in data collection, analysis and reporting. Unfortunately, most health workers were not exercising the new practices, as they explained that they have faced a number of difficulties in adopting the changes. Others chose to stick to old practices and others sought the changes and adopted the new system by devising workarounds that helped them to make things done in their daily activities.

iii. Improving the Culture of Using Information

In most routine health information systems in developing countries as Bayrne & Sahay (2003) argue, the culture of using information "reflects the practice of collecting and sending it upwards to satisfy the needs of the bureaucracy, rather than to support action at the local level where the

information is needed most"(p. 238). This research has observed this practice in Zanzibar, which makes health workers feel they do not own their data and as a result, they were not ensuring its quality and they did not take any action on using it.

To improve this culture Lippeveld (2001) suggests building health workers capacity on understanding and responding accordingly on using data. To equip health workers with the capacity for understanding health data, the RHINO discussions (2001) suggested helping health workers to understand the reasons for collecting data and if there are databases used, the users must understand their own database to be able to use it effectively. There was a need of building this capacity on health workers at all levels of the HMIS in order to improve the culture of using information.

In addition, Lippeveld (2001) suggests that the culture of using information can be improved by improving ownership and relevance of the information among potential users of the information. Furthermore, RHINO discussions (2001) have shown that when health workers feel the ownership of their data, they can ensure its quality and hence use it accordingly. There was a need for HMIS to change the perception of upward reporting and make health workers feel the ownership of their data.

Supporting health workers by giving them informative feedback and motivating them in using data were also shown by different studies as ways of improving the culture of using information (Neame & Boelen, 1993; RHINO, 2001). Neame & Boelen (1993) give details that, data providers will start to appreciate the value of data collected and take appropriate steps to improve the quality, timeliness and quantity when they begin to receive meaningful and useful feedback. This research has observed little feedback provided to health workers in the facilities and districts on the data collected. To improve this situation in the facilities, the RHINO discussions (2001) suggest that, managers need to be encouraged to support and follow-up information use at facility levels. In the case of Zanzibar, these managers were District Health Officers and HMIS focal persons. For them to support facility workers, they needed to provide training and motivation to health workers to

help them to interpret data and respond to it accordingly. They also have to receive informative feedback and support from the higher levels.

However, Zheng (2005) argues that, culture cannot be crated but it can be nurtured, because it is rooted in historical and social settings, and it is constantly evolving over time. It can be nurtured by constantly cultivating it. There was a need for HMIS to use cultivation initiatives such as training and support in improving the culture of using information.

Reasons for difficulties

Straggling with the changes brought by the reformation of HMIS, health workers faced a number of difficulties. This section explains reasons that lead to difficulties in adopting the changes before the intervention of this research.

During the diagnosis phase of the research, I identified with the health workers' different problems that faced them in the whole change process. In the facilities, we identified that health workers faced difficulties in collecting, processing, reporting and using the data they collected. In the districts, they had difficulties in data entry, analyzing, importing/exporting in the DHIS, and using data generated from DHIS. Identified reasons for these difficulties were insufficient training, educational backgrounds of health workers, culture of non-ownership of data collected, the design of data collection tools and the way HMIS handled the change process.

i. Insufficient Training

After the introduction of new data collection tools in facilities and DHIS in districts, HMIS management in collaboration with HISP team and other stakeholders conducted training seminars to intervene the use of these tools. However, the training was shortened due to the insufficiency of the training budget allocated, as explained by the HMIS coordinator. Consequently, the training seminars did not equip health workers with sufficient skills to use the new technologies in their daily work. As a result, of insufficient training, the new technologies were abandoned, underutilized or used for what they were not intended. This situation has been observed in other developing countries by different researchers (Star & Ruhleder, 1996; Olow & Ladipo, 2002).

As explained in findings chapters, training facility workers took two days and training district workers took one week and plans for retraining have taken more than six months because of budget limitations and other reasons. All the health workers interviewed said that the training they received was insufficient for them to start using new data collection tools and DHIS as Lippeveld (2000) argues that, health providers receive little training and instructions are rarely standardized. Training of data collection procedures is mandatory whenever the system introduces new tools or modifies the existing ones. Instructions on how to use these tools have to be available so that the health workers can consult them after training.

For the facility workers, the training was not only short but also did not put everything clear especially on the new practices of collecting and aggregating data. Previously there were no standardized procedures on data collection and aggregation, every facility was doing it their own way; and because the training did not set such procedure, health workers continued to use their own procedures. This resulted to incorrect and inaccurate data collection.

In the districts, health workers were taught basic computer skills and entering data in DHIS. As a result, health workers had no skills on data analysis, import/export and generating different reports for further analysis. This collapsed data flow from the districts to the zones and the ministry for more than six months.

Further more, Paul (1983) argues that, in most developing countries, trainees are selected based on bureaucratic politics and patronage rather than greatest need. Similarly, Mukama (2003) present a situation in Tanzania mainland where training of MTUHA system was not fruitful because of training wrong people. In this study, there were cases where health workers who attended the training were not the ones who were going to use new data collection tools or DHIS. The District Health Management Team chose health workers at the facilities to attend the training but because HMIS management customary offers financial allowances for attending training, wrong people were chosen. From the finding, I have seen a number of potential health workers who did not receive training. In such cases, after training there were no efforts made on using new data collection tools and DHIS.

In addition, the training conducted did not equip health workers with skills for using data for action. This training could have been the best starting point for introducing initiatives for using data. Lippeveld suggests that, on the introduction of new data collection tools, "training programs should not only explain how to fill in the form but also focus on how to use the information generated through the form" (Lippeveld, 2000, p. 109).

Similarly, other studies show that users are trained to adopt new technologies and become technically literate, yet the type of training and support offered to them rarely give them the basic skills necessary to evolve along with the infrastructure as Star & Ruhleder (1996) argue. The HMIS in Zanzibar is comprised of health workers with different educational and motivational backgrounds, English language proficiency, computer literacy and different work practices. Other health workers have also received several trainings that did not add value to their skills and practices. These varieties have to be considered in one way or the other when training them. Murphy (1997) argues that this will help in ensuring authenticity ad presentation of the complexity of real world to the learners.

ii. Educational Backgrounds

Health workers have different backgrounds that lead to different capacities of understanding, perception, work practices etc. In this research, I have analyzed the effects of educational backgrounds in relation to English language proficiency, arithmetic skills and computer literacy.

Table 7.1 depicts the relationship between educational background arithmetic skills and English language proficiency identified in the facilities.

Educational Background - Arithmetic skills - English Language Proficiency in the Health Facilities				
Education Background	**Number of health worker**	**%**	**Arithmetic skills**	**English language Proficiency**
Form 3 + Certificate	20	52.6	Poor	Very Poor
Form 4 + Certificate	15	39.5	Acceptable	Poor
Form 6 + Diploma	3	7.9	Acceptable	Acceptable
TOTAL	**38**	**100**		

Table 7.1: Educational background in relation to arithmetic skills and English language proficiency in the Facilities

There was a mix of the three educational backgrounds in the facilities, as indicated in Table 7.1. Most of the nurses were in the Form 3 + Certificate and Form 4 + Certificate levels and a few facility prescribers had Form 6 + Diploma level. This shows that, most health workers have only completed the first cycle of secondary education, i.e. Form 3. This is the lowest secondary education level in Zanzibar. As a result, most health workers had poor arithmetic skills and very poor understanding of English. On the other hand, this was based more on personal experience, because some of the health workers had low educational level but they were good in arithmetic skills and vice versa. Having poor arithmetic skills and poor English language proficiency have lead to inaccuracy and incompleteness in filling in monthly reports. It has also lead to poor or no skills, especially statistical skills, in using data.

During the RHINO discussion on using information (RHINO 2001), they learnt that low literacy levels might limit understanding and use of information. They explained that messages are misunderstood if they are not adapted to appropriate language. Most of the health workers had difficulties in understanding data collection tools because of the English language used. In some cases, they understood differently from what it says on the form. In other cases where the tally sheets were in Kiswahili but the report forms were in English, translating from Kiswahili to English was a problem.

Low numerical skills limited the extent to which percentages, rates and ratios were used in calculating indicators and drawing graphs; RHINO discussions (RHINO 2001) also explained this.

Most health workers with poor arithmetic skills faced difficulties in filling in calculated data values and engaging in using their data for calculating indicators and drawing graphs.

In the districts, health workers had higher educational levels than in the facilities. Table 7.2 describes the relationship between educational background, English language proficiency and computer literacy in the districts.

Educational Background - English Language Proficiency – Computer Literacy in the Districts				
Education Background	**Number of health workers**	**%**	**English language Proficiency**	**Computer Literacy**
Form 3 + Certificate	0	0		
Form 4 + Certificate	3	43	Acceptable	Variable
Form 6 + Diploma	4	57	Acceptable	Variable
TOTAL	**7**	**100**		

Table 7.2: Relation between educational background, English language proficiency and computer literacy in the districts

All the health workers had acceptable English language proficiency and variable levels of computer literacy, as indicated in Table 7.2. This shows that district workers have completed the second cycle of secondary education and as thus, they had little difficulties in understanding English language used on the data collection tools and DHIS.

Computer literacy varied from not knowing how to use a computer to being able to use computer applications. Health workers that had some computer skills have acquired them through personal efforts by either attending computer courses from private firms or learning from someone who knew. Generally, health workers at the districts had marginal computer skills. This made it difficult for them to use DHIS to enter, analyze, import/export data and to use reports generated from DHIS for further analysis.

Wilson and Smith (1991) give details that, the skills to use computers can be affected by users' access to computer technology. This was one of the reasons in Zanzibar as in many other

developing countries where the ICT infrastructure is poorly developed in terms of human and technical capacity, as Braa et al. (2001) explain for the case of Mozambique and other developing countries.

In general, health workers with low educational levels faced more difficulties in understanding data collection tools and in using data than those with higher educational levels. From the findings, I having seen that more health workers have low education level in Zanzibar, this could be a result of different things. One of the reasons could the way the educational institutions are managed and financed as Paul (1983) explains that, most of the training institutions in developing countries are poorly financed and managed and they are usually heavily dependent on government. As a result, the quality of education delivered could be poor.

iii. Culture of non-ownership of the data collected

Before the implementation of HMIS, most of data in the facilities was collected for the vertical programs. The only data that was collected for the ministry was on disease surveillance. All the data collected was sent upward to the ministry and vertical programs. This created a depiction to the health workers that the data they collect was to fulfill the interests of the higher levels. As a result, they felt that the information gathered was not valuable to them. To change this perception, in the RHINO discussion (2001) they suggested that, health workers need to understand the reasons for collecting data.

In addition, the practice of sending information upward created a perception to health workers that they cannot use it to support action at the local levels where it is needed the most as Bayrne & Sahay (2003). This practice weakens information use at facility and the district levels. Lippeveld (2001) also indicates that, information use, its relevance and ownership are weakened at the district and facility levels. Such factors have been observed in this research and they made health workers feel that they do not own the data they collected. As thus, they have not devised any means of using data for their own purposes. This was a big hindrance on using information in the facility and district levels.

Zheng (2005) argues that, people will use information in a certain way if there is a culture of using information in that way. In the health sector in Zanzibar, most of the decisions, for example, on personnel, medical supplies and equipments distribution and allocation come from the top management. These decisions are most of the times based on budget allocation and not on the data collected. As a result, health workers find that the data they collect is useless to them and the ministry as well. Moreover, due to the centralized management, health workers at the facility and district levels find themselves in a situation that they cannot make any decisions based on the data they collect. To improve the culture of ownership of information, it has to be cultivated In the HMIS.

For health workers to embrace changes and improve their performance in using the system, different studies suggest that, they have to be actively involved in the change process (Ives & Olson, 1984; Lorenzi, 1995). To improve the ownership of information to health workers, they need to be involved and empowered to use it. The management has to find ways of empowering them to perform different actions such as planning and decision making in the system. For active involvement of users in such activities, their skills have to be improved.

iv. Design of Data collection Tools

Lippeveld (2000) argues that, the simplicity and layout of data collection tools determine the quality and use of the data collected. However, the layout of some of the HMIS data collection tools was not easy to understand, the sequence of flow was not clear, the arrangement of columns was confusing, the spaces in the tally sheets were not enough and there was no instruction manual on how to fill in the reports. This layout has reduced the accuracy of data collected.

Most health workers faced difficulties in understanding what to fill in the reports especially in the areas where they did not have such services, as a result, they either, filled in wrong values or they did not fill in at all. In other cases, health workers were supposed to fill in the summation of values on the reports, but due to confusing arrangements of columns and rows and lack of instructions, wrong values were filled in.

Lippeveld (2000) gives details on designing data collection tools that they have to be self-explanatory, there should be sufficient open spaces on the tally sheets, headings of columns should clearly indicate the data item need to be filled in and the order of data on the forms should take into account the sequence of procedures. This was not the case on the layout of some of the HMIS data collection tools and no instruction manuals were provided to health workers after training.
The design of the HMIS data collection tools has contributed to the problem of understanding them. Most of these examples were explained in the diagnosis phase in Chapter 5. I elaborate a few examples here.

In the Family Planning Services section in RCHS form, as indicated in Figure 7.1, in most facilities the part to the right, was either left blank or filled in incorrect values. It was not indicated that the values in the right column, '**No. of new clients**' and '**No. of continuing users**', should correspond to the total values of what was written in the sections to the left under the columns '**No. of new clients**' and '**No of continuing users**' respectively.

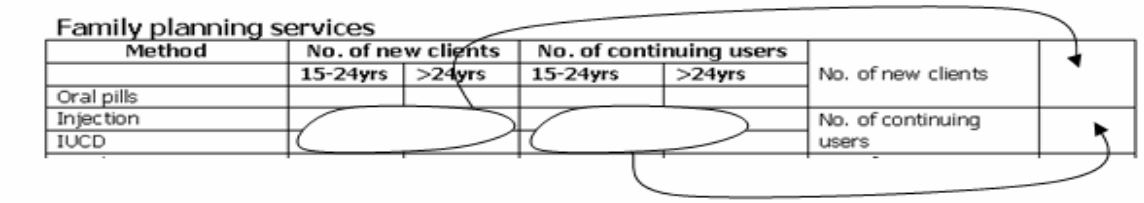


Figure 7.1: Family planning section in RCHS form

In another example, the Delivery services section in the RCHS form, the part to the right, as presented in Figure 7.2, was either left blank or filled in incorrect values by most facilities. Most health workers explained that they did not understand that it has a connection with in the section under the column '**Total**'.

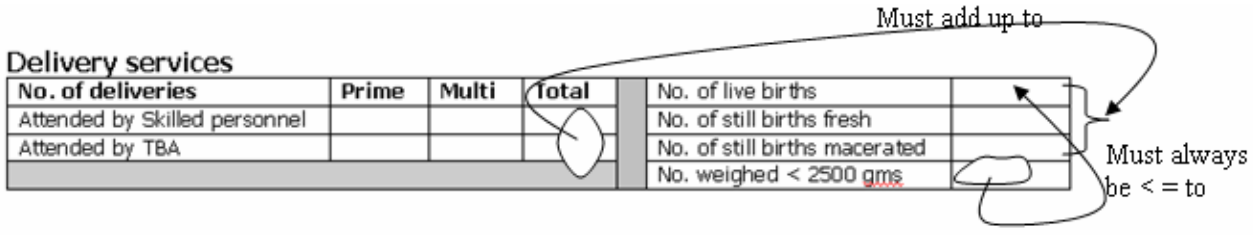


Figure 7.2: Delivery Services in RCHS form

In other sections, health workers had problems getting the data to fill in because such data needed to be collected daily, 'tallied on the daily tally sheets' but the sections were not in the tally sheets. In such situations, most health workers created their own ways of collecting such data. For example, in collecting data on Family planning, every facility had its own way of identifying and recording new and continuing clients and most of these ways were wrong. In one facility, for example, they had different values on the number of new and continuing clients on the monthly report compared to the values their daily tallying book. The facility worker explained that, they do not record clients in their daily book according to age groups, they just list them but they record their ages. At the end of the month, they have a loss of more than 70 clients; it became tedious for them to aggregate the number of clients according to the age groups on the form as indicated in Figure 7.3. As a result, they report incorrect data.

Family planning services

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

Figure 7.3: Family Planning section in the RCHS form

In addition, the design of the forms should consider the size of open spaces in the tally sheets as Lippeveld (2000) suggests. The design of HMIS forms did not consider this; as a result, in facilities that serve large communities, the open spaces provided on the tally sheet was not enough. For example in one facility, they had a larger value of antigens given in their reports than those in the zero zero form, which they tallied. One health worker explained that, the facility serves a large population and the space for tallying on the form were not enough, so they tallied other clients another peace of paper, which they forgot to add the values with the others at the end of the month. However, when I asked her to show me the peace of paper used for tallying additional values, she could not find it. This shows that, when the spaces on the tally sheet are not enough, health workers either stopped tallying or created their own tally sheets, which at the end of the month they forget to add the values or they have lost them, this lead to incorrect reporting of data. The design of data collection tools is an important factor in increasing the quality of data collected.

v. HMIS way of handling changes

The implementation of HMIS has brought many changes in the health sector, some of them being changing of job descriptions, practices of data collection and reporting, and revision of data collection tools. These changes have brought difficulties to health workers in their daily activities due to the way HMIS has involved and supported them in the change process.

To increase users' acceptance to changes, Ives & Olson (1984) explain that, they have to participate actively in the change process. One way of involving users actively in the change process, as Lorenzi (1995) argues, is to set clear organizational objectives on the change. The management has to set clear vision on the changes and these have to be communicated openly to those involved to make it easier for them to incorporate themselves within the change process.

Changing job descriptions has put health workers in dilemma of not knowing of what is expected of them in the new HMIS. Statisticians for example were previously responsible for data collection in the zones but the new HMIS has phased them out and that responsibility was given to the District Health Officers who were not sure of what exactly were their responsibilities regarding data collection as one explained. As a result, most of the districts stopped reporting to the zones and they were entering data in DHIS at their own pace.

There were changes in the ways of collecting and reporting data. Lippeveld (2000) suggests that health workers need to be given instruction manual after training so that they can use them to refer things that they forgot or were not clear in the training. However, HMIS did not put standardized procedures and they did not provide instruction manual on neither filling in reports nor using DHIS. This has caused incorrect and incomplete reports from the facilities and underutilization of DHIS in the districts because they did not have anywhere to refer to after training. Mukama (2003) present a similar case in Tanzania mainland where in the MTUHA system changes were made without informing the users and it resulted to incorrect, inaccurate, untimely, and non-utilization of information.

During the implementation of HMIS, the data collection tools have been revised from time to time and District Health Management Team personnel were distributing them to the facilities. However, the health workers were not informed of the changes made, all they noticed was an addition or removal of a section in the forms and tally sheets. This added confusion to health workers because they did not understand what to fill in the new parts added on the forms. In other facilities, they continued using the older versions of the forms, this lead to incomplete and inaccurate data.

In addition, the reporting procedures set by HMIS for the districts to send a softcopy of database to the zones and vertical programs, were not implemented. At the districts, they did not know which database to send and how they were going to send it to the zones, ministry and vertical programs. At the zones, ministry and vertical programs as well, they did not know if they receive the database how they were going to use it. This was evident that HIMS did not actively involve health workers in the change process. However, Lorenzi (1995) argues that users need not just merely be informed of the changes; they need to be actively involved in the change.

7.1.2. Intervention

This research has intervened in the implementation process by training health workers at the facilities and districts. This section looks at the effects of training and the way training brought a difference in health workers skills, performances and behaviors.

Effects of Training

After identifying difficulties facing health workers in using the new system, there appeared a need to help them in solving the problems they were encountering. This research took the action of training health workers at the facilities and districts to support them in learning and adopting new practices in the implementation of HMIS. The training conducted brought changes in health workers' skills, performance and behaviors in facilities and districts that participated fully in the training.

In the facilities, problems identified were training, completeness and accuracy in filling in monthly reports, timely reporting and usage of health data. Results obtained after training, as indicated in the findings in Chapter 5, have shown that health workers have acquired knowledge by being able

to solve these problems. More facility workers received training, completeness and accuracy problems in filling in monthly reports were reduced, and there was an increase in timely reporting and data use.

The number of health workers who have not received training has changed from 17 before training to five after training, meaning that 71% of the training problem was solved. The percentage of incompleteness has changed from 8% before training to 4% after training. Fifty percent of the problem of completeness in filling in monthly reports has been reduced. Figure 7.4 presents the relationship of the percentage of incompleteness in each facility before and after training.

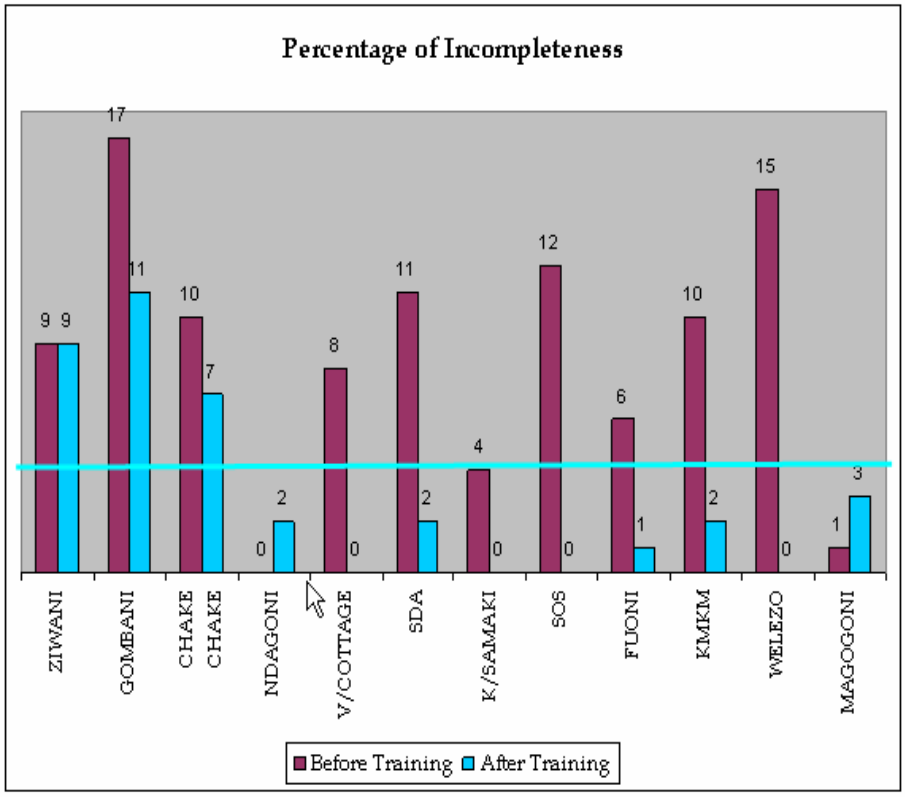


Figure 7.4: Comparison on the Percentage of Incompleteness before and after Training

Taking the 4% average after training as a cross cutting point between good and bad performance, from Figure 7.4, is shown that, before training, nine facilities had bad performance and after training three facilities had bad performance. This means that nine facilities were performing well after training.

