HEALTH INFORMATION SYSTEMS INTEGRATION AS INSTITUTIONALISATION

The Case of Zanzibar

By

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To my lovely family

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Acronyms

ADB – Africa Development Bank
ANT – Actor Network Theory
DANIDA – Danish International Development Agency
DHIS – District Health Information Software
DHMT – District Health Management Team
DHO – District Health Officer
DHA – District Health Administrator
DMO – District Medical Officer
DSO – District Surveillance Officer
EPI – Expanded Programme for Immunization
HIS – Health Information System
HISP – Health Information System Programme
HMIS – Health Management Information System
HMN – Health Metrics Network
ICT – Information and Communication Technology
IT – Information Technology
IS – Information System
MDG – Millenium Development Goals
MoH – Ministry of Health
OPP – Obligatory Passage Point
PHC – Primary Health Care
PHCC – Primary Health Care Centre
PHCU – Primary Health Care Unit
PMI – President's Malaria Initiative
RCH – Reproductive and Child Health
TZS – Tanzanian Shilling
UiO – University of Oslo
USD – United States Dollar
UNICEF – United Nations Children's Fund
UNFPA – United Nations Population Fund
WHO – World Health Organisation
ZACP – Zanzibar AIDS Control Programme
ZHO – Zonal Health Officer
ZHMT – Zonal Health Management Team
ZMCP – Zanzibar Malaria Control Programme
ZMO – Zonal Medical Officer

Abstract

This thesis addresses the question of how to understand and promote health information systems (HIS) integration given the highly entrenched fragmentation of healthcare service provision, a common scenario for developing countries. Three sub questions were developed to operationalise the main question: 1) what are the health information system's institutional characteristics that shape HIS integration in Zanzibar? 2) How does the power interplay between HIS stakeholders affect development and institutionalization of the integrated HIS? 3) What design strategies can be used to foster integrated HIS?

The study adopted interpretive strand of epistemology, utilising an action research design based on the ongoing action research project to design and implement integrated healthcare information system (HIS) in Zanzibar, Tanzania. The project involves three main areas: developing data collection tools, setting up and promote software solution for data processing and reporting, and capacity building to sustain the interventions. Data were collected through participant observations, document analysis, and interviews and discussion.

The thesis adopted a socio-technical perspective of HIS integration, and view integration as a process of institutionalisation of tools (technology) and routines. The thesis used the Circuits of Power framework to study the HIS institutionalisation from the lens of power. In so doing the thesis contributes to the discourse of HIS integration in the context of low resourced settings, contributing both theory and practice.

The principal theoretical contributions offered in this study are the introduction of the notions of institutionalisation and power to explicitly and further unpack the dynamics of HIS integration, and to underscore the political nature of HIS integration. Specifically, the thesis made the following contributions: 1) The study reveals the role of status quo in shaping HIS integration, and particular the role of hierarchies and information culture in defining the standing conditions and rules of meaning which members in the healthcare bureaucracy subscribes to, and consequently affecting institutionalisation of the HIS. 2) The study realises the relationship between power and rationality, concurring with previous studies, and extending the findings to incorporate the complexity related to the contextual nature of HIS integration in the context of developing countries. 3) The study responds to the challenge facing IS innovation in the context where power supersede rationalism, and contributes to understanding how technology can play a mediation role in shaping the path of IS in such context. The study adopted the actor network theory concept of inscription, offering an alternative to open power contests, whereby the rational agenda could be inscribed in software solution that is widely in use.

Practically, the thesis contributed to developing strategies sustainable HIS integration in the context where fragmented service provision prevails. 1) The thesis reiterates the importance of developing flexible standards that guide design of the HIS tools and procedures that governs the HIS process. Those standards should be flexible enough to cater for the needs of different players, and should offer a room for accommodating tensions resulting from historicity at the same time coping with the evolving nature of the healthcare sector. 2) The thesis acknowledges the importance of building political alliances and creating strategic partnerships within the organisational bureaucracy in order to build trust and gaining influence in decision making regarding implementation. 3) The thesis outlined a strategy for human capacity development to foster long term goals of institutionalisation of HIS, in a setting where both IT and data experts are difficult to build and retain, and where support is usually through short term projects.

Chapter 1: Introduction

This thesis aims to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision with a case study from Zanzibar, Tanzania. This chapter introduces the research domain, which is healthcare information systems integration and propose the theoretical lens used to discuss HIS integration from institutionalisation standpoint. Section 1.1 introduces the research domain and problem area, section 1.2 gives a brief introduction of the theoretical approach used to analyse and discuss the case. Research questions that guides this study are presented in section 1.3 followed by the brief introduction of the context and finally in section 1.5, summary of findings is presented in reflection to research questions.