The accuracy problem in filling in monthly report was also reducing after training. The percentage of inaccuracy has changed from 15% before training to 6% after training, and the problem has been reduced by 63%. The changes for each facility before and after training are as shown in Figure 7.5.

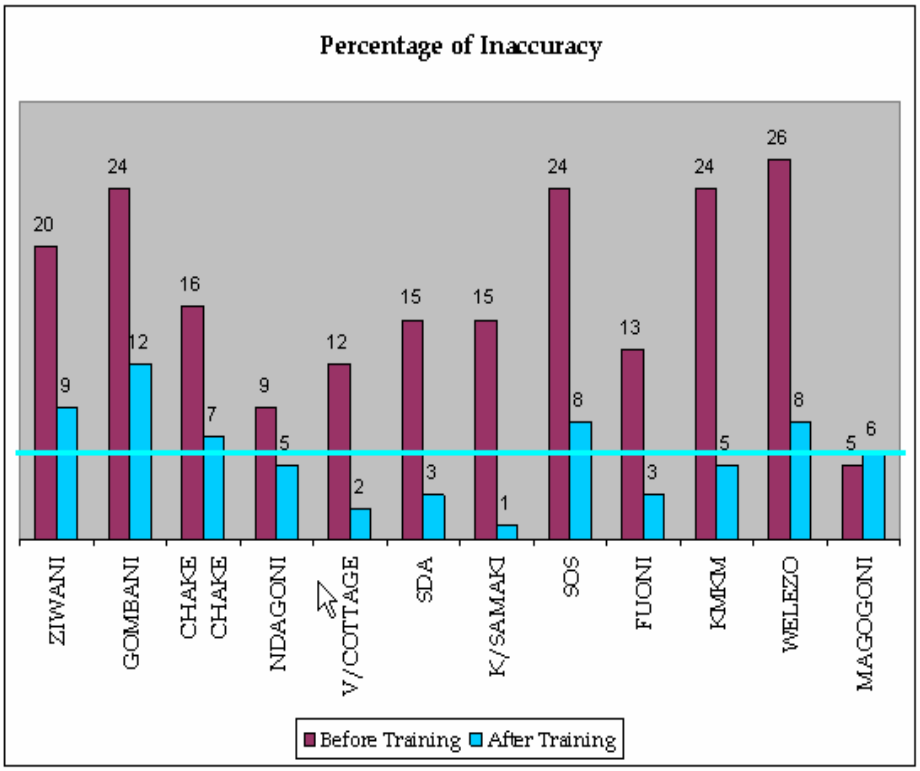


Figure 7.5: Comparison on the Percentage of Inaccuracy before and after Training

Taking the percentage after training, 6%, as the cross cutting point between good and bad performance in inaccuracy reporting, Figure 7.5 indicate that the inaccuracy problem has also been reduced. Before training, one facility was performing well and after training, seven facilities were performing well.

The timely reporting problem was also reduced after training. Before training it was a problem for six facilities but has changed to be a problem for two facilities after training, 67% of the problem was solved.

Data use was a problem facing all the twelve facilities before training, after training it was facing six health facilities. After training on calculating indicators, drawing graphs and tables, health workers have gained knowledge and changed the way they perceived data and started to use it. In the facilities, as explained previously, they created different graphs and tables and used them for clinic management.

In the districts, problems identified were training, understanding of data collection tools, computer literacy, problems in using DHIS for data entry, data analysis, data import/export and data use. These problems have been reduced after training as indicated in Table 7.3.

Problems in the Districts Before and After Training						
Problem	**Before Training**			**After Training**		
	Chake Chake	**West**	**Urban**	**Chake Chake**	**West**	**Urban**
Received training	YES	NO	YES	NO	NO	NO
Understand data collection tools	YES	YES	NO	NO	NO	NO
Computer literacy	YES	NO	NO	NO	NO	NO
Data Entry	NO	YES	YES	NO	YES	NO
Data Analysis	YES	YES	YES	NO	YES	NO
Data Import/Export	YES	YES	YES	NO	YES	NO
Data Use	YES	YES	YES	YES	YES	YES

Table 7.3: Problems identified in the districts before and after training

Table, 7.3 shows that before training Chake Chake and Urban personnel had not received previous training on data collection tools and using DHIS, after training, the problem was eliminated in both districts. The problem of understanding data collection tools was facing Chake Chake and West districts before training but it was eliminated in all districts after training. Computer literacy was a problem in Chake Chake district before training but after training, it was not a problem in any district.

Data entry in DHIS was a problem in West and Urban district before training but after training it was facing only West district. Data analysis, import/export and usage were problems in all the districts before training. The data analysis and import/export problems were solved in two districts,

Chake Chake and Urban. However, the problem of data use was not solved but it has been reduced in Urban district.

In the district, they learnt to use data from DHIS by generating reports from DHIS and manipulate the data in Ms. Excel for further analysis and deriving desired outputs. The tables and graphs made were used in their monthly and quarterly reports. In Urban district, the District Medical Officer was finally happy to learn that DHIS was not a 'black hole' as he was able to use the data from DHIS for further analysis.

Moreover, looking at how training has made a difference, I compared the performance of facilities that received training and those that did not by looking at the percentage of incompleteness and inaccuracy in filling in monthly reports. From the results obtained, there were improvements in the facilities that received training

In general, facilities that received training have improved in completeness and accuracy of data collected. The situation of facilities that did not receive training was getting worse, this could be that the health workers were facing more difficulties and they received little or no support from District Health Management Team. As a result, they have gone back to their old work practices.

I can conclude that definitely, training has made a difference and most health workers have gained more knowledge on working with the new system after training.

Why did Training make a Difference

For the success of training, different studies have given different approaches. Barki et al. (2003) argue that, organizations need to set integrative and comprehensive set of training strategies. Being part of the organizational objectives, sufficient training budgets can be put into considerations and as a result appropriate trainers will be appointed and training will focus on improving health workers' skills, knowledge and behavior and make them evolve along with the system.

In this section, I explain how training has made a difference in improving health workers skills, performance and behaviors. From the empirical findings, training has brought these improvements because of the training and supporting strategies used, and training methods used in conducting training.

i. Training and Supporting Strategies used

The training and supporting strategies have enabled me to arrange training and produce successful outcomes as indicated in the findings. By adopting and extending the Compeau et al. (1995) training and learning framework, training was arranged into three phases, initiation, training and learning, and post-training.

Initiation Phase

In this phase, as Compeau et al. (1995) describe, managers should identify training needs, develop training method, design the training environment, select trainees, compose training groups and train trainers. However, they do not describe how to do this. In this research, training was initiated in the diagnosing and action planning phases of the training cycle.

In this phase, I worked with health workers in preparing training. Kirkpatrick & Kirkpatrick (2006) also argue that for training to be effective, it must meet the needs of participant. For the success of the training, we (me and health workers) first identified training needs and expectations for training through interviews, document reviews and my observations. The results obtained helped us to set training objectives. The objectives set were the prime factors in choosing training methods to be used, preparing training places, selecting training groups and setting timetables to be used, and determining subject content to be trained.

Training objective, as Kirkpatrick & Kirkpatrick (2006) suggest, should be based on three things, first the results to be accomplished after training such as production, quality, benefit, etc. Second, the behavior needed to accomplish desired results and third, on the skills, knowledge and attitude necessary to achieve the desired behavior. In this research, I focused on the first and third aspects. Training objectives set in the facilities were, to improve levels of awareness, understanding and technical skills in relation to data collection, processing, reporting and utilization and to motivate

the culture of using data collected for patient and facility management. In the districts, training objectives set were to improve levels of awareness, understanding and technical skills in relation the use of DHIS for data collection, reporting, analysis and utilization and to motivate the culture of using data collected for patient and district management. To achieve these results, no prior knowledge or skills other than health workers' experiences were needed. Attitudes needed were respect and commitment for the accomplishment of the desired results.

Training methods can enhance motivation to learn and to use the system, as shown in different studies (Creswell, 2003; Olfman & Bostrom, 1991). The choice of these methods should be based on what actions need to be taken in order to achieve the desired objectives. In this research, as the objectives were to improve awareness, skills and understanding in using data collection tools, DHIS and improving the culture of using information, training methods used were learning-by-doing and informal learning. Learning-by-doing method has been suggested to be effective in improving problem-solving skills, teamwork and intrinsic motivation (Hmelo-Silver, 2004). Informal learning has been described to be successful for adult learners in the work place as it helps in construct meaning of what people do (Daley, 1997; Lovin, 1992; Watkins & Marsick, 1992). The uses of these methods have shown to improve health workers skills, behavior and performance in using data collection tools, DHIS and data collected. The findings also have indicated improvements in teamwork and intrinsic motivation among health workers after training.

Training places were also prepared in this phase. Different studies have indicated that training environments have to be carefully arranging because the environment can affect learning. Kirkpatrick & Kirkpatrick (2006) suggests that, training places should be comfortable and convenient, negative factors such as noises and other destructions and inconveniences should be avoided. In this research, health workers chose the rooms that were convenient for them and me to be used for training. In the districts, we chose the rooms with computers that were installed DHIS.

The health workers themselves in this phase chose the training groups and set convenient time for them to be trained. Delivering training to intended participants and avoid choosing participants based on bureaucratic politics and patronage as Olow & Ladipo (2002) describe, Kirkpatrick & Kirkpatrick (2006) advise the decisions to be based on "who can benefit from the training" (p. 10).

The choice of the training materials was based on the subject content identified as Kirkpatrick & Kirkpatrick (2006) advise. In addition, Olfman and Bostrom (1991) in their study of software training, where the sessions were delivered in a seminar or classroom setting, they described that training material should include overview, presentation material, exercises and documentation/handouts. The overview should consist of introductory information, presentation of basic concepts of the software to be learned, and a brief demonstration of the software capabilities. Presentation material should contain the specific procedural and usage information about the software. Exercises should be given after the presentation and they could be done with or without the computers. Documentation/handouts are provided to assist the trainee during the seminar and for later reference. Although in this research training was not delivered in a seminar or classroom setting, as Olfman and Bostrom (1991) describe, I adopted their approach on preparing training materials for software and non-software training. I prepared handouts that had the overview and presentation material and exercises that contained the application of subject training in which in the districts they were done using computers and in the facilities were done without computers. I also prepared posters, which contained the elaborations of data collection tools with simplified English phrases, mathematical formulas and with instructions on filling them. These materials helped me in covering and delivering the appropriate subject content to the health workers.

However, no trainers were trained in the training initiation phase as Compeau at al. (1995) describe. Training aimed at improving health workers' skills, knowledge and behaviors and to encourage sharing the knowledge gained with the others who did not receive training. I did not aim at creating trainers but make health workers collaborative to share the gained knowledge with the others.

In this phase, I gained an understanding on health workers' problems, attitudes, expectations and perception on training. As Murphy argues that, previous knowledge constructions, beliefs and attitudes of learners have to be considered in training (Murphy, 1997) because people learn by constructing knowledge through their reflections on experiences.

Training and Learning Phase

Compeau et al. (1995) name this phase as formal training and learning phase. In this phase, the action of conducting training is carried out. Appropriate methods that can be used in delivering training are; methods that incorporate hands-on use, behavior modeling, good conceptual models and manuals that encourage exploratory learning should be provided to the learners as Compeau et al. (1995) suggests. It is at this phase where the managers should decide on "who will facilitate the training" (p.24).

Training was conducted in the action taking phase of this research, however it was not formal training as Compeau et al. (1995) suggest. In this phase, I carried out the actions planned in the action planning phase. Governed by the training objectives, I used training methods selected for conducting training and learning, and training materials designed for instruction giving and presentation. Training and learning processes aimed at improving skills, performance and behavior in using data collection tools, DHIS and using the collected data.

To give trainees a strong grounding in conceptual understanding, emphasize motivation, and aim at building accurate and flexible mental models as Compeau et al. (1995) suggest, I used learning-by-doing and informal learning methods to conduct training in the facilities and districts. The identified problems were worked on by engaging health workers in solving them in group discussions while I was facilitating them. In the districts, training was conducted with the interaction of computers.

Venkatesh (2000) advices organizations to conduct computer training programs that target increasing computer awareness, enhancing computer self-efficacy, and reducing computer anxiety among employee for the introduction of the use of computer systems. Enhancing computer self-efficacy will improve skills of health workers make them feel they have control on their actions. To improve these skills, in this research, training focused not only on how to use DHIS but also why. In addition, health workers need to have appropriate facilitating conditions for using the new systems such as taking different actions on the data regarding the interpretations from the data.

Furthermore, Compeau (1992) suggests organizations to use system-specific training interventions that enhance user perceptions about the specific system and their general beliefs about new information technologies. The training conducted in this research was a system-specific intervention as it focused on the specific training needs of the health workers. To enhance their perceptions about the HMIS and their beliefs on the new technologies imposed, training conducted helped health workers to acquire skills on solving their problem through using their own data and sharing their experiences. They also changed their perceptions on using data after starting to use it.

In addition, trainers have to be identified in this phase as Compeau et al. (1995) argues, though they did not give an answer as to who will facilitate the training. Kirkpatrick & Kirkpatrick (2006) advice that, trainers should have "knowledge on the subject being taught, a desire to teach, the ability to communicate and skills to getting people to participate" (p. 12). Though affording such trainers can be expensive, the choice of the trainer should focus on the training objectives.

Post-training Phase

In this phase, Compeau at al. (1995) give details that training and learning should be evaluated, trainees should be supported and transfer of training should be evaluated. The aim of this phase was to evaluate training and to see if it has been transferred to the workplace, and learning continues after training has ended. This research, supported health workers in applying the gained skills and knowledge on using data collection tools, DHIS and using the collected data after training. The impact and outcome training were evaluated in the evaluation phase of the training cycle.

The behaviorists describe that human actions are governed by rewards and punishments and they are motivated to seek rewarding experiences and avoid experiences that are not rewarding (Pavlov, 1927). After training, health workers improved their performance, skills and behavior in using data collection tools, DHIS and data collected, for them it was a rewarding experience. However, changing the culture as Lippeveld (2001) argues may take a long time. In this phase, I supported health workers in acquiring the trained knowledge and applying it in their daily activities, as a result, they changed their perception about data. This change was observed to improve month after

month because I was constantly supporting them. The support they received has been a rewarding experience for them.

Skinner (1953) describes the way stimulus follows a response that if a stimulus is a positive or negative reinforcement, it can increases or decrease the probability for different responses to occur in the future. Stimulus such as giving feedback to health workers, can ether strengthen or weakens learning depending on the way it is given. In this research while supporting health workers, I was giving them informative feedback on the progress of their performance and on the mistakes made and how to avoid them in the future. This kind of support has enhanced self-efficacy among health workers as Bandura (1999) argues that, supportive relationships such as effective copping attitudes and strategies for managing problem situations, demonstrate the value of perseverance, and provide positive incentives and resources for efficacious coping to those supported.

To evaluate training in this phase, I used the Kirkpatrick's (1996) four levels of evaluation. Kirkpatrick & Kirkpatrick (2006) suggest training to be evaluated to gain information on how to improve it for future training. Williamson (2000) also in his study of evaluating training in Health Information Systems (HISs) suggests that, evaluation will increase the appropriateness of training in developing knowledge and skills in the purpose, process and use of HISs. In this research, training was evaluated to gain information on how to improve it further for future training. This evaluation aimed at assessing the impact and outcome of training on knowledge gained, attitude and behavior changes and health workers' performance.

The first level evaluates the reactions towards training. In this research, the evaluation focused on identifying health workers reactions towards training in relation to shortcomings in the training methods and materials used. Although, Compeau at al. (1995) does not suggest evaluating training reaction, evaluating training reaction is an effective and easy way of getting feedback of training as Kirkpatrick & Kirkpatrick (2006) argues. The results obtained in this research have shown that most of the health workers were happy after training. They contributed to what I needed to modify in the training materials and presentations. This helped to improve the way I delivered training and in modifying training materials while I was supporting them.

In the second level of evaluating learning, I evaluated the extent to which health workers changed their attitudes and improved their skills. Compeau at al. (1995) also suggest learning to be evaluated. Using the Kirkpatrick & Kirkpatrick (2006) suggestions on evaluating learning, I assessed the exercises I gave health workers to work on after training. Comparing the results with the situation before training, the findings have shown improvements on their attitudes and skills. Health workers became more collaborative with each other and with other facilities. They changed their perceptions on collected data and started to use it. Their skills on using data collection tools have improved, as they became more conscious on data quality. In the districts, they were capable of using DHIS for data entry, import/export, generating reports and analyzing them further.

To evaluate behavior change, as the third level, I evaluated the way health workers have applied new knowledge and skills gained from the training in their daily practices. Compeau et al. (1995) also advise evaluation on transfer of knowledge to the workplace. The findings have indicated some changes in the behaviors in using data collection tools, DHIS and the data collected. In the facilities, they started to apply new practices and the results have shown improvements in data quality, timely reporting, and others explained that they became more comfortable and confident with their work after training. In the districts, the findings indicate that health workers started to use data from DHIS and were able to find out that it was not a 'black hole'.

The forth level of evaluation is to evaluate results or outcomes of training. Compeau at al. (1995) argue that training long-term and short-term outcomes have to be evaluated. Due to time limitation on the field, this research evaluated short-term impact of training on the performance of facilities and districts. By using Kirkpatrick & Kirkpatrick (2006) suggestions on evaluating training results, I evaluated training results using two actions. In the first action of comparing the performance of facilities in collecting complete and accurate data, timely reporting and data use before and after training, the findings have indicated reduction of incomplete and inaccurate data, improvements in timely reporting and data use after training. Similarly, in the districts where I compared the performance in using DHIS and generated information, findings have shown improvements after training. In the second action, I compared the performance between the facilities and districts that participated poorly in training and those that participated well, the findings have shown improvements in the facilities and districts that participated well in the training. I also compared

the performance of facilities that did not receive training and those that received training. The findings have indicated bigger improvements in terms of complete and accurate data reported and data use after training in the facilities that received training.

Using the framework as described by Compeau et al. (1995), the characteristics of trainee, software, task/job, and organizational will influence decisions about training design, delivery, and effectiveness. Looking at the trainees as health workers, software characteristics as characteristics of DHIS and data collection tools, task/job as the use of data collection tools, DHIS and collected data, and organization as HMIS, in this research, findings have indicated that their characteristics have influenced decision on training design, delivery and effectiveness. These characteristics were the core factors of the identified training needs, which were used to formulate training objectives. In addition, training was affected by social influences on health workers from coworkers and the society. Gallivan et al. (2005) also give details on the way coworkers can influence learning on computer use. This was also evident in this research as elaborated in the following sections.

ii. Learning and Training methods used

In this research, I adopted learning-by-doing and informal learning methods in conducting training and learning in the facilities and districts.

a. Learning-by-Doing

People improve by becoming more attuned to constraints and affordances of different real life situations. Yet, they need to be helped to participate meaningfully in the practices they choose to enter as Greeno argues (Greeno, 1997). Being a method that incorporates hands-on use, learning-by-doing can be used to "give trainees a strong grounding in conceptual understanding, emphasize motivation, and aim at building accurate and flexible mental models" (Compeau et al., 1995, p. 24).

One way of learning-by-doing in this research was through solving problems where health workers learned through solving different problem facing them. Doing so I employed the Problem-Based-Learning (PBL) approach aiming at developing health workers problem-solving skills through solving their problems collectively, and in this process develop teamwork and intrinsically

motivate them. PBL as Hmelo-Silver argues, it is a method of learning that help to develop effective problem-solving skills, improve teamwork among participants and nurture intrinsic motivation (Hmelo-Silver, 2004). This is a pedagogical approach in which, learning is driven by challenging, open-ended problems, students work in small collaborative groups and the teachers take on the role of facilitating of learning.

Acquiring Problem-solving skills

Hmelo-Silver argues that using PBL, learners have to identify and understand their problems in order to develop effective skills in solving them (Hmelo-Silver, 2004). In the diagnosing phase of this research, in the facilities we identified problems in data collection and processing, reporting, and using data it. In the districts, we identified problems in understanding data collection tools, computer literacy, using DHIS for data entry, analysis and imports/export, and data usage. These were ill-structured problems and I used them as a stimulus for learning as Barrows suggests (Barrows, 2000).

The eagerness for learning ways of solving these problems has been a major impact on making health workers participate in the training and as a result transfer the gained knowledge in solving their problems. Different studies have revealed that, as people solve problems facing them, they learn how the problem has been hindering them in performing certain actions, this knowledge help them in devising solutions, which they can apply in other problems of a similar or different nature. (Gardner, 1983; Greeno, 1997; Boddy et al., 2005).

Fjuk et al. (2006) argue that knowledge is embedded in the social activities and actions performed, and learning is a product of these activities. Engaging health workers in solving their problems, they improved their skills and the findings have shown the improvements in performance after training. The findings indicated that, facilities and districts that participated poorly in training had very little or no improvements compared to the ones with good participation in the training. By participation here, I mean attendance of health workers in the training and no interruption during the training session. Poor participation has been observed more in the districts than in facilities. In Chake Chake and West districts, only one health worker showed up for training and in Urban

district, two health workers participated but one dropped out without completing the course. This could have been because they were not given any allowances for attending the training as customary.

Becoming Team Players

The constructivists argue that learning can be experienced through social interactions among learners and with the teacher, books or computers. These interactions can help individuals to construct knowledge by reflecting on the experiences gained (Piaget, 1960; Jonassen, 1994). PBL also supports the concepts of the social aspect of learning where learners engage in discussions with peers in small facilitated groups as Hmelo-Silver elaborates (Hmelo-Silver, 2004).

Using PBL in this study, health workers were learning to solve their problems in discussion groups in the facilities and districts. This encouraged sharing experience and knowledge and as a result it helped them creating teamwork. It is also shown in different studies that, collaboration through solving real-life problems improves learning as learners share and challenge each other's knowledge (Lave and Wagner, 1991).

Gallivan et al. (2005) also argue that social influences and daily pressures that a user encounters from coworkers and the society as a whole affects the way s/he will participate in using the system. During the discussions, when the group had to contribute their ideas, they were eager to see how the others understood, and whenever it appeared that one was correct, the others wanted her/him to explain to them in their 'local understanding'. The good thing was that when one understood a concept and the others did not, they become keen to understand as well.

Conducting training in groups has improved learning as health workers were interacting with each other, with the computer and with the trainer as Piaget (1960) argues that people learn as they reflect experience through such interactions. PBL has also helped in building teamwork among health workers as they worked together and helped each other in solving their problems. Previously, for example, as I observed in one facility, the MCH nurse was responsible for filling in RCHS and ICCM reports and the facility in charge was filling the MDSR. However, when s/he was absent at the end of the month when they process reports, no one will do that until s/he comes

back. This was a problem in many facilities where you can find that they have not reported for several months because the person responsible is either on maternity leave, sick leave or on holiday. When we were discussing on this issue, most health workers said they could not do the reports if the person responsible was absent because they were paid when they were trained on that, and it is their responsibility. Such perception was changed in some facilities. After training, they started to work as a team and collaborated in filling in secondary and primary tools. They understood the importance of data they collected and the outcomes of working as a team.

In addition, different studies have shown that, people working collectively in a group having a common goal, can develop a collective-efficacy whereby, "the stronger the beliefs people hold about their collective performance, the more they achieve." (Bandura, 1993; Feltz and Lirgg, 1998; Hodges and Carron, 1992; Little and Madigan, 1994; Prussia and Kinick, 1996; Spink, 1990: as cited in Bandura, 1999)

Getting Intrinsically Motivated

Most health workers have been intrinsically motivated after training, as they gained an understanding of solving problems facing them and change the way they perceived data they collect. It was evident that, they were motivated when they started to value what they were learning. Different studies have shown that, people learn when they work on tasks motivated by their own interests and challenges and by believing that the outcomes of learning are under their control (Ferrari and Mahalingham, 1998; Leontiev, 1978; Bandura, 1997; Dweck, 1991)

In one facility, for example, where there was a good attendance in the training, after training, the MCH nurse who was responsible for filling in RCHS and ICCM reports went for holiday but because the other nurses were involved in the training, they worked on the reports at the end of the month instead of leaving them until she returns.

In another facility, learning through solving problems took them a mile ahead in dealing with their daily activities. As they were doing the exercise of calculating indicators and drawing graphs, I gave them simple indicators to start with but they added their own indicators and worked on them.

When I was assessing them, I realized tremendous achievements, though some graphs were not correct. This shows that, they have become intrinsically motivated, as they have taken their own interests and challenges in using their data. **T**hey have also developed efficacy beliefs as they have taken actions that made them reach their goals as Bandura argues (Bandura, 1999). They also wanted to create other indicators and represent them graphically. We worked together in determining the numerators and denominators to use. The next time I was assessing the exercises, they showed improvements. Working as a team has motivated them intrinsically as they shared the knowledge gained in training on solving their problems.

In Pemba, the facilities I could not train wanted the training as well but due to time limitation I could not train all the facilities. However, I asked the health workers who attended the training to help the others who could not. I did not expect if this was going to happen but one day I met a nurse, from a facility that I trained, training another nurse from a facility I did not train. I asked her why she did that and she said that, she felt motivated to share the knowledge she gained. That kind of motivation was overwhelming because it was not there before. This shows that what she has learnt has modified her behaviour and motivated her to create a beneficial environment that will cultivate valued potential in other facilities. As Bandura elaborates the way individuals can change their behaviours when motivated (Bandura, 1999). After training, most health workers became more collaborative in solving problems not only in their own facilities but also with other facilities.

Initially, for example, the need for proper storing of reports was not there in most facilities. After sending their reports to the district, they could either remain with a copy or not. Those who remained with copies they would just store them anywhere as a result most of reports end up lost somewhere. After they gained knowledge of using data for their own activities, they have changed the way they handled their reports. They started filing their reports and ordering folders and filing cabinets from the district. This shows that they have been motivated to handle their data properly.

In another facility, there was only one nurse in the facility and she participated very well in the training. As an assessment of using data, I gave her an exercise to calculate indicators and represent data from her reports in graphs and tables. During the assessment of the exercises, she

did all the exercises very well and she expressed to be motivated to do better, as she explained of getting more confident with her work after training. As Bandura argues, individuals develop self-efficacy when they feel they have power to produce changes by their own actions (Bandura, 1999). This shows that she now knows what she is doing and she feels motivated by that. She has developed a self-efficacy, and she feels that she has the power to produce changes in her working environments by her own actions

During the research, I was supporting facilities and districts by giving them informative feedback on their performances. During this time, we discussed on solving mistakes that appeared repeatedly until they were able to solve the problems. Neame & Boelen (1993) argue that, people will start to value data as they receive meaningful and useful feedback. This was the case in this study when health workers took steps to improve the quality, timeliness and quantity of data they collected, as they received meaningful and useful feedback, this motivated them. The trend of reduction of problems has been increasing after training, month after month.

In general, SOS, KMKM, Welezo, V/Cottage, SDA and K/Samaki PHCUs, were the worst in correctness and completeness problems before training, but after training, they have improved tremendously, as shown in Figure 7.6.

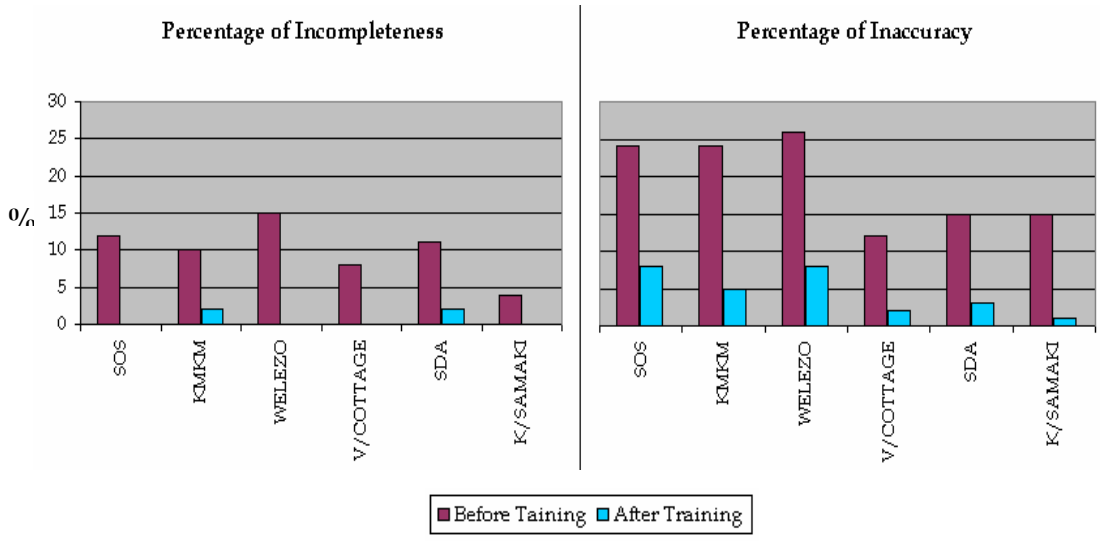


Figure 7.6: Comparison of the percentages of incompleteness and inaccuracy before and after training in Facilities that participated well

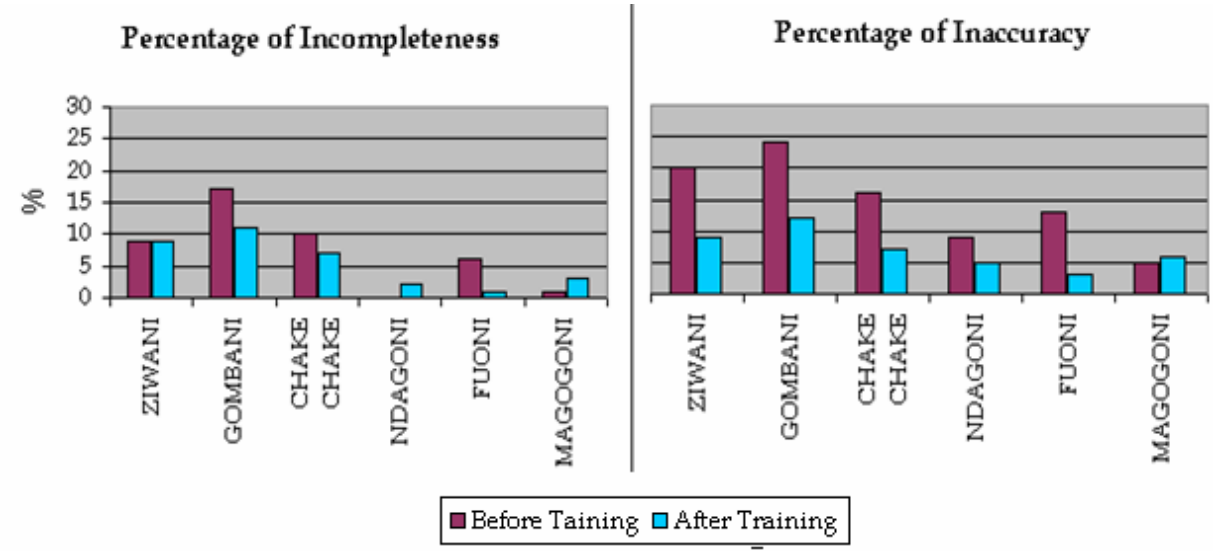


Figure 7.7: Comparison of the percentages of incompleteness and inaccuracy before and after training in Facilities with bad participation

Comparing the graphs in Figures 7.6 and 7.7, in Figure 7.6 the change before to training to after training is larger compared to those in Figure 7.7. This indicates that, there was a large improvement in the facilities that participated well than those participated poorly. These achievements have mainly been a result of good attendance in the training, collaboration and commitment and as a result, health workers became intrinsically motivated and team players.

Furthermore, due to some shortcomings in the design of forms, most facilities had to change the way they collect data to meet the requirements of the forms. For example, they have created new daily register books with age categories as the ones in the forms to make it easier for them to aggregate the data at the end of the month. In other cases where they have to get the data, but there was nowhere to tally in the tally sheets; they have designed their own tally sheets. They have reinvented workarounds that made their work to be done easier by trying to compensate for its perceived limitations in the design of the data collection tools as Boudreau & Robey (2005) explains the way people can improvise themselves to enact on new technologies.

b. Informal Learning

In this research, I used informal teaching style. Different scholars have used this method and it has been successful for adult learners in the work place as it helps in construct meaning of what people do (Daley, 1997; Lovin, 1992; Watkins & Marsick, 1992). Informal learning make learning a life mission as it drives a learner to discover and increase learners to be self-directive and help them to make meaningful learning choices and maximizing motivation as Michael & Boverie (2000) argue.

Training was conducted as a group discussion at the facilities for facility workers At the District Health Management Team offices in the districts, training was conducted as a discussion while interacting with the computer. Previously, I indicated that health workers have different educational levels, work practices, expectations, etc.; Greeno suggests that, supporting them to work together towards a common goal needed a careful arrangement of training (Greeno, 1997). Informal learning can be used as a way of building respect, trust, and teamwork.

Respect builds trust over time and trust is the foundation for developing productive relationships among health workers with different backgrounds. As health workers worked together and respected each other, despite of their differences, it was an easy way for them to develop trust and open relations with one another. This relationship nurtured a learning environment and made it interactive and cooperative.

Informal learning has enabled health workers to learn in their experience which are interwoven in their culture through which knowing and learning have meaning (Wilson, 1992; Daley, 1997; Lovin, 1992). The discussions had focused on making health workers create meaning of what they do by understanding their own problems and devising solutions, which were meaningful in their own cultural settings.

However, Lohman (2000) argues that, lack of time for learning is the most common inhibitor to informal learning. This was also the case in this research where some health workers could not attend the training because they were attending their daily responsibilities as a result, they did not receive training or they could not finish the training sessions. This has affected their performance

as indicated in the finding from the district where the District Medical Officer was not able to be to attend all the training sessions due to time limitation and the informal nature of training.

In addition, people have their own power to create changes by one's action and they learn what type of actions are suitable in a given situation as they notice the effects, being negative or positive outcomes, of their actions. By cultivating personal attributes that enable people to make the most of fortuitous opportunities, they have a greater hand in shaping their own destinies (Bandura, 1999).

7.2. Discussion

This chapter presents an analytical discussion on summarizing the major findings of the research while responding to the research problem.

Problem Discussion

The objective of the research was to suggest appropriate training and supporting strategies that can be used to sustain the implementation of HMIS in Zanzibar. To accomplish this objective, I conducted an action research where I did on-job training and support for health workers at the facility and district levels. Through these actions, I collected data that helped me to answer the following research questions:

1. How to arrange training for health workers at the facility and district levels for the sustainable implementation of HMIS
2. What can be done to improve the culture of using information among health workers at district and facility levels

I summarize how each question was answered in the following paragraphs.

The first question;

How to arrange training for health workers at the facility and district levels for the sustainable implementation of HMIS?

For the sustainable implementation of HMIS in Zanzibar, there is a need for proper institutionalization of standards imposed. This could be done in many ways, one of them being through training and support. However, different researchers have stated training to bring little or no changes in improving skills qualitatively and quantitatively, unless it is carefully arranged focusing on the needs of those trained.

Training is one way of influencing learning and through learning people acquires knowledge and uses it to improve their daily activities. If health workers gain the knowledge on understanding of health data, they can manage data in the best way they can to improve their work performance and the health services in general. However, no matter how much training health workers receive, the power of changing one's behavior is on the person's action. Personal attributes to enter in the practices they choose to in order to attain certain goals can be cultivated. The implications of this study suggest that training and support can be used to cultivate such attributes.

The findings of this research suggest that, for the sustainable implementation of HMIS in Zanzibar through proper training and support, training has to be carefully arranged using three major strategies initiation, training and learning, and post-training. The initiation strategies give HMIS management an opportunity to study the installed base, which will help in constructing knowledge from what is there, and thus formulate training objectives. Training and learning strategies are used in conducting training and learning to fulfill the set objectives through cultivating positive learning attributes of learners. The post-training strategies give guidelines for supporting trainees and evaluating training to see its impact on improved performance, skills and behaviors, and to find ways of further improving it.

Training Initiation Strategies

In this research, training was initiated in the diagnosing and action planning phases of the training cycle. For the success of training, the implications of the findings have indicated that training has to be included in the HMIS wide strategies. In addition, it has to be prepared before it is conducted in order to make the trainees ready to receive the new knowledge and the trainer ready to facilitate the training. By preparing, here I mean identifying training needs, formulating training objectives,

selecting training methods to be used, preparing training places, formulating training groups and timetable, and designing training materials.

The findings have shown that the previous HMIS training was insufficient due to budget limitations and other reasons. This research through the implications of the findings suggests that, to have a sufficient budget allocation for training, training has to be included in the broad objectives of the HMIS. These objectives should be set clear to the management, trainers, trainees and all the involved parties. A well-defined and communicated vision gives the people in the organization a context that helps in understanding the probable directions of change and the desired outcomes (Lorenzi, 2005). With a clear vision, HMIS can allocate its resources more wisely despite of the dynamic and complex nature of the health sector. For health workers as well, having the understanding of the direction and outcomes of training, they can embrace the changes and re-evaluate their perceptions on training.

In preparing training, we (me and health workers) first identified training needs and expectations for training. In this research, these needs were identified through interviewing different health workers at all levels of the HMIS and other health stakeholders, reviewing different documents, and through observations. The identified training needs and expectations guide us in formulating sufficient training objectives that addressed those needs. The objectives set guided me in choosing the subject content to be trained, the health workers to participate in the training and the training methods to be used. Together with health workers, we identified training groups, timetable and training places to be used at their respective facilities and districts.

The choice of training methods, in this study, was based on the actions that were needed to be taken in order to equip health workers with sufficient knowledge, skills and attitudes to accomplish the desired objectives. Training methods used were learning-by-doing and informal learning. The findings have indicated that the use of these methods improved health workers' problem-solving skills, encouraged teamwork and intrinsically motivated them. Learning-by-doing method is characterized by the assumptions that learning is deeply embedded in doing and people can improve their knowledge by engaging in solving problems they encounter. This method was chosen to engage health workers in gaining knowledge while solving their problems. Informal

learning method is a learning activity that takes place outside of the formal curriculum, workshop or seminar. In this study, this method was used in conducting on-job training through discussion groups in the facilities and districts.

Training places prepared, in this research, were in the facilities and districts. In the facilities since not all health workers work in the same office, they chose and prepared rooms that were convenient for the training. In the districts, we prepared the office where there was a computer with DHIS in Unguja. In Pemba, we booked the conference room and prepared it to be used.

Training participants in this research were not chosen. I include all health workers in the facilities and all the Health Management Team members in the districts. However, the implications of this study suggest that, the choice of health workers to participate in the training has to be based on the most need and not on bureaucratic or patronage basis. In the facilities, all health workers agreed to be in one group, we formed groups of two to eight health workers. In the districts, we chose the District Health Management Team members to attend with most emphasis on the District Health Officer and HMIS focal person, because they were responsible for all the data in the district. Health workers in the facilities chose to have one training session per month for three months, each taking two hours. Training was to be conducted during the week after working hours and others chose to have the sessions on weekends. Those who chose to participate during the week, they chose the days that they had few clients so that they can get time to prepare the room and themselves for training. In the districts, we arranged to have two hours session daily for two week. However, in most cases, the time for the next day's training session was negotiated daily depending on the health workers availability. .

Training materials were prepared based on the training objectives. In this research, I prepared handouts, posters and flipcharts. Handouts were prepared to be used during the training instructions to guide the health workers through the whole course. The materials used on the handouts were derived from HISP training manuals (South Africa and Botswana) and from University of Botswana HMIS in-service training course. These materials were modified to suit the needs of facility and district workers. Posters were prepared for each data collection tool to provide health workers with simplified English phrases and formulas, and with instructions on filling in the

tools. The data used for elaborations and instructions on the posters was from the respective facilities and districts. Flip charts were prepared to be used in places where there was no black/white board.

Furthermore, the training initiation strategies suggest a careful selection of trainers. In this research, no trainers were selected; the implications of this study suggest that trainers should be selected depending on the training objectives set. They should have good communication skills. This can help them in facilitating training and learning.

Training and Learning Strategies

Training was conducted in the action taking phase of the training cycle of this research. For the positive outcomes of training, different studies have suggested improving user attitude, behavior and performance. To improve these attributes in this research, training was conducted focused on improving health workers' awareness, skills, encourage teamwork and be supportive. To do so, I implemented the prepared plans by using the selected training methods, prepared training materials and the timetables set for the accomplishment of the training objectives.

By conducting training using the learning-by-doing and informal learning methods, the findings of this research have indicated the improvements on health workers' skills, performance and behavior, development of teamwork, and intrinsic motivation on health workers. The two methods were used simultaneously. Using the learning-by-doing method, I facilitated health workers in identifying problems and challenges facing them in using data collection tools, DHIS and collected data. Then we worked together in solving those problems informally through group discussions. After training as indicated in the findings, health workers' skills on solving problems were improved. This was identified from the assessment of exercises I gave them immediately after training and from the improvements in their performance after applying trained skills to their work practices. For example in the facilities, they were able to reduce the incorrectness and incompleteness of data collected and improve timely reporting. There were also improvements in data use in the facilities and districts and improvements in using DHIS in the districts.

During the discussions as the health workers were interacting in solving problems through sharing experiences, they developed teamwork. The findings have indicated incidences in the facilities where health workers created a collective efficacy of achieving better outcomes out of their daily activities. I also observed that training in groups joined health workers with different experiences. They were listening and observing each other's responses and actions, and in time, they become inspired to learn what works and does not work as one heath worker said

> *"If my colleague understands why can't I?"*

Health workers, through peer pressure, inspired each other to perform at their best, as a result, each suggestion built on the previous suggestions and this created and expanded their knowledge base.

The training methods used also intrinsically motivated health workers in this research. The findings have indicated that, involving health workers in formulating training objectives motivated them to participate in order to achieve the desired outcomes. The health workers became aware of what they should expect out of training from the trainers and from themselves, and this motivated them to learn. Before starting the training session, I showed health workers indicators that they would be able to calculate, graphs and tables that they would be able to draw and ways of interpreting them accordingly, after training. This motivated them to learn and gain knowledge that helped them to improve their performances in their daily activities. One facility worker said after using data and became aware of how it helped her and how to make sure that it is accurate so as to make sound decisions out of it she commented that

> *"I am more confident with my work than I was before"*

Another one in the district said that

> *"It took me two days to prepare a quarter report, which I could have done for a week or so, and I wouldn't have come up with such fancy graphs"*

Another thing observed in this research after training was horizontal interaction between health workers in the facilities in terms of knowledge sharing. This was observed at the district office when most of the workers were there at the end of the month to collect their salaries. Health workers who received training were sharing what they gained from training with the others who did not receive training. When I questioned them why they did so, one explained that

> *"I have gained the knowledge and I feel good to share it with the others to help them solve their problems"*

Sharing of acquired knowledge was one of the things stressed during the training; that they should share the knowledge with others and this would make them understand more as well as improve the others and the health services in general.

In general, the implications of this study suggest that for the success to training should provide activities, opportunities, tools and environments that encourage self-analysis, -regulation, -reflection and –awareness. The trainer should facilitate learning while the learners mediate and control learning. Learning methods, environments, content and tasks have to be relevant and realistic, focusing on health workers' daily experiences and using their own data. In addition, learners' previous knowledge constructions, beliefs and attitudes have to be considered in training (Compeau et al., 1995; Murphy, 1997). Finally yet importantly, learners should be motivated and supported towards experiences that are rewarding (Skinner, 1953) to motivate them.

Post-training Strategies

The post-training strategies give details on supporting trainees to help them apply the gained knowledge and skills in their daily practices and evaluating training to identify whether it has met the set objectives.

To support training, for the period of three months after training, I gave health workers informative feedback on the progress of their performance, and supervised them on using data collection tools, DHIS and data collected. I was giving them feedback on their performance on monthly basis together with the performance of other facilities and districts. I indicated mistakes and

achievements that were made. On the achievements, I congratulated them and on the mistakes, we identified solutions to make sure they did not happen again. Giving them the comparison of their performance with other facilities and districts made them realize how poorly or well they were performing. This made them eager to improve and have better performance next time. Supervising them at least once a month motivated them. The findings indicate a progressive increasing of health workers' performance every after month after training this implies that for a change of behavior to take effect, health workers need to be constantly supported.