1.1. Research Domain and Problem Area

Healthcare sector is one among the most important indicators of human development. As Sen (1999) makes clear, human development need to be understood much broader than only economic indicators and very much include healthcare. However, for years, its performance in developing countries has been very low, largely caused by budgetary problems limiting the authorities in terms of both human resources as well as essential supplies. In recognition of this importance and the situation facing developing countries, in 2000 the United Nations outlined a blueprint for development growth in which eight millennium development goals (MDG) were set, three out of these are directly related to healthcare sector. Thus, tracing indicators to monitor these goals as well as other national goals requires comprehensive and effective information system (IS).

However, healthcare information systems (HIS) in most developing countries have evolved in the way that led to multiple and parallel HIS. This came out of necessity; the sector comprises a complex setup as a result of prolonged disease burdens as well as shortage in financial and technical resources necessary for the smooth management of health and wellbeing of the populations. Donors, both bilateral and multilateral inject

huge amount of money to help control the diseases as well as helping to improve the health of the specific groups. This is usually implemented by setting up vertical programmes, some engaged in fighting diseases such as Malaria, HIV/AIDS, and Tuberculosis, and some focusing on providing specialised services such as those related to mother and child health (Lippeveld, 2001, Braa et al., 2004, Chilundo and Aanestad, 2005). To monitor progress and to comply with the data requirements of their financiers, individual programmes have developed information systems to cater for their programme needs, leading to these multiple and uncoordinated HIS.

This fragmentation implies lacking sector-wide support and accordingly creates a strong motivation for closer integrating of these HIS. For example, it would be difficult to have a holistic means to calculate the MDG related indicators as well as most of the national indicators with the present data scattered around programmes. Furthermore, this fragmented HIS is associated with other problems. Multiple data collection leads to the problem of data quality, as data collected from the different sources often fail to be consistent. The multiple data collection efforts also increase a burden to the already overloaded staff, risking quality of both the data collected and the services provided (Mosse and Sahay, 2003, Sheikh, 2005). Thus, HIS integration has become important agenda for both researchers and practitioners. At a global level, Health Metrics Network (HMN) emphasises on HIS integration as the best solution to offering the required data for the sector planning, monitoring and evaluation (HMN, 2008). Thus, this study responds to this call for HIS integration.

1.1.1. Health Information Systems Integration

In recognition of such situation, there have been a number of initiatives in several developing countries to introduce information systems to serve their healthcare sector. However, these efforts have been slowed down by a number of failures. Generally there has been different approach to how we perceive IS development, with the traditional scholars and practitioners emphasising on how we can develop better technical solutions for data collection, processing, and presentation. This school has been challenged by its treatment of IS solutions as mere technical artefacts making, disregarding the context under which the IS operates. Researchers have associated this perception with the

experienced failures of the introduced HIS initiatives, where design reality gap basically based on technology, organisational and use context have been identified (Berg, 1999, Heeks, 2002, Heeks, 2005).

An alternative approach to this technical perception have been developed, where IS have been conceptualised as socio-technical systems (Bostrom and Heinen, 1977a, Bostrom and Heinen, 1977b), emphasising on the need for careful consideration of the social aspects of IS giving them equal weight as the technical aspects, and that the two are interweaved. In this conceptualisation, IS development is seen largely as a wider process of socio-technical configuration. Thus, apart from development and installation of software and hardware required for capturing, processing and disseminating data, the process includes matching the design process and technology designed with the existing organisational routines, norms, and procedures as well as social, economic and political aspects, which together highly determines the outcomes of IS development efforts.

Research on this conception has in the past three decades made noticeable progress. Avgerou and Walsham (2001) explicitly urge for the needs to address the social processes which comprise the organizational, national and sectoral contextual aspects that are implicated in the development and use of IS. Mulugeta et al. (2007) in their study of ART information system pinpoint to identify the need to play around the political sphere and the deep rooted practices around the IS implementation, while Silva and Hirschheim (2007) underscore the importance of social dynamics of an organisation including core values, power distribution and mechanism of control.

However, much of this research has focused on the complexity behind developing standalone systems, and little has been done to address IS integration. So far debate on IS integration is still predominantly technical agenda focusing on how to develop better technologies to improve system's (software and hardware) interoperability (Naumann et al., 1999, Chari and Seshadri, 2004, Park and Ram, 2004). Understood more broadly than in its traditionally technical form , IS integration is rather a complex process, far more complex process compared to developing individual IS. This complexity not only comes from developing interoperable technological solutions, but also the fact that the social and

organisational contexts under which the individual IS operate need also be harmonised. In this respect, IS integration cannot be well understood by only addressing the issue of proper software and hardware integration; it is the process of bringing together the complex assemblage of technology, routines, norms and organisational procedures. It involves complex negotiations between actors involved, and the path may not be easily predicted. It is a process which requires careful configuration of both technology (Fleck, 1988, Fleck, 1994) and politics (Sahay et al., 2009).