Training evaluation was done during the evaluation phase of the training cycle of this research where I evaluated training reactions, learning, behavior change of health workers and training results. Evaluate training reactions gave me the feedback on how health workers received training. Findings have indicated that most health workers were happy at the end of the training and some of their comments and suggestions alerted me to modify some of the training materials used and the way I was giving elaborations and presentations.

To evaluate learning, in this research, I assessed changes in health workers' skills and attitudes after training to indicate how well they have learnt. Findings have shown that health workers have learned because they were able to fill in data collection tools accurately, to calculate indicators and to draw graphs in the facilities. In the districts, they were able to use Ms. Excel and Ms. Word applications and DHIS.

Behavior change was also evaluated in this research to identify the way health workers were applying gained knowledge and skills in their daily practices after training. Findings have indicated behavior changes in most health worker as they were applying trained practices and they have changed their perceptions about their data and started to use it. However, a change in behavior can take a long time and I could not justify further my findings if health workers kept the observed changed behaviors or not.

To evaluate training results, I aimed at identifying the way training has improved performance in the health facilities and districts. The results have indicated that after training there were reductions of incomplete and inaccurate data collected, improvements in timely reporting and data use in the

facilities. In the districts, health workers were able to get data out of DHIS and they generated graphs, performed further analysis and used the data for their monthly and quarterly reports.

The post-training strategies also suggest that, training does not stop at the end of the training session. The evaluation will give a way of further improving training next time. As thus, training and learning become ongoing processes governed by strategies for initiating, conducting, supporting and evaluating training and learning.

The second question was,

What can be done to improve the culture of using information among health workers at district and facility level?

This question was answered as follows:

The findings have indicated that, health workers perceive that the data they collect is to fulfill the needs of the higher levels. They also perceived that immunization is the only important data they used and ensured its quality. However, the other data are perceived to have little importance, they do not ensure its quality and they do not use it. In addition, all the collected data was not used effectively for facility, district or patient management. This was the case because health workers had little or no skills on using their data and the HMIS was not supporting them to use the data they collected. This indicated a need of improving the culture of using information that was there by cultivating it through proper training and support to improve health workers skills and understanding on using their data.

This study has introduced and suggested initiatives on improving the culture of using information. Building individual and collective capacity for understanding and using data, and strengthening the HMIS in support of data collection and use were seen as ways of improving the culture of using information. To improve this capacity, this research has trained and supported health workers in using data collection tools, DHIS and data collected, and suggested ways of strengthening HMIS in support data collection and use.

Through training, the findings have shown that, health workers can be equipped with an understanding of health data and skills for using it. After training health workers on different ways that they could use their data they worked on the exercises I gave them and after gaining the understanding they changed their perceptions on using data. They started to use data for calculating indicators, drawing graphs and tables and interpreted them according to their needs.

The findings have also shown that, after health workers started to use their data, they strived to ensure its quality in order to make appropriate decisions out of it. In some facilities, for example, they designed their own tallying books and registers for the data that they were supposed to collect but they were not indicated on the primary data collection tools. This did this to ensure that they collected accurate data because they were going to use it at the end of the month. This indicated that, they changed their perception about the data they collected and as thus, they started to understand the importance of the data they collect. As some facility worker commented after drawing a graph and saw the trend of attendance of pregnant mothers in the clinic.

> *"We have always wanted to know the trend of pregnant mothers' attendance in our clinic but we did not know how until you trained us"*

Support is another aspect of building capacity for understanding and using health data for improving the culture of using information among health workers. In this research, I supported health workers in applying the trained skills on using their data. I provided them supportive supervision and informative feedback on their progress and performance for the period of three months after training. In providing supportive supervision, I worked with health workers in solving problems facing them. They continued to learn after training. This helped them to improve further their skills and performance. The implications of the study suggest that, health workers need to be constantly given supportive supervision .health facility workers have to be supervised by district officials who are HMIS focal persons. In the districts, they need support from the zonal and ministry officials who manage the health data.

Hand in hand with supportive supervision, health workers need to be given informative feedback on their performances. The implications of this research suggest that, health facility workers should be given feedback from the district level and the districts should get feedback from the zonal and ministry levels. This can change the perception of upward reporting to fulfill the needs of the higher levels, and make them feel the ownership of the data they collect. This research suggests provision of written informative feedback on good and bad performance. Informative feedback strengthens learning if it is either negative or positive. If it is feedback on bad performance, the information given should indicate the weaknesses and ways of solving them. For good performance, the strengths should be highlighted and health workers should be congratulated. In addition, this study gave health workers feedback that indicated the performance of the facility or district compared with other facilities or districts. Having known their position, health workers tried their best not to be seen as a poorly performing facility or district the next time.

Furthermore, the implications of the study give suggestions on strengthening the HMIS to support the use and collection of data as a way of improving the culture of using information. The HMIS need to set policies and guidelines for using and collecting data. These guidelines should include procedures for collecting and using data, handling errors and mistakes in data collected and ensuring its quality. The HMIS should also design tools for using data; such tools could be used for planning and management in all levels of the HMIS.

The training and supporting strategies that are suggested in this study as elaborated in answering the research questions are summarized in Figure 7.8.

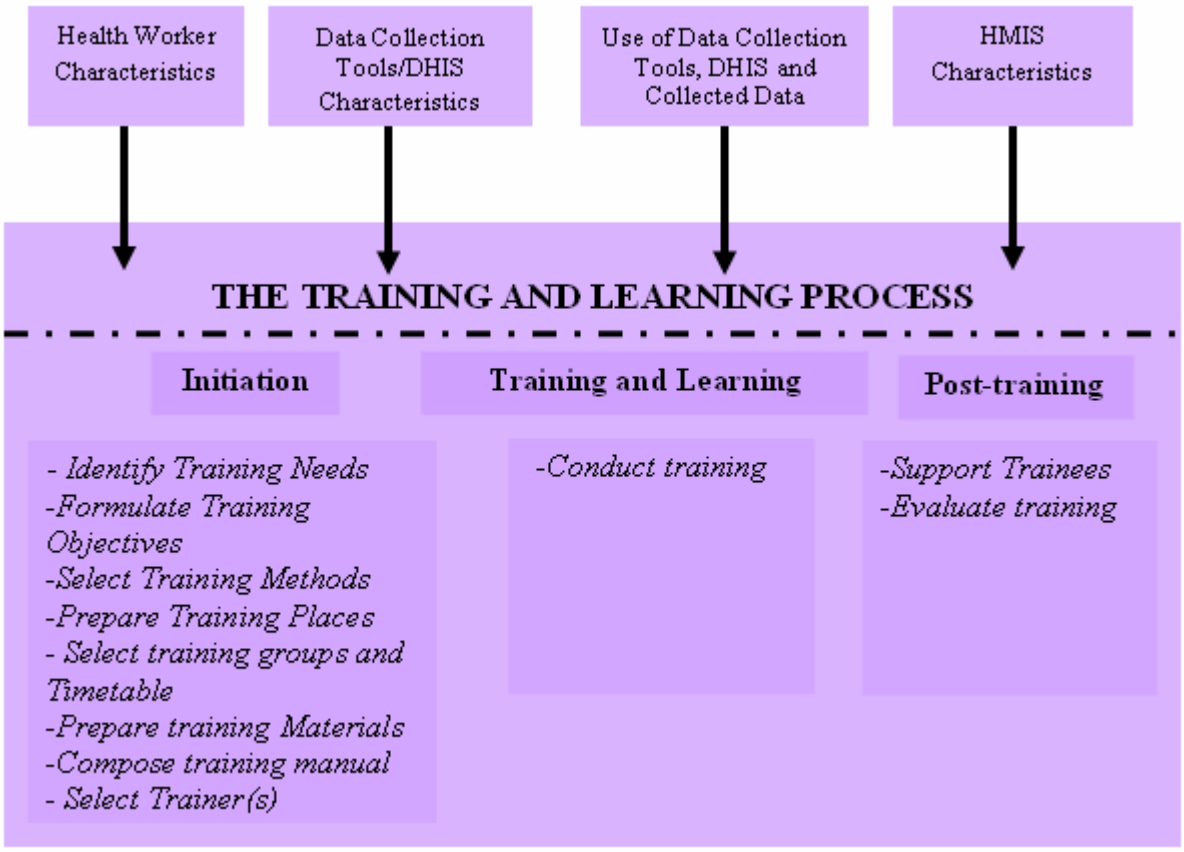


Figure 7.8: Suggested Training and Supporting Strategies

8. CHAPTER 8: Conclusion

This chapter presents the concluding remarks on the research contribution and recommendations. Research contributions are presented in section 8.1 and recommendations are in section 8.2. Research limitations are presented in section 8.3 and section 8.4 presents recommendations for further research.

8.1. Research Contribution

In this research, I intended to come up with training and supporting strategies that can help health workers in learning and creating meaning of what they do. Some health workers have managed to engage themselves in learning and they have improved their skills, and changed their practices and perceptions on health data after training. The results accomplished have added value to training qualitatively and quantitatively. These contributions have added scientific knowledge in the theory, methodology and practice.

8.1.1. Theoretical Contributions

Health Information Systems are constrained by a number of problems, as I have seen from the empirical findings and other researchers that, most of the data collected is incomplete, inaccurate, untimely and not used for action (Braa et al., 2001; Lippeveld, 2001; Sauerborn, 2000). These are a result of other problems such as insufficient training, the culture prevailing in the health sector, English language proficiency, low computer literacy, design of data collection tools, and bureaucratic ways of making decisions. This research contributes theoretically by conceptualising training as a cultivation strategy that can be used to sustain the implementation of HMIS in Zanzibar specifically and in a developing country context in general.

Cultivation as a suggested strategy for developing information infrastructures (Hanseth 2002; Hanseth, 2000; Hanseth & Aanestand, 2003) is also suggested in this research as one way of sustaining the implantation of HMIS in Zanzibar trough training and support.

For training to build capacity it has to be included in the HMIS broad objectives and when preparing it, there should be a careful selection of trainers, trainees, training objectives, training methods to use, training places and content of training. The trainer should facilitate learning while the trainees control the process. To make learning an ongoing process, health workers need to be supported and retrained often to have appropriate skills that will help them evolve along with the infrastructure.

This study also contributes the use of Compeau et al. (1995) training and learning framework for conducting training for computer and non-computer use through informal training. The framework gives guidelines on initiating training, conducting training and post-training activities but it does not suggest how to conduct these activities. In the initiation phase, the framework does not suggest when training should take place and who should participate. In the training and learning phase, the framework give the guideline on conducting training on-job but it does not say how or who should conduct training. In the post-training phase, the framework give guideline that trainees should be supported and training should be evaluated, but they do not explain how these can be done.

The empirical findings of this research have shown that health workers need to be trained at the introduction of new data collection tools – both manual and computerized. Lippeveld (2000) also suggests that training should be conducted before or at the introduction of new data collection tools. This can reduce the confusion between old and new practices and health workers can switch to the new practices right after training.

The choice of the training participants should focus on the health workers who need the skills and knowledge trained. In the facilities, all the facility workers have to be involved in the training, this will give them an opportunity to learn how to fill in data collection tools and how to use the data collected for action. In the districts, the District Health Management Team has to be included in the training. This can reduce the risk of training wrong people who cannot be useful after training. However, Lippeveld (2000) suggested that only the health personnel at the districts have to be involved in training. This research suggests that building a system wide capacity for collecting and using data, all health workers need to be involved in training in order to improve their understanding on health data.

To conduct training, the findings of this research suggest that training has to be prepared before it is conducted as a collaborative initiative between the trainer and the trainees. Clear training objectives should be set, acted upon and evaluated at the end of training. Training instructions have to reflect the natural complexity of real world and support collaborative social negotiations in the construction of knowledge (Jonassen, 1994). Lippeveld (2000), suggests that training programs should not only explain how to fill in the forms but also how to use the information generated, clearly written or printed instructions on how to fill in forms should be available at the time of training and handled to trainees after training.

The empirical findings of this research and the Compeau et al. (1995) training and learning framework suggest that training courses should be conducted on-job. This can make it easier to involve everyone in the learning process since the discussions will be in small groups that are easy to facilitate because people learn best when they collaborate with others (Gallivan et al. 2005; Boddy et al., 2005; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006; Østmo, 2007). For the choice of trainers, Murphy (1997) suggests that trainers should be facilitating the intervention while students control leaning because people acquires and integrates knowledge not only by reproducing what the teacher trains them but also through the influences of organizational culture, training methods used, social influence, their involvement and participation, and interactions with the system. Findings of this research suggest that the trainers need to have socio-technical skills with an understanding of both computer and health domain knowledge, and with good communication skills.

During the post-training phase of the framework, the findings of this research suggest that health workers need to be provided with supportive supervision and informative feedback. This is also suggested in the RHINO discussion (2001) as they explain that managers at the district levels should support the use of data in the facilities and give them meaning feedback on the collected data. To evaluate training, this study used Kirkpatrick (1996) four levels of evaluation where I evaluated training reaction, learning, behavior change and training results. The results of the evaluation have shown improvements in health workers skills, behavior and performance and the comments and recommendations I got from health workers helped me to modify some of the training materials and my presentation in delivering training.

8.1.2. Methodological Contributions

Conducting training in this action research has enabled me to improve training by involving health workers in initiating training and in the learning and training process. The research took a concurrent triangulation strategy where data was collected and analyzed qualitatively and quantitatively giving priority to the qualitative data.

Using the quantitative approach, I have been able to collect data that has helped me in evaluating training. Quantitative results show that the magnitude of completeness problem has changed from 8% before training to 4% after training and accuracy problem has changed from 15% before training to 6% after training. This was noted as a good improvement.

8.1.3. Practical Contributions

In this research, I have been engaged in the implementation of HMIS in Zanzibar through training and supporting health workers. Conducting on-job training and support at the grass root levels of the HMIS, health facilities and districts, has given me a better understanding of their problems and through that I have been able to initiate and conduct training that suited their needs.

In addition, I have introduced ways that health workers can employ in using their data by calculating indicators, drawing and interpreting graphs, and tables and use that knowledge to take desired actions. To enhance that I gave them calculators and graph papers, I also gave them folders for storing their monthly reports.

The calculators helped them to simplify calculations, and reduce calculation errors. Graph papers were used for drawing graphs, as has been shown previously. It was easier for the health workers to draw graphs using graph papers than plain papers. The folders were used to store data collection tools; this helped them to reduce the risk of misplacing data collection tools and having a common place to storing them.

Furthermore, this research has taken part in reducing the number of health workers who have not received training. The number has changed from nine health workers before training to three after training in Pemba. In Unguja, it has changed from eight before training to two health workers after

training. This makes the total from seventeen to five. Meaning that 88% of the gap between health workers who have received training and who have not has been recovered.

Using the Learning-by-doing as suggested by Compeau et al. (1995), Hmelo-Silver (2004) and Hmelo-Silver & Barrows (2006) and informal learning as suggested by Daley (1997), Lovin (1992) and Watkins & Marsick (1992) for conducting training, this study has contributed to the improvement of health workers' problem-solving skills, motivated them intrinsically and improved teamwork.

8.2. Recommendations

Due to the exposure in the field, I have been observing a number of activities taking place and this section describes some of my recommendations in initiating training, conducting training, supporting health workers and evaluating training, and in improving the culture of using information, through the reflection of my findings.

In initiating training

For successful training, I recommend that, the HMIS management need to understand the importance of training and formulate training objectives. These objectives can help in allocating sufficient training and support budgets and change the perception on training to be seen as a way of improving skills and performance and not just gaining per diems.

Training budgets have to be sufficient for the completion of training. For the allocation of sufficient budget for training, the implications of this research recommend that, the HMIS has to include training in the HMIS broad objectives. This can help in considering the allocation of sufficient training budget. Having training included in the HMIS wide objectives, the management can formulate appropriate training objectives that will ensure its success. As thus, good trainers will be selected, appropriate participants for training will be chosen and training will be evaluated to see its impact and the results obtained will help the management to find ways of improving it in the future.

Training objectives have to be formulated by considering the results needed after training. These objectives will guide the whole training process and they can be used after training to see how much have been accomplished from training. The objectives have to be openly communicated to all the involved parties in the training.

Training participants should not be selected on bureaucratic or patronage basis but the management should ask themselves who needs this training. This will avoid wasting resources on training unintended health workers. Trainers for conducting training should also be carefully selected. This study suggests trainers should have knowledge on the subject training and with good communication skills so as to be able to facilitate training, and s/he needs to have a desire to teach and to meet the needs of the trainees.

The choice of training places should also be considered. The implication of the findings have indicated that training place should be convenient for both trainers and trainees and any inconveniences such as interruptions and noises should be avoided.

Due to the complex nature of the HMIS, training as an ongoing process, it has to be conducted from time to time. This research suggests the frequency of training to be at least once a year. The HMIS revise the data collection tools every year as explained by the HMIS coordinator, so health workers have to be trained after this revision to update them with the changes if there are any and to improve their skills.

Training methods selected should incorporate hands-on-use. Training should also be carried out in discussion groups that are facilitated by the trainers. Such methods will help health workers to be involved in learning what they are doing. The findings of this research have indicated that training methods that incorporate hands-on-use and a social aspect of discussion groups help to improve health workers' problem solving skills, motivate them intrinsically and improve teamwork. The actions performed have to be based on health workers daily experiences.

Furthermore, the choice of subject content for the training materials should be based on accomplishing the training objectives. The material used has to reflect the situation on the ground,

elaborations and examples have to base on the facility or district data. The findings of the study indicate that training materials should include overview, presentation material, exercises and handouts. The overview should consist of introductory information and presentation of basic concepts of the subject to be learned. Presentation material should contain the specific procedures on using data collection tools, DHIS and data collected. Exercises should be given after the presentation to help in evaluating learning. Handouts are provided to assist the trainee during the training session and for later references after training. In addition, exploratory training manuals have to be prepared and distributed to health workers after training. The manuals and handouts given to trainees after training have to be simple and use appropriate language that will help health workers get appropriate information when referring to them. This can encourage health workers to continue learning after training.

In conducting training

To conduct training, I recommend that, methods that help the learners to construct mental models should be chosen. Such methods can help in improving skills, performance and changing behaviors of learners because people can learn something provided there is sufficient time and training to enable them acquire necessary skills and knowledge. To do so, training has to focus on improving problem-solving skills, building teamwork and nurturing intrinsic motivation and this can be achieved by using hands-on training methods.

The trainees should be shown the outcomes of training, for example, graphs they will be able to draw, indicators they will be able to calculate, problems they will be able to solve, difficulties they will be able to face, decisions they will be able to make from their data etc after training.

I recommend training to be conducted in group discussions where health workers interact with themselves and the teacher and with computers if they are trained on using computers. The trainer should improvise training while the trainees control learning.

In evaluating training

I recommend training to be evaluated in order to identify its impact. Health workers reactions toward training should be evaluated, learning, behavior change and training results should also be evaluated. The results obtained can help the HMIS to find ways of further improve training, such as who should be involved in training, how and when should training be conducted, what materials to be used, and who should conduct training.

In supporting health workers

Training does not end at the end of the training session, health workers have to be supported in applying the gained knowledge for the change of their behaviors to take effect. This research recommends that health workers need to be given supportive supervision and informative documented feedback at least once per month. In the facilities, they should be given support and feedback from the district level and in the districts, the zonal and ministry levels should give them feedback.

This study recommends health workers to be supported in the problems facing them either by working with them or by giving them opinions on how to solve them. This can make health workers feel that the management cares about them and they help them in facing their problems, as thus they will avoid reporting the same mistakes in the future.

This research suggests provision of written informative feedback on good and bad performance. The information given during feedback should indicate the weaknesses and how to solve them if it is for bad performance. For good performance, the strengths should be highlighted and health workers should be congratulated. In addition, the feedback should indicate the performance of the facility or district compared with other facilities or districts. This will show the health workers their health facility's position in relation to other facilities and districts. It will also help to awaken them to make them try their best not to be seen as a poorly performing facility of district next time.

In improving the culture of using information

From the empirical findings, I recommend that the culture of using information can be improved by improving the design of data collection tools and strengthening the HMIS in the support of using data.

The implications of this study have indicated that the layout of the data collection tools can influence the use of data. This study recommends the layout of some HMIS data collection tools to be reconsidered for revision. I recommend the use of one language, either Kiswahili or English, on both secondary and primary data collection tools. This can reduce the confusion when aggregating the data at the end of the month. The sequence of flow of data also needs to be looked into, especially on the fields where the data is to be summed up or consistent to what has been written in other fields. The headings on the columns have to reflect the kind of data to be filled in. There is also a need for simplifying the formulas on the forms. In addition, there should be explanations to clarify on the formulas and summing up values either at the backside of the form or in the instruction manual. This can improve the accuracy of data and make health workers feel confident to use their data and rely on it for decision making and planning.

Another recommendation is to strengthen the HMIS in supporting the use of data. This can be done in many ways some of them are to motivate, support and empower health workers, and putting in place HMIS guidelines, procedures and policies for handling quality of data

To motivate health workers to use data, I recommend that HMIS should devise incentives for using data by rewarding and supporting health workers in using their data. To support the use of data, I recommend HMIS to create tool(s) or devise ways of using data at all levels of HMIS. Empowering health workers to participate effectively in using data for making decisions and planning, I recommend that health workers have to improve their statistical skills. I also recommend that there should be information officers in the districts who are responsible for handling the data. These officers can be responsible for the district data, supporting health workers and providing informative feedback to health workers at facilities

8.3. Research Limitations

Long-term impact of training as one way of evaluating and improving training could not be done in this research due to time limitations.

To device training and support manuals was one of the goals of the research that have not been achieved. The support cycle of the action research could not be done due to time limitations and other constraints; as a result, no manual was developed.
In addition, I could not create DHIS instruction manual for the districts because there was one that was under construction by the HISP team, which they suggested I should test during the research instead of making a new one so as to improve it. However, I got the copy at the later stage of the research and it was in its early development stage, not ready to be used.

Lack of experience in health domain has limited my study. With such experience, I would have more knowledge on the problem domain and that could have helped me better interpret my findings and perform the actions. Despite these limitations, I believe my findings are valid and may be useful in other settings.

8.4. Further Research

This as an action research is the beginning of other action for the improvement of scientific knowledge. For further improve the gained knowledge, I would suggest other researchers to

- Continue with the support cycle of this research
- Evaluate the training impact on the gained knowledge in terms of health workers attitudes, satisfactions, expectations, behavior, and performance and suggest more ways of improving it
- Study on how to support users and give them feedback to motivate them intrinsically.

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Appendices

Appendix A: Interview Question Guide

A.1. In the Health Facilities

English Version

Education

1. What is your Education background?

Using HMIS data collection tools

2. Did you receive training on using the HMIS data collection tools?
3. If not, when you get training how will it help you?
4. If yes, do you understand all the sections on the data collection tools?
5. Are you ready to be trained?

Reporting to the District

6. When do you report to the district?
7. What are the problems that make you report late?

Data Use

8. How do you use the data you collect?
9. Do you think if you had more skills you can use the data for other purposes?
10. How could the use the data help you?

HMIS

11. Do you understand the HMIS?
12. What is you opinion on the new data collection tools compared to the old ones?

Feedback and support

13. What kind of feedback do you receive feedback from the district and vertical programs?
14. If you receive feedback, how do they help you?
15. If you don't receive feedback, how do you think it will make a difference if you receive them?
16. How does the district support you?

Training

17. What can you say about the training you received?
18. How did the training help you?

Kiswahili Version

Elimu

1. Una kiwangogani cha elimu?

Kutumia Fomu za HMIS

2. Umepata mafunzo yoyote kuhusu matumizi ya fomu za HMIS?
3. Kama hukupata, ungeyapata yangekusaidiaje?
4. Kama umepata, unaelewa vipengele vyote kwenye fomu?
5. Uko tayari kupewa mafunzo hayo?

Kuripoti Wilayani

6. Lini unaripoti wilayani?
7. Kuna matatizo yanayofanya uchelewe kuripoti?

Matumizi ya Data

8. Data unazokusanya unazitumiaje?
9. Unadhani ungekua na uelewa zaidi ungezitumia ipasavyo?
10. Ungezitumia zingekusaidiaje?

HMIS

11. Unaelewa mfumo mzima wa HMIS?
12. Unaonaje utaratibu wa fomu mpya na zile za zamani?

Mrudisho nyuma na Msaada

13. Unapata feedback ya aina gani kutoka wilayani au kwenye vetiko programs?
14. Kama unapata zinakusaidiaje?
15. Kama Haupati, ungepata zingekuletea tofauti gani?
16. Wilayani wanawasaidiaje mkiwa na matatizo?

Mafunzo

17. Una mchango gani kuhusiana na mafunzo uliyopata?
18. Mafundo uliyopata yamekusaidiaje?

A.2. In the Districts

English Version

Education and Computer literacy

1. What is your Education background?
2. Which computer applications can you use?

Using HMIS data collection tools and DHIS

3. Did you receive training on using the HMIS data collection tools and DHIS?
4. If not, when you get training how will it help you?
5. If yes, do you understand all the sections on the data collection tools?
6. How are you using DHIS in your daily activities?
7. If you receive training, will it help you in using DHIS?

Reporting to the District

8. When do you report to the zone?
9. What are the problems that make you report late?

Data Use

10. How do you use the data gathered from the facilities?
11. Do you think if you had more skills you can use the data for other purposes?
12. How could the use the data help you?

HMIS

13. Do you understand the HMIS?
14. What is you opinion on the new data collection tools compared to the old ones?
15. What difference does it make to your job to use DHIS compared with before when you were not using DHIS?

Feedback and support

16. What kind of feedback do you receive feedback from the zones, ministry and VPs?
17. If you receive feedback, how do they help you?
18. If you don't receive feedback, how do you think it will make a difference if you receive them?
19. How does the zone support you?

Training

20. What can you say about the training you received?
21. How did the training help you?

Kiswahili Version

Elimu

1. Una kiwangogani cha elimu?
2. Applikesheni gani zakompyuta unaweza kutumia?

Kutumia Fomu za HMIS

3. Umepata mafunzo yoyote kuhusu matumizi ya fomu za HMIS na DHIS?
4. Kama hukupata, ungeyapata yangekusaidiaje?
5. Kama umepata, unaelewa vipengele vyote kwenye fomu?
6. Unatumiaje DHIS kwenye kazi zako za kilasiku?
7. Ungepata mafunzo yangekusaidia kutumia zaidi DHIS?

Kuripoti Wilayani

8. Lini unaripoti kwenye zoni?
9. Kuna matatizo yanayofanya uchelewe kuripoti?

Matumizi ya Data

10. Data unazokusanya unazitumiaje?
11. Unadhani ungekua na uelewa zaidi ungezitumia ipasavyo?
12. Ungezitumia zingekusaidiaje?

HMIS

13. Unaelewa mfumo mzima wa HMIS?
14. Unaonaje utaratibu wa fomu mpya na zile za zamani?
15. Unaona tofauti gani kutumia DHIS na kutotumia?

Mrudisho nyuma na Msaada

16. Unapata feedback ya aina gani kutoka kwenye zoni, wizarani au kwenye VPs?
17. Kama unapata zinakusaidiaje?
18. Kama Haupati, ungepata zingekuletea tofauti gani?
19. Zoni wanawasaidiaje mkiwa na matatizo?

Mafunzo

20. Una mchango gani kuhusiana na mafunzo uliyopata?
21. Mafundo uliyopata yamekusaidiaje?

A.3. Other Interviews

1. How is the current Health Information System functioning?
2. What are the achievement of the new Health Information System?
3. What are the failure of the implementation of Health Information System?
4. What are the achievements of computerizing some of the functions in the HMIS?
5. How do you conduct training?
6. How I data used at all the levels of the HMIS?
7. What is your opinion on the status of data quality comparing before and after the implementation of HMIS?
8. How do you make sure that HMIS implementation is sustainable?

Appendix B: Some Results from Interviews, Document Reviews and Observations

B.1. Identified Problems and Education Backgrounds in Pemba Health Facilities

IDENTIFIED PROBLEMS AND EDUCATIONAL BACKGROUNDS OF HEALTH WORKERS IN PEMBA							
Health Facility	**Interviewed HWs**	**Education Background**	**Received previous training**	**PROBLEM**			
				Completeness	**Accuracy**	**Timeliness**	**Data use**
ZIWANI	SN in charge MCH aid Orderly Nurse	Form 3 + Certificate Form 3 + Certificate Form 3 + Certificate	YES YES NO	YES	YES	NO	YES
GOMBANI	MCH aid Medical Doctor	Form 3+ Certificate Form 6 + Diploma	YES YES	YES	YES	YES	YES
CHAKE CHAKE	PH Nurse PH Nurse MCH Aid Nurse Midwife	Form 3 + Certificate Form 3 + Certificate Form 3 + Certificate Form 4 + Certificate	YES NO YES NO	YES	YES	YES	YES
NDAGONI	SN in charge PH Nurse MCH aid Orderly Nurse	Form 3 + Certificate Form 3 + Certificate Form 3 + Certificate Form 3 + Certificate	YES NO YES NO	YES	YES	NO	YES
V/Cottage	Medical Doctor RCH in charge Nurse Midwife SN – STI	Form 6 + Diploma Form 3 + Certificate Form 3 + Certificate Form 3 + Certificate	YES YES NO NO	YES	YES	YES	YES
SDA	SN in charge Nurse Midwife	Form 4 + Certificate Form 4 + Certificate	NO NO	YES	YES	NO	YES

B.2. Identified Problems and Education Backgrounds in Unguja Health Facilities

IDENTIFIED PROBLEMS AND EDUCATIONAL BACKGROUNDS OF HEALTH WORKERS IN UNGUJA							
Health Facility	**Interviewed HWs**	**Education Background**	**Received previous training**	**PROBLEM**			
				Completeness	**Accuracy**	**Timeliness**	**Data use**
K/Samaki	PH Nurse PH Nurse Nurse Midwife Orderly Nurse	Form 4 + Certificate Form 4 + Certificate Form 3 + Certificate Form 3 + Certificate	YES NO YES NO	YES	YES	NO	YES
SOS	PH Nurse	Form 4 + Certificate	YES	YES	YES	NO	YES
FUONI	PH Nurse MCH Aid MCH Aid Nurse Midwife	Form 4 + Certificate Form 4 + Certificate Form 3 + Certificate Form 3 + Certificate	YES NO YES NO	YES	YES	YES	YES
KMKM	SN Midwife PH Nurse MCH aid	Form 4 + Certificate Form 4 + Certificate Form 4 + Certificate	YES NO YES	YES	YES	NO	YES
WELEZO	Medical Doctor MCH Aid Nurse Midwife	Form 6 + Diploma Form 4 + Certificate Form 4+ Certificate	YES YES NO	YES	YES	YES	YES
MAGOGONI	PH Nurse PH Nurse Nurse Midwife Orderly Nurse	Form 4+ Certificate Form 4+ Certificate Form 3+ Certificate Form 3+ Certificate	YES NO YES NO	YES	YES	NO	YES

Appendix C: Results from Reviewing Data Collection Tools

C.1. Percentages of Incompleteness an Inaccuracy in filling in Monthly Reports before and after Training in Pemba

PERCENTAGES OF INCOMPLETENESS AN INACCURACY BEFORE AND AFTER TRAINING IN PEMBA											
Health Facility	**Report**	**Before Training**					**After Training**				
		Month	**Incompleteness (%)**	**Aver age**	**Inaccuracy (%)**	**Aver age**	**Month**	**Incompleteness (%)**	**Aver age**	**Inaccuracy (%)**	**Aver age**
ZIWANI	ICCM	May	1/68 = 1	**1**	9/68 = 13	**11**	Aug	0	**0**	0	**0**
		June	0		2/68 = 3		Sept	1/68 = 1		1/68 = 1	
		July	1/68 = 1		11/68 = 16		Oct	0		0	
	RCHS	May	0	**0**	20/106 = 19	**20**	Aug	1/106 = 1	**1**	2/106 = 2	**2**
		June	0		23/106 = 22		Sept	0		2/106 = 2	
		July	0		19/106 = 18		Oct	2/106 = 2		2/106 = 2	
	MDSR	May	36/138 = 26	**26**	40/138 = 29	**28**	Aug	34/138 = 25	**26**	34/138 = 25	**26**
		June	35/138 = 25		39/139 = 28		Sept	40/138 = 29		40/138 = 29	
		July	38/138 = 28		38/138 = 28		Oct	34/138 = 25		35/138 = 25	
GOMBANI	ICCM	May	1/68 = 1	**0**	1/68 = 1	**1**	Aug	0	**0**	0	**0**
		June	0		0		Sept	0		1/68 = 1	
		July	0		2/68 = 3		Oct	0		0	
	RCHS	May	1/106 = 1	**5**	16/106 = 15	**25**	Aug	9/106 = 9	**3**	9/106 = 9	**4**
		June	0		35/106 = 34		Sept	0		0	
		July	15/106 = 14		26/106 = 25		Oct	0		2/106 = 2	
	MDSR	May	77/138 = 56	**45**	77/138 = 56	**46**	Aug	37/138 = 27	**30**	37/138 = 27	**31**
		June	71/138 = 51		73/138 = 53		Sept	34/138 = 25		34/138 = 25	
		July	39/138 = 28		39/138 = 28		Oct	54/138 = 39		55/138 = 40	
NDAGONI	ICCM	May	2/68 = 3	**1**	5/68 = 7	**9**	Aug	1/68 = 1	**1**	1/68 = 1	**9**
		June	0		6/68 = 9		Sept	0		9/68 = 13	
		July	0		8/68 = 12		Oct	2/68 = 1		9/68 = 13	
	RCHS	May	0	**0**	20/106 = 19	**15**	Aug	1/106 = 1	**3**	1/106 = 1	**3**
		June	0		17/106 = 16		Sept	3/106 = 3		3/106 = 3	
		July	1/106 = 1		10/106 = 9		Oct	4/106 = 4		4/106 = 4	
	MDSR	May	1/138 = 1	**0**	3/138 = 2	**3**	Aug	1/138 = 1	**3**	1/138 = 1	**3**
		June	0		4/138 = 3		Sept	13/138 = 9		13/138 = 9	
		July	0		5/138 = 4		Oct	0		0	
	ICCM	May	0	**6**	2/68 = 3	**12**	Aug	12/68=18	**14**	15/68=22	**14**
		June	12/68 = 18		14/68 = 21		Sept	3/68 = 4		8/68 = 12	

CHAKE CHAKE		July	0		9/68 = 13		Oct	13/68=19		6/68 = 9	
	RCHS	May	23/106 = 22	**13**	34/106 = 33	**20**	Aug	0	**0**	0	**1**
		June	15/106 = 14		28/106 = 27		Sept	0		4/106 = 4	
		July	2/106 = 2		0		Oct	0		0	
V/COTTAGE	ICCM	May	9/68 = 13	**6**	11/68 = 16	**7**	Aug	0	**0**	4/68 = 6	**5**
		June	2/68 = 3		4/68 = 6		Sept	0		6/68 = 9	
		July	0		0		Oct	0		0	
	RCHS	May	1/106 = 1	**0**	13/106 = 12	**10**	Aug	0	**0**	0	**0**
		June	0		11/106 = 10		Sept	0		0	
		July	0		10/106 = 9		Oct	1/106 = 1		1/106 = 1	
	MDSR	May	84/147 = 57	**19**	84/147 = 57	**19**	Aug	0	**0**	0	**0**
		June	0		2/147 = 1		Sept	0		0	
		July	0		0		Oct	0		0	
SDA	ICCM	May	25/68 = 37	**17**	25/68 = 37	**18**	Aug	5/68 = 7	**7**	5/68 = 7	**8**
		June	8/68 = 12		10/68 = 15		Sept	9/68 = 13		12/68 = 18	
		July	1/68 = 1		1/68 = 1		Oct	0		0	
	RCHS	May	33/106 = 32	**15**	33/106 = 32	**22**	Aug	0	**0**	0	**2**
		June	4/106 = 3		18/106 = 17		Sept	0		6/106 = 6	
		July	10/106 = 9		19/106 = 18		Oct	0		0	
	MDSR	May	0	**1**	5/138 = 4	**5**	Aug	0	**0**	0	**0**
		June	2/138 = 1		7/138 = 5		Sept	0		2/138 = 1	
		July	3/138 = 2		8/138 = 6		Oct	0		0	

C.2. Percentages of Incompleteness an Inaccuracy in filling in Monthly Reports Before and After Training in Unguja

PERCENTAGES OF INCOMPLETENESS AN INACCURACY BEFORE AND AFTER TRAINING IN UNGUJA											
Health Facility	Report	Before Training					After Training				
		Month	Incompleteness (%)	Ave rage	Inaccuracy (%)	Aver age	Month	Incompleteness (%)	Aver age	Inaccuracy (%)	Aver age
K/SAMAKI	ICCM	April	7/68 = 10	4	10/68 = 25	15	July	0	0	2/68 = 3	1
		May	0		9/68 = 13		Aug	0		1/68 = 1	
		June	2/68 = 3		5/68 = 6		Sept	0		0	
	RCHS	April	1/106 = 1	3	11/106 = 10	14	July	0	0	1/106= 1	1
		May	5/106 = 5		17/106 = 16		Aug	0		1/106= 1	
		June	4/106 = 4		18/106 = 17		Sept	0		0	
FUONI	ICCM	April	5/68 = 7	4	15/68 = 22	13	July	0	0	7/68 = 10	6
		May	2/68 = 3		6/68 = 9		Aug	0		4/68 = 6	
		June	1/68 = 1		5/68 = 7		Sept	0		2/68 = 3	
	RCHS	April	37/106 = 35	12	46/106 = 45	23	July	4/106 = 4	2	4/106 = 4	2
		May	2/106 = 2		10/106 = 9		Aug	0		0	
		June	0		15/106 = 14		Sept	1/106 = 1		1/106 = 1	
	MDSR	April	2/138 = 1	2	4/138 = 3	4	July	0	0	0	0
		May	3/138 = 2		8/138 = 6		Aug	1/138 = 1		1/138 = 1	
		June	3/138 = 2		5/138 = 4		Sept	0		0	
SOS	ICCM	April	10/68 = 15	10	25/68 = 37	30	July	0	0	3/68 = 4	8
		May	9/68 = 13		21/68 = 31		Aug	0		4/68 = 6	
		June	2/68 = 3		15/68 = 22		Sept	0		10/68 = 15	
	RCHS	April	19/106 = 18	14	24/106 = 23	17	July	0	0	20/106 = 19	8
		May	10/106 = 10		11/106 = 10		Aug	0		5/106 = 5	
		June	14/106 = 13		19/106 = 18		Sept	0		0	
KMKM	ICCM	April	10/68 = 15	14	14/68 = 21	19	July	1/68 = 1	0	1/68 = 1	0
		May	12/68 = 18		18/68 = 26		Aug	0		0	
		June	7/68 = 10		7/68 = 10		Sept	0		0	
	RCHS	April	4/106 = 3	6	25/106 = 24	28	July	8/106 = 8	4	23/106 = 22	9
		May	8/106 = 7		22/106 = 21		Aug	4/106 = 4		4/106 = 4	
		June	9/106 = 8		39/106 = 38		Sept	0		1/106 = 1	
	ICCM	April	9/68 = 13	6	20/68 = 29	17	July	0	0	2/68 = 3	2
		May	2/68 = 3		9/68 = 13		Aug	0		2/68 = 3	

WELEZO		June	2/68 = 3		7/68 = 10		Sept	0		0	
	RCHS	April	34/106 = 33	**24**	35/106 = 34	**35**	July	0	**0**	22/106 = 21	**14**
		May	21/106 = 21		34/106 = 33		Aug	0		21/106 = 20	
		June	19/106 = 19		40/106 = 39		Sept	0		1/106 = 1	
MAGOGONI	ICCM	April	1/68 = 1	**1**	1/68 = 1	**3**	July	0	**1**	0	**3**
		May	1/68 = 1		1/68 = 1		Aug	2/68 = 3		3/68 = 4	
		June	0		5/68 = 7		Sept	0		4/68 = 6	
	RCHS	April	8/106 = 8	**3**	13/106 = 13	**10**	July	0	**0**	0	**2**
		May	0		8/106 = 8		Aug	0		0	
		June	0		9/106 = 9		Sept	1/106 = 1		5/106 = 5	
	MDSR	April	1/138 = 1	**0**	12/138 = 7	**3**	July	0	**9**	0	**9**
		May	0		2/138 = 1		Aug	1/138 = 1		1/138 = 1	
		June	0		2/138 = 1		Sept	35/138 = 25		35/138 = 25	

C.3. Percentages of Incompleteness an Inaccuracy in filling in Monthly Reports in the Facilities that were not trained

PERCENTAGES OF INCOMPLETENESS AN INACCURACY IN THE FACILITIES THAT WERE NOT TRAINED											
Health Facility	**Report**	**Situation Before**					**Situation Later**				
		Month	**Incompleteness (%)**	**Aver age**	**Inaccuracy (%)**	**Aver age**	**Month**	**Incompleteness (%)**	**Aver age**	**Inaccuracy (%)**	**Aver age**
Sanasa	ICCM	April	1/68 = 1	**1**	3/68 = 4	**6**	July	0	**0**	1/68 = 1	**3**
		May	2/68 = 3		8/68 = 12		Aug	0		3/68 = 4	
		June	0		2/68 = 3		Sept	0		5/68 = 6	
	RCHS	April	43/106 = 41	**28**	46/106 = 43	**31**	July	4/106 = 4	**16**	40/106= 38	**40**
		May	30/106 = 28		30/106 = 28		Aug	26/106 = 23		42/106= 40	
		June	16/106 = 15		22/106 = 21		Sept	23/106 = 22		45/106 = 42	
Kizimbani	ICCM	April	2/68 = 3	**2**	12/68 = 18	**17**	July	2/68 = 3	**6**	17/68 = 25	**25**
		May	1/68 = 1		11/68 = 16		Aug	9/68 = 13		19/68 = 28	
		June	1/68 = 1		11/68 = 16		Sept	1/68 = 1		15/68 = 22	
	RCHS	April	4/106 = 4	**2**	29/106 = 27	**28**	July	3/106 = 3	**4**	15/106 = 14	**14**
		May	1/106 = 1		23/106 = 22		Aug	8/106 = 8		18/106 = 17	
		June	0		38/106 = 36		Sept	2/106 = 2		12/106 = 11	
	MDSR	April	4/138 = 3	**3**	12/138 = 3	**4**	July	8/138 = 6	**2**	11/138 = 8	**4**
		May	4/138 = 3		11/138 = 6		Aug	0		4/138 = 3	
		June	3/138 = 2		11/138 = 4		Sept	0		2/138 = 1	
Selemu	ICCM	April	2/68 = 3	**2**	3/68 = 4	**6**	July	0	**4**	0	**12**
		May	1/68 = 1		8/68 = 12		Aug	0		5/68 = 7	
		June	1/68 = 1		2/68 = 3		Sept	8/68 = 12		20/68 = 29	
	RCHS	April	1/106 = 1	**2**	37/106 = 35	**24**	July	0	**6**	21/106 = 20	**19**
		May	3/106 = 3		16/106 = 15		Aug	15/106 = 14		25/106 = 24	
		June	1/106 = 1		23/106 = 22		Sept	4/106 = 4		13/106 = 12	
	MDSR	April	52/138 = 38	**40**	52/138 = 38	**41**	July	112/138 = 81	**55**	116/138 = 84	**57**
		May	48/138 = 34		50/138 = 36		Aug	83/138 = 60		86/138 = 62	
		June	67/138 = 49		67/138 = 49		Sept	35/138 = 25		35/138 = 25	
	ICCM	April	0	**5**	5/68 = 7	**14**	July	7/68 = 10	**3**	14/68 = 21	**9**
		May	6/68 = 9		12/68 = 18		Aug	0		3/68 = 4	
		June	4/68 = 6		11/68 = 16		Sept	0		1/68 = 1	
		April	0		22/106 = 21		July	3/106 = 3		25/106 = 24	

Bwefumu	RCHS	May	6/106 = 6	**2**	27/106 = 25	**16**	Aug	0	**1**	21/106 = 20	**22**
		June	0		34/106 = 32		Sept	1/106 = 1		24/106 = 23	
	MDSR	April	37/138 = 27	**27**	37/138 = 27	**35**	July	20/138 = 14	**5**	23/138 = 17	**8**
		May	35/138 = 25		35/138 = 25		Aug	0		4/138 = 3	
		June	40/138 = 29		74/138 = 54		Sept	1/138 = 1		5/138 = 4	
Kombeni	ICCM	April	0	**4**	11/68 = 16	**19**	July	2/68 = 3	**5**	10/68 = 15	**18**
		May	2/68 = 3		12/68 = 18		Aug	8/68 = 12		18/68 = 26	
		June	6/68 = 9		16/68 = 24		Sept	1/68 = 1		9/68 = 13	
	RCHS	April	3/106 = 3	**3**	18/106 = 17	**18**	July	2/106 = 2	**4**	10/106 = 9	**11**
		May	3/106 = 3		23/106 = 22		Aug	8/106 = 8		18/106 = 17	
		June	2/106 = 2		15/106 = 14		Sept	1/106 = 1		9/106 = 8	
	MDSR	April	6/138 = 4	**13**	9/138 = 7	**15**	July	39/138 = 28	**18**	39/138 = 28	**20**
		May	37/138 = 27		37/138 = 27		Aug	2/138 = 1		4/138 = 3	
		June	12/138 = 9		16/138 = 12		Sept	35/138 = 25		38/138 = 28	

Appendix D: Samples of Data Collection Tools

D.1. Immunization and Cold Chain Monitoring (ICCM) Monthly Report

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
IMMUNIZATION AND COLD CHAIN MONITORING

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

Status of equipment at the health facility

Item	Status		Remarks
	Working	Not working (how long)	
Refrigerator			
Thermometer			

Antigen use at the health facility

Antigen	Doses given			Antigen stock (in doses)				Doses wasted	Percentage wastage
	< 1 yr	≥ 1 yr	Total	Start balance	Received	In stock	End balance		
Guide	(a)	(b)	(C) = a+b	(d)	(e)	(f) = d+e	(g) - ledger	(h)=f-(c+g)	(i)=h/(c+g)*100
BCG									
DPT HepB 1									
DPT HepB 2									
DPT HepB 3									
Polio 0									
Polio 1									
Polio 2									
Polio 3									
Measles									
Fully immunized under 1 year ----→						No. of children born protected →			

Tetanus toxoid for women

Antigen	Doses given			Antigen stock (in doses)				Doses wasted	Percentage wastage
	Pregnant women	WRA	Total	Start balance	Received	In stock	End balance		
Guide	(a)	(b)	(C) = a+b	(d)	(e)	(f) = d+e	(g) - ledger	(h)=f-(c+g)	(i)=h/(c+g)*100
TT 1									
TT 2									
TT 3									
TT 4									
TT 5									

Vitamin A Supplement

Category	Doses given
Postnatal mothers	
Children during Measles vaccination	
Children at 15 months	
Children at 21 months	

Name of service provider _____

Designation _____

Signature _____ Date ____/___/20___

D.2. Reproductive and Child Health Services (RCHS) Monthly Report

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 _____

D.3. Monthly Disease Surveillance Report (MDSR)

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
MONTHLY DISEASE SURVEILLANCE REPORT

Name of health facility _____ District _____Month _____20___

Total headcounts ---------- →		Total headcounts under 5 years -------→	

Immunizeable disease

Diagnosis	0 – 11 months			1 – 5 years		
	Vaccinated	Unvaccinated	Unknown	Vaccinated	Unvaccinated	Unknown
Measles						
AFP						
NNT						

Malaria

Under 5 years			5 years and above		
New	Reattendance	Referred	New	Reattendance	Referred

Other diagnosis

Diagnosis	< 5 years		≥ 5 years	
	N	R	N	R
Anaemia				
Pneumonia				
Diarrhoea				
Urinary Tract Infection (UTI)				
Schistosomiasis				
Acute Respiratory Infections (ARI)				
Malnutrition				
Intestinal Worms				
Scabies				
Eye diseases				
Typhoid				
Dysentry				
Tuberculosis (TB)				
Dental carries				
Cholera				
Road Traffic Accidents (RTA)				
Yellow fever				
Trauma / Injuries				
Rabies / Animal bites				
Tetanus				
Mental diseases				
Substance abuse				
M. Meningitis				
Filariasis				
Disorders of childhood				
Epilepsy				

Note: N = new case; R = Reattendance

Referral cases (State problems)

Condition	Cases
Total number referred	

Deaths (Reported deaths in the hospital / catchment area)

Diseases	No. of deaths reported		Diseases	No. of deaths reported	
	< 5 years	≥ 5 years		< 5 years	≥ 5 years
Malaria			Measles		
Cholera			NNT		
Yellow fever			Tetanus		
Diarrhoea			Meningitis		
Dysentry			Pneumonia		
Rabies / Animal bites			AFP		
Tuberculosis (TB)			RTA		
HIV/AIDS			Others		
Total deaths (Male) →			**Total deaths (Female) →**		

In-patients' record (For PHCC only)

Bed capacity		No. of patients in the beginning of month	No. of admissions	No. of discharges		No. of deaths	No. of patients end of the month	No. of lying days
Authorised	Actual			Home	Transfers			

Comments

Name of service provider _____ Designation _____

Signature _____ Date _____

D.4. Zero Zero Form for Reproductive Health

WIZARA YA AFYA NA USTAWI WA JAMII, ZANZIBAR
HUDUMA ZA AFYA YA UZAZI

Jina la kituo _____ Wilaya _____ Mwezi _____

Mahudhurio ya kwanza kwa mama wajawazito

	Mimba ya kwanza	Jumla	Mimba ya pili na kuendelea	Jumla
Kabla ya wiki 20	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Wiki 20 na zaidi	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	

Mahudhurio ya marudio kwa mama wajawazito

Mimba ya kwanza	Jumla	Mimba ya pili na kuendelea	Jumla
00000 00000		00000 00000	

Matumizi ya kinga ya malaria (IPT) kwa mama wajawazito

Dozi ya kwanza (wiki 20 – 24)	Jumla	Dozi ya pili (wiki 28 – 32)	Jumla
00000 00000		00000 00000	

Matatizo / magonjwa yanayohatarisha afya za mama wajawazito

		Jumla
EPH Gestosis / Pre-Eclampsia	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Anaemia	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Malaria	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Syphilis	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Uja uzito kabla ya miaka 18	00000 00000 00000 00000 00000 00000 00000 00000 00000	
Uja uzito baada ya miaka 35	00000 00000 00000 00000 00000 00000 00000 00000 00000	
Waliojifungua zaidi ya mimba 4	00000 00000 00000 00000 00000 00000 00000 00000 00000	
Waliopata ujauzito kabla ya miaka 3 kutoka mimba iliyopita	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	

Mahudhuri ya mama baada ya kujifungua (Postnatal visits)

SIKU YA 7	SIKU YA 14	SIKU YA 28	SIKU YA 42
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
Jumla	Jumla	Jumla	Jumla

D.5. Zero Zero Form for Immunization and Vitamin A Supplement

WIZARA YA AFYA NA USTAWI WA JAMII, ZANZIBAR
HUDUMA ZA CHANJO NA NYONGEZA YA VITAMIN A

Jina la kituo _____ Wilaya _____ Mwezi _____

Chanjo za watoto (fanya muoanisho kwa umri)

Aina	Umri chini ya mwaka 1	Jumla	Umri mwaka 1 na zaidi	Jumla
BCG	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
Polio 0	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000			
Polio 1	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
Polio 2	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
Polio 3	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
DPT He B 1	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
DPT He B 2	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
DPT He B 3	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
Measles	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000		00000 00000 00000 00000 00000 00000 00000 00000	
Watoto waliokamilisha chanjo Chini ya mwaka 1	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000			
Watoto waliozaliwa na mama Waliopata chanjo 2 za pepopunda na zaidi	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000			

Chanjo ya Pepopunda kwa mama wajawazito (fanya muoanisho kwa kila dozi)

Dozi 1	Dozi 2	Dozi 3	Dozi 4	Dozi 5
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
Jumla	Jumla	Jumla	Jumla	Jumla

Chanjo ya Pepopunda kwa mama wasio wajawazito (fanya muoanisho kwa kila dozi)

Dozi 1	Dozi 2	Dozi 3	Dozi 4	Dozi 5
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
Jumla	Jumla	Jumla	Jumla	Jumla

Nyongeza ya Vitamin A		**Jumla**
Mama waliojifungua (Postnatal mothers)	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Watoto wakati wa chanjo ya surua	00000 00000	
Watoto wenye umri wa miezi 15	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	
Watoto wenye umri wa miezi 21	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	

D.6. Zero Zero Form for Children Nutrition Status

WIZARA YA AFYA NA USTAWI WA JAMII, ZANZIBAR
HALI YA LISHE YA WATOTO

Jina la kituo ___________________________ Wilaya _________________________ Mwezi ___________________

UMRI (MIEZI)	KIJANI (NZURI)		KIJIVU (HAFIFU)		NYEKUNDU (MBAYA)		JUMLA	
	W/ME	W/KE	W/ME	W/KE	W/ME	W/KE	W/ME	W/KE
0 – 11	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000	00000 00000 00000 00000 00000		
12 – 23	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000	00000 00000 00000 00000 00000		
24 – 35	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000	00000 00000 00000 00000 00000		
36 – 60	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000	00000 00000 00000 00000	00000 00000 00000 00000		
JUMLA								

D.7. OPD Tally Sheet

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
OPD TALLY SHEET

Name of health facility _____ District_____ Month _____

Malaria cases

Under 5 years			5 years and above		
New	**Reattendance**	**Referred**	**New**	**Reattendance**	**Referred**

Other diagnosis

Diagnosis	**< 5 yrs**		**≥ 5 yrs**	
	N	**R**	**N**	**R**
Anaemia				
Diagnosis	**< 5 yrs**		**≥ 5 yrs**	
	N	**R**	**N**	**R**
Pneumonia				
Diarrhoea				
Urinary Tract Infection (UTI)				

Schistosomiasis				
Acute Respiratory Infections (ARI)				
Diagnosis	**< 5 yrs**		**≥ 5 yrs**	
	N	**R**	**N**	**R**
Malnutrition				
Intestinal Worms				
Scabies				
Eye diseases				
Typhoid				

Dysentry				
Tuberculosis (TB)				
Dental carries				
Diagnosis	**< 5 yrs**		**>= 5 years**	
Cholera				
Road Traffic Accidents (RTA)				
Yellow fever				
Trauma / injuries				
Rabies / Animal bites				
Tetanus				
Mental diseases				
Substance abuse				
M. Meningitis				
Filariasis				
Disorders of Childhood				
Epilepsy				
Others				

Appendix E: Posters Used in Training

E.1. Poster for elaborating ICCM form

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
IMMUNIZATION AND COLD CHAIN MONITORING

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

Status of equipment at the health facility

Item	Status		Remarks
	Working	Not working (how long)	
Refrigerator			
Thermometer			

Antigen use at the health facility

Antigen	Doses given / Dozi zilizotolewa			Antigen stock (in doses)				Doses wasted / Dozi zilizoharibika	Percentage wastage
	< 1 yr	≥ 1 yr	Total	Start balance / Zilizoko kwenje friji (mwanzoni mwa mwezi)	Received	In stock	End balance / Zilizobaki kwenye friji (mwishoni mwa mwezi)		
Guide	**(a)**	**(b)**	**(C) = a+b**	**(d)**	**(e)**	**(f) = d+e**	**(g) = fridge**	**(h)= f – c - g**	**(i)=h/(c+g)*100**
BCG									
DPT HepB 1									
DPT HepB 2									
DPT HepB 3									
Polio 0									
Polio 1									
Polio 2									
Polio 3									
Measles									
Fully immunized under 1 year / Idadi ya Watoto Waliopata chanjo zote chini ya mwaka mmoja ----→					**No. of children born protected / Idadi ya watoto waliozaliwa na mama aliyepata angalau TT Mbili (TT 1 na TT 2) na zaidi →**				

Tetanus toxoid for women									
Antigen	Doses given / Dozi zilizotolewa			Antigen stock (in doses)				Doses wasted / Dozi zilizoharibika	Percentage wastage
	Pregnant women	WRA	Total	Start balance / Zilizoko kwenje friji (mwanzoni mwa mwezi)	Received	In stock	End balance / Zilizoko kwenje friji (mwishoni mwa mwezi)		
Guide	(a)	(b)	(C) = a+b	(d)	(e)	(f) = d+e	(g) = fridge	(h)= f - c - g	(i)=h/(c+g)*100
TT 1									
TT 2									
TT 3									
TT 4									
TT 5									

Vitamin A Supplement

Category	Doses given
Postnatal mothers	
Children during Measles vaccination	
Children at 15 months	
Children at 21 months	

Name of service provider _____

Designation _____

Signature _____ Date ____/___/20___

E.2. Poster for elaborating MDSR form

MINISTRY OF HEALTH AND SOCIAL WELFARE, ZANZIBAR
MONTHLY DISEASE SURVEILLANCE REPORT

Name of health facility _____ District _____Month _____20___

Total headcounts/ Idadi ya waliohudhuria kituoni ---------- →		Total headcounts under 5 years / Idadi ya waliohudhuria kituoni wenye umri chini ya miaka 5 ----------→	

Immunizeable disease

Diagnosis	0 – 11 months			1 – 5 years		
	Vaccinated	Unvaccinated	Unknown	Vaccinated	Unvaccinated	Unknown
Measles						
AFP						
NNT						

Malaria

Under 5 years			5 years and above		
New	Reattendance	Referred	New	Reattendance	Referred

Other diagnosis

Diagnosis	< 5 years		≥ 5 years	
	N	R	N	R
Anaemia				
Pneumonia				
Diarrhoea				
Urinary Tract Infection (UTI)				
Schistosomiasis				
Acute Respiratory Infections (ARI)				
Malnutrition				
Intestinal Worms				
Scabies				
Eye diseases				
Typhoid				
Dysentry				
Tuberculosis (TB)				

Dental carries				
Cholera				
Road Traffic Accidents (RTA)				
Yellow fever				
Trauma / Injuries				
Rabies / Animal bites				
Tetanus				
Mental diseases				
Substance abuse				
M. Meningitis				
Filariasis				
Disorders of childhood				
Epilepsy				

Note: N = new case; R = Reattendance

Referral cases (State problems)

Condition	**Cases**
Total number referred (Pamoja na Malaria hapo juu)	

Deaths (Reported deaths in the hospital / catchment area)

Diseases	**No. of deaths reported**		**Diseases**	**No. of deaths reported**	
	< 5 years	**≥ 5 years**		**< 5 years**	**≥ 5 years**
Malaria			Measles		
Cholera			NNT		
Yellow fever			Tetanus		
Diarrhoea			Meningitis		
Dysentry			Pneumonia		
Rabies / Animal bites			AFP		
Tuberculosis (TB)			RTA		
HIV/AIDS			Others		
Total deaths (Male) →			**Total deaths (Female) →**		

In-patients' record (For PHCC only)

Bed capacity		No. of patients in the beginning of month	No. of admissions	No. of discharges		No. of deaths	No. of patients end of the month	No. of lying days
Authorised	Actual			Home	Transfers			

Comments

Name of service provider _____ Designation _____

Signature _____ Date _____

E.3. Poster for elaborating RCHS form

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 / Idadi ya wateja wapya (wa mwezi huu)		No. of continuing users / Idadi ya watumiaji wanaoendelea (wa mwezi huu)			
	15-24yrs (A)	>24yrs (B)	15-24yrs (C)	>24yrs (D)	No. of new clients / Jumla ya wateja wapya **(A + B)**	
Oral pills						
Injection					No. of continuing users / Jumla ya watumiaji wanaondelea **(C + D)**	
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 / Waliozalishwa kituoni			
Attended by TBA / Waliozalishwa na TBA			

No. of live births (kituoni na kwa TBA)	
No. of still births fresh (kituoni na kwa TBA)	
No. of still births macerated (kituoni na kwa TBA)	
No. weighed < 2500 gms (kituoni na kwa TBA)	

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 F: Handouts on the Training Courses

F.1. Course for the Health Workers at the Facilities

Course Objectives

- To improve levels of awareness, understanding and technical skills in relation to data collection, processing, reporting and utilization and
- To motivate the culture of using data collected for patient and Health Facility management

At the end of the course, the Health Workers will be able to:

- Understand general concepts in HMIS
- Use the information cycle as a tool to understand health information management and to pinpoint problems and devise solutions
- Collect, process, analyze, Interpret, present analyzed data and utilize the information.

Course Details

1. HMIS in general

- Overview of HMIS in Zanzibar
- Concepts about data and information

2. Information Cycle

- Explain what is information cycle in the context of health management
- Describe the outputs of each stage of information cycle
- Appreciate the role of information as a tool in decision making

3. Data collection

- Identify and be familiar with data collection tools

4. Data processing

- Examine the importance of good data quality
- Explain the techniques for ensuring good quality data
- Appreciate the importance of accuracy in health data
- Understand why errors occur
- Acquire the skills to detect, correct errors and prevent further errors

5. Data Analysis

- Explain concepts of numerators and denominators
- Make simple calculations

6. Data Interpretation

- Define what are goals targets and indicators

7. Presentation of analyzed data

- Present various types of data in simple tables and graphs
- Explore the use of reports in decision making

8. Health Information management and use

- Analyze simple HF data
- List and prioritize identified health needs

F.2. Course for the Health Workers at the Districts

Course Objectives

- To improve levels of awareness, understanding and technical skills in relation the use of DHIS for data collection, reporting, analysis and utilization and
- To motivate the culture of using data collected for health facility and district management

At the end of the course, the Health Workers will be able to:

- Use DHIS
- Understand general concepts in HMIS
- Use the information cycle as a tool to understand health information management and to pinpoint problems and devise solutions
- Collect, aggregate, process, analyze, Interpret, present analyzed data and utilize the information.

Course Details

1. Use of DHIS

- Undertake data entry and validation
- Undertake data analysis and presentation
- Undertake data import and export

2. HMIS in general

- Overview of HMIS in Zanzibar
- Concepts about data and information

3. Information Cycle

- Explain what is information cycle in the context of health management
- Describe the outputs of each stage of information cycle
- Appreciate the role of information as a tool in decision making

4. Data collection and aggregation

- Identify and be familiar with data collection tools
- Indicate common data aggregation problems

5. Data processing

- Examine the importance of good data quality
- Explain the techniques for ensuring good quality data
- Appreciate the importance of accuracy in health data
- Understand why errors occur
- Acquire the skills to detect, correct errors and prevent further errors

6. Data Analysis

- Explain concepts of numerators and denominators
- Make simple calculations

7. Data Interpretation

- Define what are goals targets and indicators

8. Presentation of analyzed data

- Present various types of data in simple tables and graphs
- Explore the use of reports in decision making

9. Health Information management and use

- Analyze simple District data
- List and prioritize identified health needs
- Propose modals of information flows for a district

F.3. Basic Concepts about HMIS

BASIC CONCEPTS ABOUT HMIS

DATA ⟶ INFORMATION ⟶ KNOWLEDGE

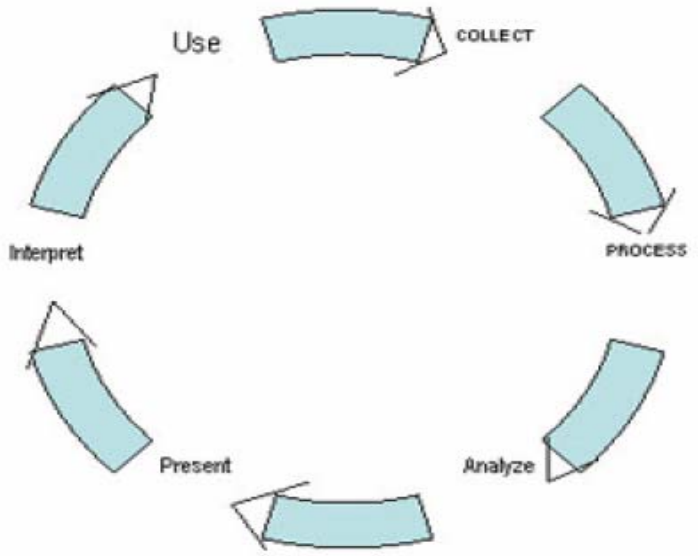
Data is unprocessed Information
Information is processed data
When information is communicated, it becomes knowledge.

Why do we collect data in the health sector?
The analyzed Data (information) is highly essential for the effective management. For example, Information on children immunized under one year will help in monitoring the coverage of immunization and this will help in planning future actions. In the same way, at the health sector, the availability of information is essential for determining the continuing and future of health delivery services at all levels.

Other reasons include:

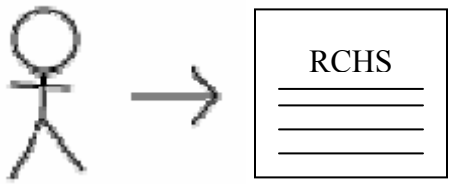
- Describing the health status of a catchment area or country
- Operational health care delivery
- The evaluation and monitoring of the health service delivered
- Making evidence-based decision and planning
- Controlling out-breaks and epidemics
- Clinical and health service research

The information cycle

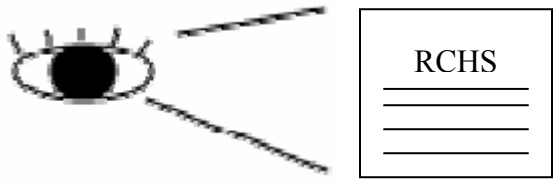


Examples:

Data collection: Data is collected at the Health Facility using forms.



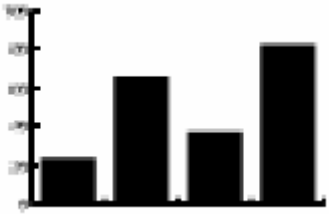
Process: The data is processed to ensure quality, consistency and accuracy.



Analyze: The data is analyzed using indicators and targets.

$$x = \frac{a}{b}$$

Present: The analyzed information is presented in the form of tables and graphs.

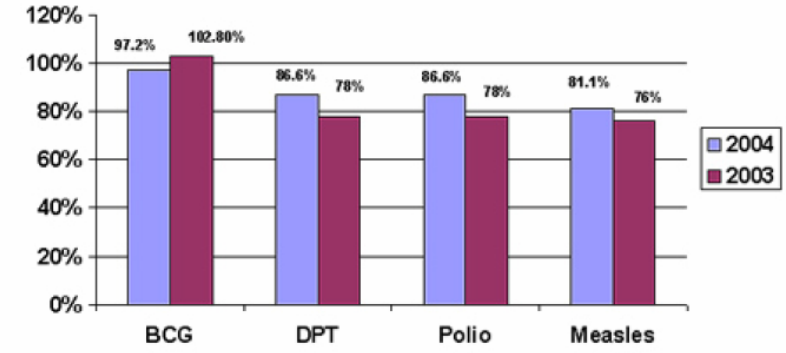


Interpret: The comparison, trends and epidemiological thinking are used to interpret the information.

Use: The information is used to improve health service delivery.

Processing and analyzing data

In order to be changed into action data must be processed and analyzed. This is the most important part of the information cycle. In analyzing data, we use the three epidemiologic analytic tools **what, why and how**. 'What' and 'how' describes the situation and how a certain program is running, 'why' helps to assess why the figures appear that way and helps to compare between different seasons and places.



What is the situation?
Why has this happened?
How can this be addressed?

Information presentation
After the analysis phase, the information should be presented in a summary statistics, graphs, charts, tables or maps to facilitate its utilization.

F.4. Health Facility Data Quality Management

1. What is data quality

Good quality data should be:
- Available on time and at all levels
- Correct, complete and consistent
- Reliable and accurate enough to support decisions
- Represent all recorders of similar data
- Comparable, i.e. using the same tool of measurement

Examples of sources of error:

Error	Example
Missing data	Data items for whole months missing
Duplicate data	Multiple counting of a fully immunized children
Data manipulation	When data collection tools are not used routinely, staff just fills in a likely-looking number
Unlikely values for a variable	Low weight babies exceeding number of deliveries.
Contradictions between variables	90 Fully immunized <1 when there are 70 who got the measles dose <1
Calculation errors	Mistakes in adding, subtracting and dividing
Capture in wrong box	Condoms distributed in place of IUCDs
Intentional errors	Increase headcount to improve workload.

2. How to ensure data Quality

The most effective way to ensure data quality is to look at the data - across each line and then from top to bottom. This is called '**eyeballing**'. It is important to look for missing data values, obvious fluctuations, inconsistencies between linked data elements, and for mathematical errors. This example shows an obvious error.

Total number of deliveries	7
Deliveries by skilled personnel	9
Deliveries by TBA	0

The number of Deliveries by skilled personnel and TBA cannot be higher than the total number of deliveries.

What to do if you find errors
- **Find the cause:** Go back to the tally sheets, zero zero forms or daily registers that were used to collected the data, point out the problem and appreciate the need for accuracy.
- **Correct the error:** Go back to the source data register, tally sheet or card, and get the correct number to put in the report.
- **Prevent future errors:** Make sure that the importance of the particular data item is clearly understood.

3. Dimensions of data quality

Different factors are involved in determining each of the three dimensions (Correctness, completeness and timeliness) of data quality. The diagram shown below presents these factors under the three dimensions of data quality.

CORRECTNESS
Data correctness could be
- Arithmetic calculations - Example: 37 + 44 = 71 – this is incorrect
- High diarrhea cases in the dry season
- High number of Yellow fever prescriptions
- A value put into a correct field on the form

COMPLETENESS
Are all the fields filled in?

TIMELINESS
Do I report on time?

4. How to improve data quality?

***Local use of information*: -** Use of data at HFs where it is collected can lead to detection of errors and inconsistencies, so that corrections are made easily.

F.5. District Data Quality and Management

1. What is data quality

Good quality data should be:

- Available on time and at all levels
- Correct, complete and consistent
- Reliable and accurate enough to support decisions
- Represent all recorders of similar data
- Comparable, i.e. using the same tool of measurement

Examples of sources of error:

Error	Example
Missing data	Data items for whole months missing
Duplicate data	Multiple counting of a fully immunized children
Data manipulation	When data collection tools are not used routinely, staff just fills in a likely-looking number
Unlikely values for a variable	Low weight babies exceeding number of deliveries.
Contradictions between variables	90 Fully immunized <1 when there are 70 who got the measles dose <1
Calculation errors	Mistakes in adding
Typing errors	Data is wrongly entered onto the computer
Capture in wrong box	Condoms distributed in place of intrauterine devices (IUCDs)
Intentional errors	Increase headcount to improve workload.

2. How to ensure data Quality

The most effective way to ensure data quality is to look at the data - across each line and then from top to bottom. This is called '**eyeballing**'. It is important to look for missing data values, obvious fluctuations, inconsistencies between linked data elements, and for mathematical errors. This example shows an obvious error.

Total number of deliveries	7
Deliveries by skilled personnel	9
Deliveries by TBA	0

The number of Deliveries by skilled personnel and TBA cannot be higher than the total number of deliveries.

What to do if you find errors

- **Find the cause:** Go back to the person who has collected the data, point out the problem and get the collector to appreciate the need for accuracy.

Or call the responsible person and ask for clarity

- **Correct the error:** Go back to the source data register, tally sheet or card, and get the correct number to put in the report.
- **Prevent future errors:** Make sure your data collector understands the importance of the particular data item.

3. Dimensions of data quality

Different factors are involved in determining each of the three dimensions (Correctness, completeness and timeliness) of data quality. The diagram shown below presents these factors under the three dimensions of data quality.

CORRECTNESS

Data correctness could be

- Arithmetic calculations - Example: 37 + 44 = 71 – this is incorrect
- High diarrhea cases in the dry season
- High number of Yellow fever prescriptions

- A value put into a correct field on the form

COMPLETENESS
Are all the field filled in?

TIMELINESS
Do I report on time?

4. How to improve data quality?

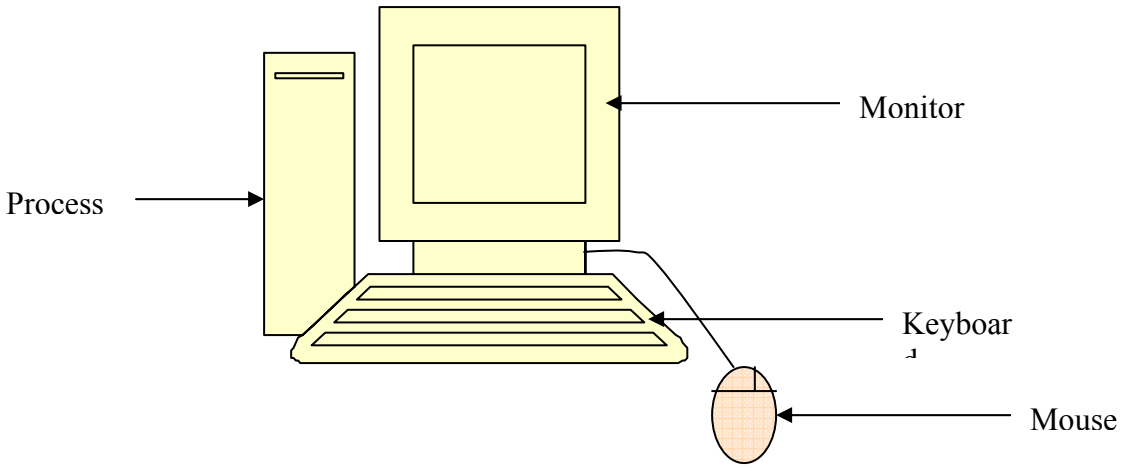
***Training/skills*: -** Data collectors must receive training on how to collect data and on how to calculate indicators.
***Local use of information*: -** Use of data at the HFs where it is collected can lead to detection of errors and inconsistencies, so that corrections are made easily.

F.6. Computer Course at the Districts

1. INTRODUCTION TO COMPUTER

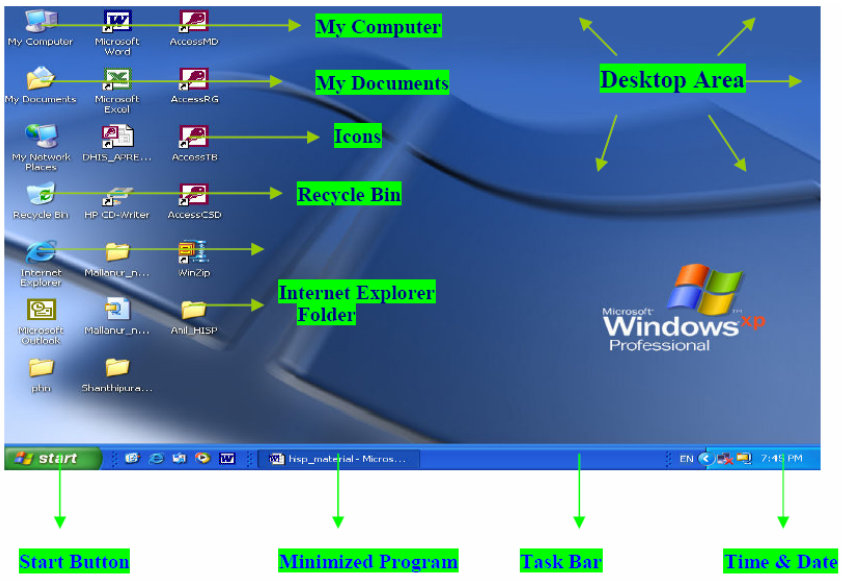
What is a computer?
It is a tool that will enable you to manipulate information rapidly, faster and accurately and it has a capability of storing data and retrieving them for use when needed.
It operates in three stages

The computer is comprised of two basic features, which make it operate. These are hardware and software.
Hardware includes physical features of a computer, such as screen, keyboard, mouse etc.
Software includes programs that carry out the instructions.



Monitor - it is a screen display
Keyboard – key in letters, numbers and special characters to the system
Mouse – points, drags and selects things
Processor – carry out all the operations

DESKTOP
As seen in the picture below:



1. Task Bar
The horizontal bar at the bottom of Desktop is called the Task Bar. You can see many small pictures on the task bar. Every time you open a window, a button representing it appears on the taskbar. The button disappears when you close a window. On this bar, you can see the Start button in the left hand corner and Date and Time in the right corner of the taskbar.

2. Start Button
You can see the Start menu anytime by clicking the Start button on the taskbar. The Start menu contains different programs ready to be used.

In addition, some commands on the Start menu have a right-facing arrow, which means additional choices are available on a secondary menu. Place mouse pointer over an item with an arrow and another menu appears.

3. Icons
The small pictures on the desktop are called icons. Place your mouse over an icon. Text appears identifying its name and other properties. To open the file or program, double-click the icon. Other icons have a small arrow on the lower left corner this identifies a shortcut icons. An icon can represent Program, File, Folders, Disk drives, Printers etc.

Shortcut icons simply supply links to the programs or files they represent. You can add and delete them without affecting the actual programs or files.

4. My Computer
When you click on this icon, you open a window with the details of the drives available in your computer like C drive, D drive, CD-ROM etc. in the form of icons.

5. My Documents
My documents is a folder in which you can save files and folders.

6. Recycle Bin
When you delete a file, it is moved in the Recycle Bin. A file which is deleted and sent to the Recycle Bin can be restored if the Recycle Bin has not been 'emptied'.

7. Internet Explorer
If your computer is connected to the Internet, this icon is used to open the 'Internet Explorer' that will take you to different websites.

FILE MANAGEMENT
Creating a Folder

A folder is a means of organizing programs and documents on a disk and can hold both files and additional folders. Folders can contain many different types of files, such as documents, music, pictures, videos, and programs. You can copy and move files from other locations, such as another folder, computer, or the Internet. You can even create folders within folders.

To Create a New Folder
Open My Documents or any other folder where you want create a new folder.
Then right clicking a blank area in a folder window or on the desktop, point to New, and then clicking Folder. Type a name (any name you like) for the new folder, and then press ENTER.
To Open a folder double click on it.

Saving Files in Folders
On the File menu of the program you are working in, click Save as. Saving Dialogue box opens, Choose the folder where you want to save the file. If you did not choose, the folder the system will automatically saves the file in My Document Folder. Type the file name of your choice and press Save Button.
To open the saved file, open the folder where the file was saved and double click on the file.

Renaming the File & Folder
Right Click your Mouse on the File or Folder you want to rename. Choose rename then type the File or Folder name of your choice and press ENTER.

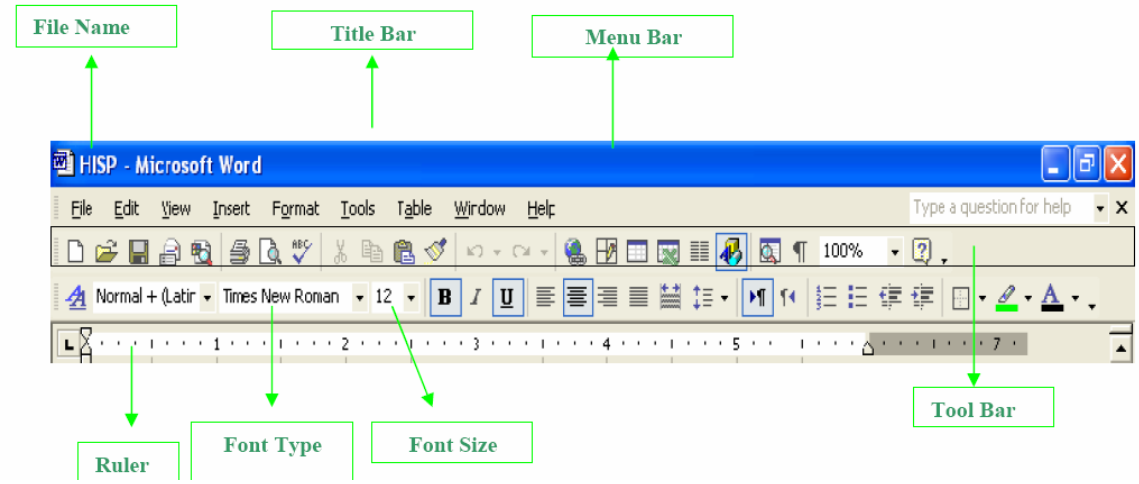
Deleting the File & Folder
Right Click your Mouse on the File or Folder you want to Delete then Choose Delete option.
OR
Click on the File or Folder you want to Delete then Press the Delete Key on the Key Board.

2. INTRODUCTUION TO MICROSOFT WORD

Usage
Microsoft word is used to make documents and you can make them look the way you want. You can also use it to enhance your documents with graphics, text effects and tables.

Open MS-Word
1. Click on the Start button on the task bar and select Programs. Click on Microsoft Word option.
2. Alternatively click on the available Word shortcut icon on the Desktop.

Creating a Document:
A file created in Word is called as a Document. You can type anything on the Plain Area of the Document. A new word document looks like the picture below.



Title Bar

A horizontal bar at the top of a window that shows the name of the document or program in use. It contains Minimize, Maximize / Restore and Close buttons at the right most corner.

Click the **Minimize** button on the title bar of the active window. The program window will minimize to a button on the Windows taskbar. To increase the Window Size to occupy the full screen click **Maximize** Button. In a maximized window, this button will have two Squares. If you click on this button, it will restore the window to its original size. This button is called **Restore** Button. To close the program window click **[X] Close** Button.

Menu Bar

The horizontal bar below the title bar that contains the names of menus like File- Edit-View-Insert… etc. under each name list of options to be performed on the document are present like New, Open, Save, Copy, Paste etc. each option performs particular task when clicked on it.

File Menu:

Contains options like New, Open, Close, Save, Save as, Print preview, Print, Exit, etc…
When you click on:
New – Creates a New Empty document.
Open – Opens an existing file selected (already if the file is in any folder).
Close – Closes the present active document.
Save – Saves the changes made in the document
Save as – Used to save a new / old document with other name
Print preview – Used to see how a document will appear on paper.
Print – Used to Print the Current document

Edit Menu:

Contains Options like Undo, Redo, Cut, Copy, Paste, Find, Select All, Replace, etc…
When you click on:
Undo - Undo the last changes made on Document.

Redo - Repeats the last changes done in the Document.
Cut & Paste –Used when you want to change the position of any part of the text or file.
Copy & Paste – Used when you want to copy the text or file from one place to another.
Find – Searches a word in current document
Select all – Selects the entire text in current document.
Replace - You can automatically replace text with another text. For example - you can replace "xyz" with "abc"

Table Menu:

Contains options like Draw Table, Insert, Delete, Select, Auto fit, etc…
When you click on:
Draw Table – Helps you to make a table according to your choice and requirement. In this tool, you will have to first draw a square and then make columns and rows by drawing lines in it. Alternatively, you can select insert rows after drawing the table.
Insert – Insert row(s) or column(s) at a desired location in the table.
Delete – Deletes the column(s) or row(s) which you selected in the table.
Select – Selects rows or columns or entire table.
Autofit – After filling in the details in the table, click on 'Autofit'. All the Columns and rows of the table will be automatically adjusted to the matter filled in the table.

There are many more features available under each menu item, Explore them and see what they can do to your document.

Tool Bar

Present below the Menu bar and contains different small buttons with pictures and different options that you use to carry out commands. Toolbars can contain buttons, menus, or a combination of both. The tasks available in the menu bar items are all present in the tool bar buttons. To know the task of the tool bar button keep the mouse pointer on the button for few seconds a tool tip text will appear indicating the task of the button. To activate the task press the tool bar button.

Editing Text

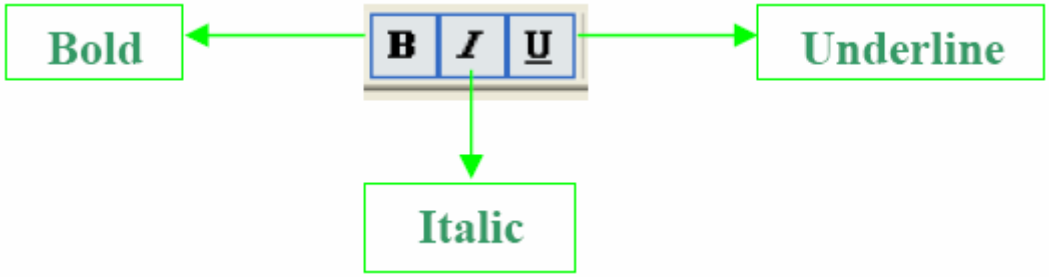
Editing the text entered in the document is the most important and interesting feature of the Word document. You can perform different styles and formats on the text using different tool and options available in the tools bar. You can easily delete or change the text and increase the size of the text. Looking at some of the tasks:

Deleting Text – Place the Cursor before the text or Highlight (Block) the text, you want to delete and Press Delete Key in the Keyboard or Place the Cursor after the text and press Back Space key in Keyboard.

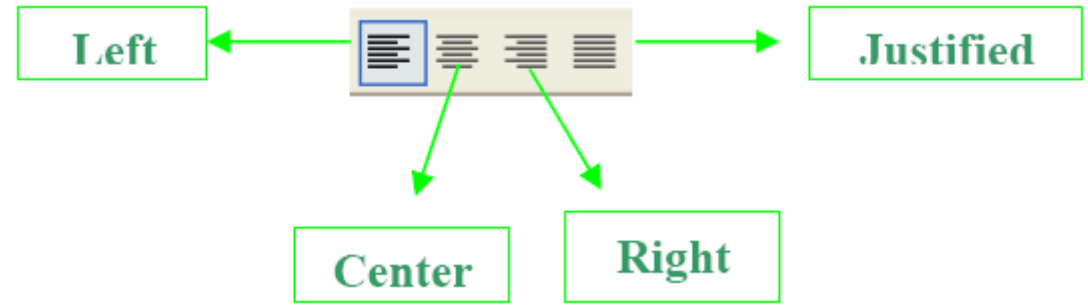
Font Type- Select the text you want to change. On the toolbar, click a font name in the Font box.

Font Size - Select the text you want to change. On the toolbar, type or click a point size in the Font Size box. For example, Type 10

Font Style – Select the text you want to change (Styles) and on the toolbar click either Bold or Italic or Underline.

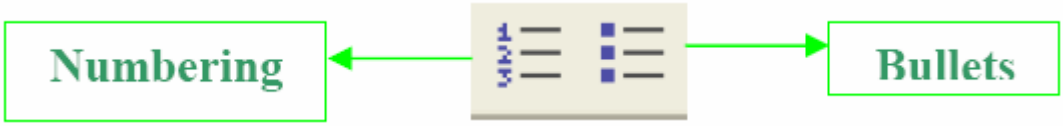


Text Alignment – Used to align a Paragraph, Text either left or right, or centre. Select the Text you want to align and Press alignment Buttons on the toolbar, either left, centre, right or justified.



Text Color – Highlight the Text you want to change the color and press Font Color Button on the Tool bar. On clicking the down arrow, a window with different colors will appear, select the color you want.

Bullets & Numbers -A dot or other symbol placed before text, or number format you want to change. On the Format menu or on the Toolbar, click Bullets and Numbering, and then click the tab for the type of list you want to modify.



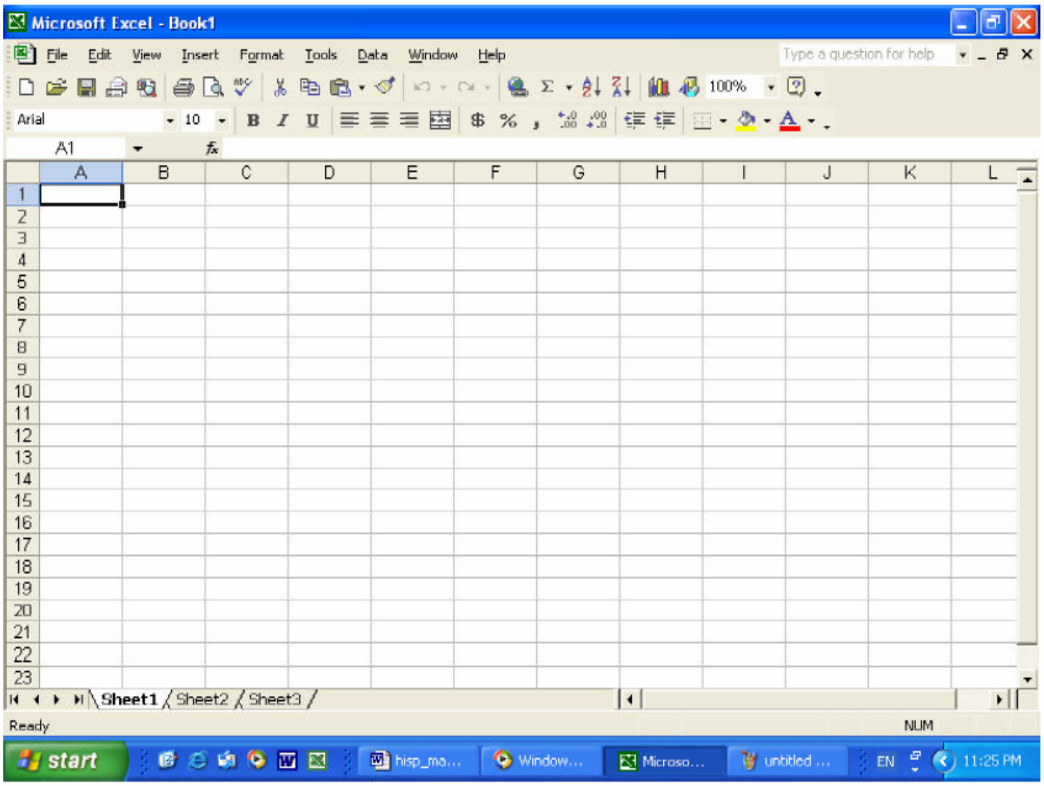
There are many more options you can use to enhance your document, explore and see what you can do.

3. INTRODUCTION TO MICROSOFT EXCEL

Usage:
Microsoft Excel is used to Perform Easy Calculations, analyze information and manage lists in spreadsheets. We can also create tabular formats easily with different styles and boarders.

Starting Excel:
1. Click on the Start button on the task bar and select Programs. Click on Microsoft Excel option.
2. Alternatively click on the available Word shortcut icon on the Desktop.

A workbook like the one below will open.



Whenever Excel is open, a new workbook with spreadsheets will open.

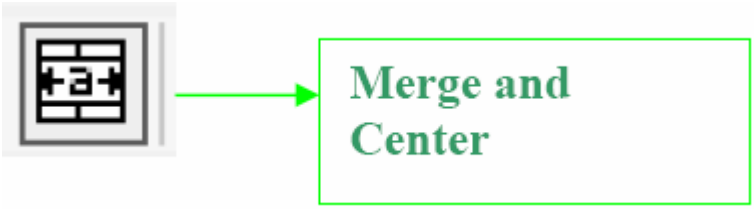
Spreadsheet – Displays Data in the form of rows and columns. Data is entered in a cell which represents the intersection of a row and a column. Columns are labeled from left to right the letters A, B, C, D...AA...BB and Rows are numbered from top to bottom with 1,2,3,4
Every cell in a work sheet has its own address that is column name and row number. For example A9 or Z8 etc… When a cell is selected, the border will be thick and highlighted.

You can move from one cell to another cell with the help of arrow key on the key board or by placing the mouse in a particular cell and clicking. You can select more than one cell by placing the cell pointer on a particular cell and then dragging the mouse in any direction while keeping the left mouse button pressed or hold the shift key press and press arrow keys at any direction you want. To select entire column or row click on column or row heading.

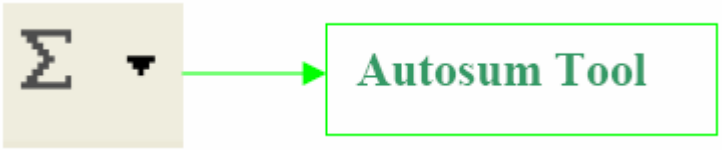
The Menu bar, Tool bar, Title bar and the options available in them are almost same as in Word Document.

Some of the Excel Tool buttons are very important in creating table formats and auto - calculating the values. For Example, Merge and Centre, Auto sum, Borders, Color Fill etc…

Merge and Centre Button:
Used to Merge (combine) two or more selected cells. It automatically centre aligns the text in the cell. To **merge cells** in a row or column and center the Text in the cell, select the cells you want to merge then click Merge and Center button on the **Formatting Tool bar**.

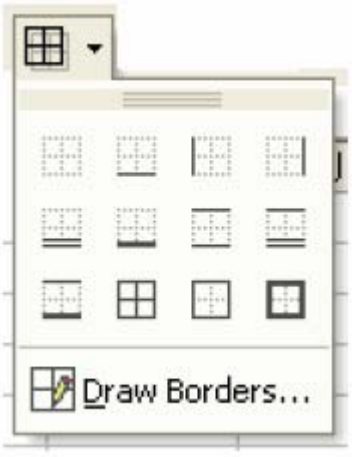


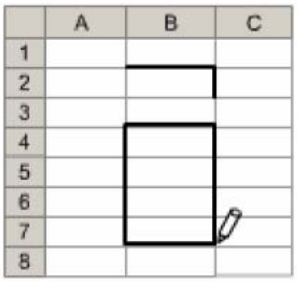
Auto sum:
You can add numbers as you type them into a cell. For example, type = 5+10 in a cell to display the result 15. Use **AutoSum** button as shown below to do this task. Click a cell below the column of numbers or right side of the row. Click AutoSum button on the Toolbar, and then press ENTER. Or Select (Block) the cells you want to add and one blank cell below or beside then press AutoSum button on the Tool bar.



Borders:
Select (Block) the cells where you want to draw borders and click on the Formatting toolbar, click the arrow next to Borders, and then click borders styles or Draw Borders on the box. Then do one of the following:

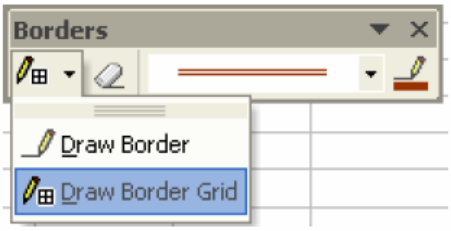
- Draw Border:

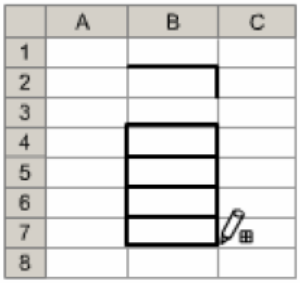




Apply Cell Borders:
On the Borders toolbar, click the arrow next to Draw Border. Draw a borderline on cells, Click the line you want as a border with the border-drawing tool or click on the line and drag on the lines you want as borders. To draw outside border around a row, Click in the center of a cell with the border-drawing tool and drag on the row. To draw outside border around a column Click in the center of a cell with the border drawing tool and drag on the column.

- Draw Border Grid





On the Borders toolbar, click the Draw Border Grid do one of the following:
Draw a borderline on cells click the line you want as a border with the border grid-drawing tool or click on the line and drag on the lines you want as borders.
Draw borders around every cell in a row, Click in the center of a cell with the border grid-drawing tool and drag on the row.
Draw borders around every cell in a column, Click in the center of a cell with the border grid-drawing tool and drag on the column.

To apply a different borderline style, click the arrow next to Line Style, and then click a line style on the palette. To apply a different borderline color, click Line Color, and then click a color on the palette.

Remove borders
On the Borders toolbar, click Erase Border on the palette. Then do one of the following:
Delete a single border; Click the border you want to delete with the eraser tool.
Delete more than one border; Drag the eraser tool over the borders you want to delete.

Color Fill:
Select (Block) the Cell or Cells you want to fill the color.

On the Drawing toolbar, click the arrow next to Fill Color.

Change a fill color:
To change the fill color, click one of the colors. Select the cells you want to remove the color and then Click No Fill.

Sheets:
Adding: Right click on any sheet name and then click insert Worksheet then press OK.
Deleting: Right click on the sheet that you want to delete and Click Delete.
Rename: Right click on the sheet which you want to Rename and Click Rename then type any name, Press ENTER

Appendix G: Training Timetables

G.1. Training Timetable for Health Facilities

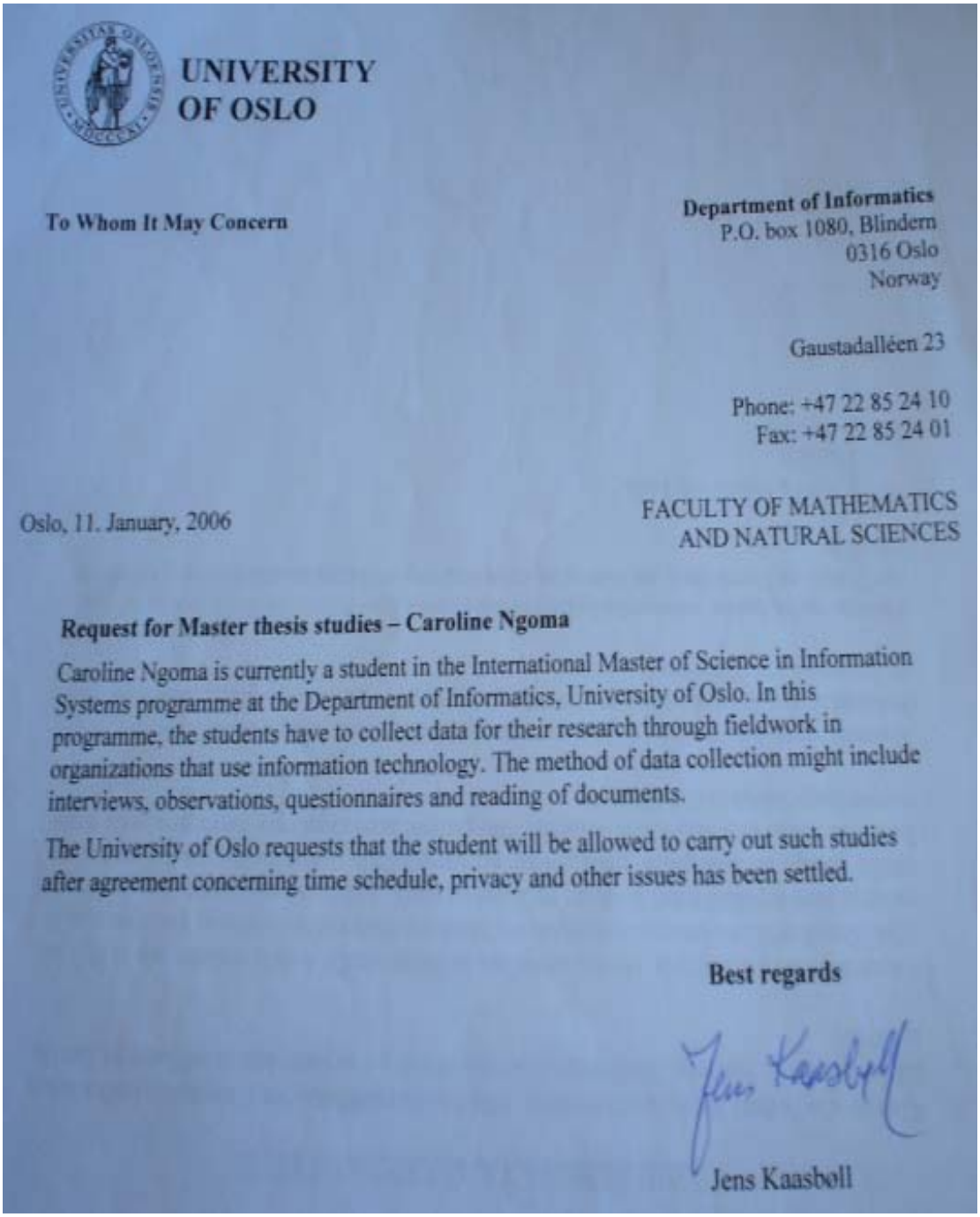
TIMETABLE FOR FACILITIES			
	Health Facility	**DATE**	**TIME**
PEMBA			
Day 1	NDAGONI	01 – 08 – 2006	1 – 3 PM
Day 2	ZIWANI	02 – 08 – 2006	11 AM – 01 PM
Day 3	CHAKE CHAKE	03 – 08 – 2006	1 – 3 PM
Day 4	GOMBANI	04 – 08 – 2006	1 – 3 PM
Day 5	SDA	06 – 08 – 2006	9 – 11 AM
Day 6	V/COTTAGE	07 – 08 – 2006	1 – 3 PM
UNGUJA			
Day 1	SOS	22 – 07 – 2006	9 – 11 AM
Day 2	WELEZO	24 – 07 – 2006	1 – 3 PM
Day 3	KMKM	25 – 07 – 2006	1 – 3 PM
Day 4	FUONI	26 – 07 – 2006	1 – 3 PM
Day 5	KIEMBE SAMAKI	27 – 07 – 2006	1 – 3 PM
Day 6	MAGOGONI	28 – 07 – 2006	1 – 3 PM

G.2. Training Timetable for Districts

TIMETABLE FOR DISTRICTS			
	Module	**DATE**	**TIME**
PEMBA			
Week 1	Introduction to Computer	01 – 08 – 2006	10 – 12 AM
	Microsoft Word	02 – 08 – 2006	3 – 5 PM
	Microsoft Word	03 – 08 – 2006	10 – 12 AM
	Microsoft Excel	04 – 08 – 2006	10 – 12 AM
	Microsoft Excel	05 – 08 – 2006	1 0– 12 AM
Week 2	Overview of HMIS and data collection tools	07 – 08 – 2006	1 0– 12 AM
	Internet and Power Point	08 – 08 – 2006	1 0– 12 AM
	DHIS - data entry	09 – 08 – 2006	1 0– 12 AM
	DHIS – Creating reports and Export / Import	10 – 08 – 2006	1 0– 12 AM
	Exercises	11 – 08 – 2006	1 0– 12 AM
UNGUJA			
Week 1	Introduction to Computer	19 – 07 – 2006	9 – 11 AM
	Microsoft Word	20 – 07 – 2006	9 – 11 AM
	Microsoft Excel	21 – 07 – 2006	9 – 11 AM
Week 2	DHIS – data entry	24 – 07 – 2006	9 – 11 AM
	DHIS – creating reports	25 – 07 – 2006	9 – 11 AM
	DHIS – Export / Import	26 – 07 – 2006	9 – 11 AM

Appendix H: Ethical Clearance

H.1. Letter of Introduction from 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

Oslo, 11. January, 2006

FACULTY OF MATHEMATICS
AND NATURAL SCIENCES

Request for Master thesis studies – Caroline Ngoma

Caroline Ngoma 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

H.2. Research Permit from Zanzibar Research Committee

REVOLUTIONARY GOVERNMENT OF ZAN

SECRETARY
ZANZIBAR RESEARCH COMMITTEE
P. O Box 239
Tel: 2230808
FAX: 2233788

RESEARCH/FILMING PERMIT

PERMIT No.ZRP/98

SECTION

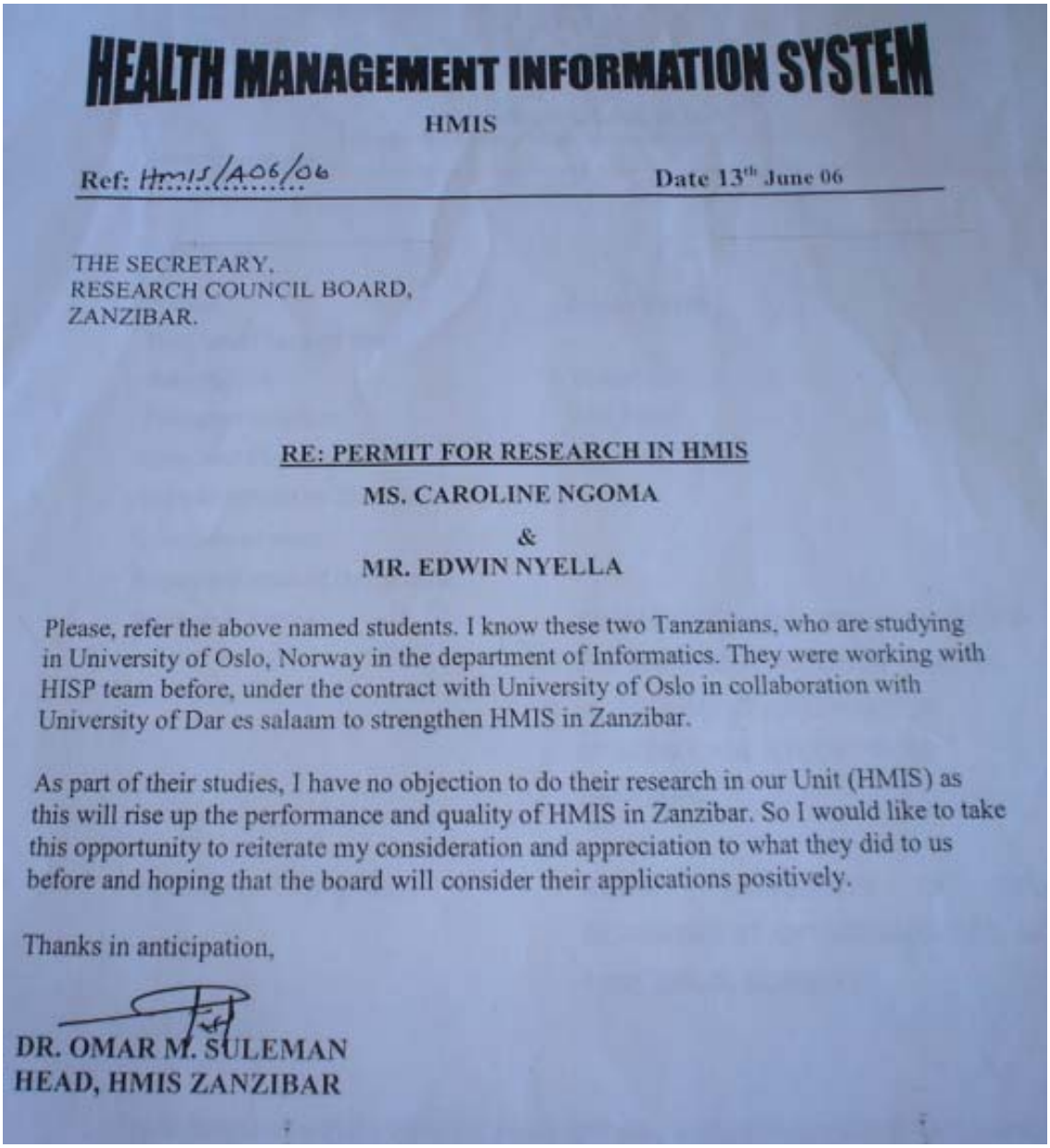
Name:	Caroline Ngoma
Date and Place of Birth	16/04/79
Nationality:	Tanzania
Passport Number:	-
Date and Place of Issue	-
Date of arrival in Zanzibar	-
Duration of stay:	-
Expected date of Departure:	-
Research Tittles:	CULTIVATION STRATEGIES IN THE IMPLEMENTATION OF HEALTH MAMANGEMENT INFORMATION SYSTEM ZANZIBAR EXPERIENCE.
Full address of Sponsor:	DEPARTMENT OF INFORMATICS, BOX 1080, BLINDERN 0316, 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
Address: P. O Box 2321 – Zanzibar
Date: 15th June, 2006

H.3. Introductory Letter from HMIS unit to the Research Council Board



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

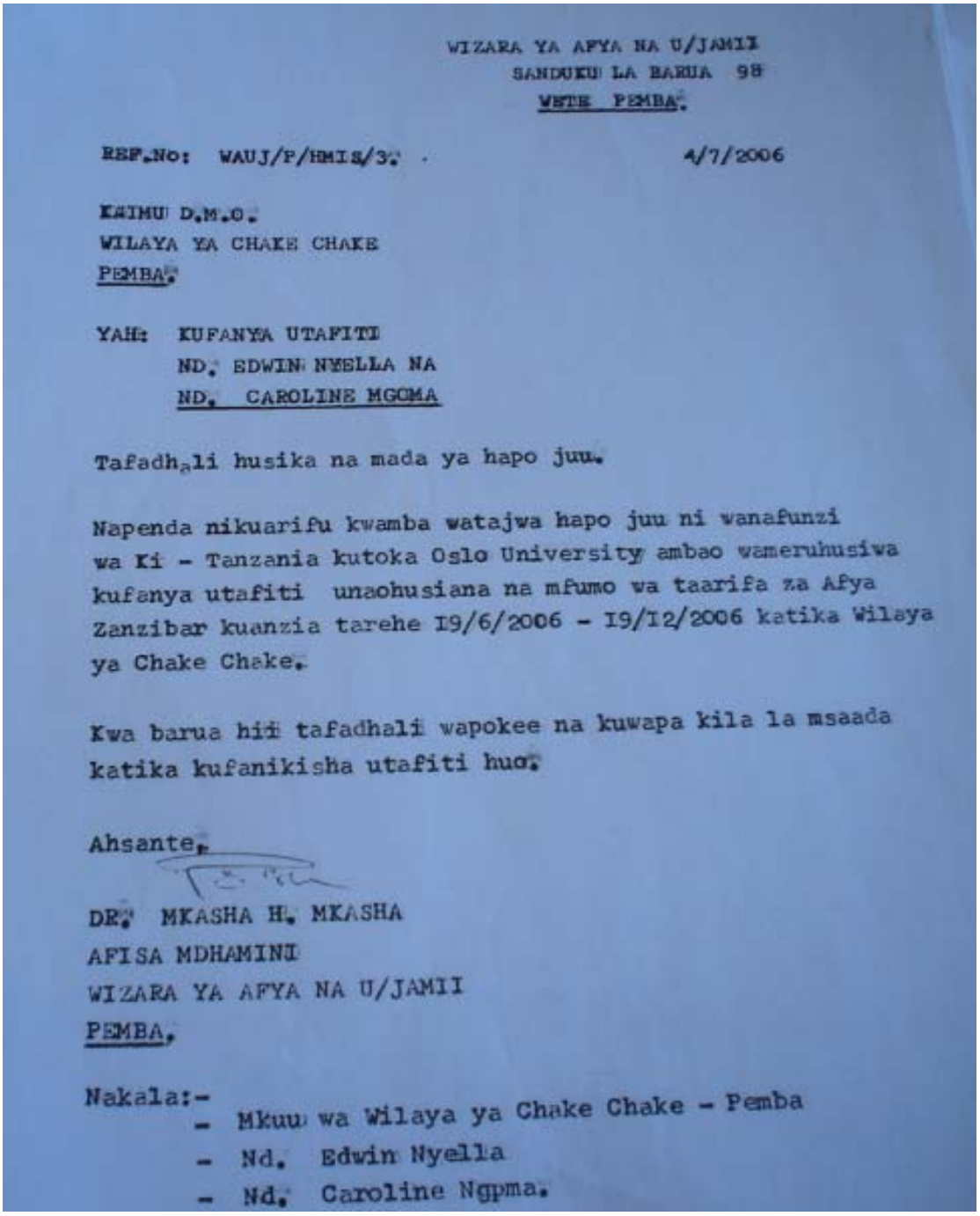
Please, refer the above named students. I know these two Tanzanians, who are studying in University of Oslo, Norway in the department of Informatics. They were working with HISP team before, under the contract with University of Oslo in collaboration with University of Dar es salaam to strengthen HMIS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

H.4. Permit to conduct Research in Chake Chake District - Pemba



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 19/6/2006 - 19/12/2006 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.

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