This is the backdrop for the contributions of this thesis. First, the stated complex settings of healthcare sector in developing countries, requires a broader understanding and explanation of the causes and actual magnitude of the HIS problem of fragmentation in order to devise mechanism for sustainable HIS integration, that is, not only dealing with how we develop the integrated technical solutions but also how this can be institutionalised in a setting that has experienced severe fragmentation of both services provision and corresponding IS, and hence setting a ground for power play between actors whenever new initiatives are made.

Second, the fact that the socio-technical analysis of HIS integration is under-researched outlines the need to address the issue in the context where it is needed most. Few studies so far have taken the issue seriously. In the Health Information System Project (HISP), which this study is part of and contributes on, case studies have been conducted that outline the importance of the non-technical aspects and particularly point out to the social, organisational and political configurations as the axis of HIS integration in the context of developing countries (Aanestad et al., 2005, Sahay et al., 2007).

Theoretically I draw upon concepts from institutional theory and power in order to understand the complexity behind HIS integration. This is introduced in the following section.

1.2. Theoretical Approach

This thesis aims to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision with a case study from Zanzibar, Tanzania. The thesis build the theoretical focus with a view that HIS integration is better

understood socio-technically. This conceptualisation of HIS integration helps to build a broader insight on how do we develop IT technological solutions to adapt with the social and organisational settings. By acknowledging this socio-technical nature of HIS integration and the thesis seeks to redefine HIS integration in order to address the issue from a broader perspective.

HIS integration not only involves merging of technological solutions, but also involves a broader process of aligning and redefining work processes, routines, and workplace norms that are usually well established within the existing systems. In this context, in addition to the technological development, we thus, should view integration as rather a process of standardisation of systems and practices (Ellingsen and Monteiro, 2006), and with the intended long term goal of sustainability, integration shall be viewed as a process of institutionalising the new integrated technical artefacts and associated routines into the organisational settings.

Institutionalisation is a concept from institutional theory, particularly new institutional theory (Meyer and Rowan, 1977), referring to a process where IS innovations go through in order to reach a stage when it is diffused into the working environment, that is, its users will take-into-granted its presence and use (Scott, 2008), and will no longer be considered as innovation, rather as unnoticed and unremarkable tools that people routinely use in doing their work (Silva and Backhouse, 1997). Thus, the thesis analyses the institutional constellations of healthcare sector and its effects on the HIS integration process. Issues addressed include donor influences, stakeholders' politics behind the integration agenda, and dynamism of healthcare sector, as among the influential factors in the integration process and its subsequent institutionalisation.

As an analytical lens, the Circuits of Power framework (Clegg, 1989) is used. The Circuits of Power framework integrates different views of power, and hence offers a comprehensive way of analysing the HIS integration from the institutionalisation standpoint. Silva and Backhouse (2003, 1997) uses the framework to assess institutionalisation of IS. Since this study is concerned about bringing up changes, I use the framework as a guiding framework in the HIS integration process. The application of

the framework will thus lead us to understand the relationship between the authority and resource distribution within the Zanzibar healthcare, and hence gain insight on factors that foster or constrain the transition from the present state of HIS fragmentation in order to boost institutionalisation of the integrated HIS.

The Circuits of Power framework offers an analytic tool to analyse those institutional constellations and how actors and their sources of power are engaged in the process and the results of these engagements, and how the change agents manage to align other actors towards the new integrated HIS with potential for institutionalisation.

1.3. Research Questions

Based on the theoretical and practical motivations, the overall research question of this thesis is:

RQ1 How to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision?

This overall question is operationalized further into the following:

RQ1.a What are the health information system's *institutional characteristics* that shape HIS integration in Zanzibar?

RQ1.b How does the *power interplay* between HIS stakeholders affect development and institutionalization of the integrated HIS?

RQ1.c What *design strategies* can be used to foster integrated HIS?

The first question aims at unpacking procedures and routines, both formal and informal, that have been established in the Zanzibar healthcare sector, and that determines how people run day-to-day activities. This will help to identify practical challenges related to IS integration. Thus, understanding these issues will add value to the present knowledge on institutional challenges to HIS integration. In that, it will help designers and implementers to better plan on the IS integration projects.

The second question discusses about power. The question aims at identifying the sources and cause of power base between stakeholders involved, primarily between vertical programmes and the central HMIS office. It also seeks to build understanding of power asymmetry between the stakeholders and how this affects IS integration the healthcare sector. The question helps to underline the political nature of HIS development and integration in particular.

The third question aims to extend our understanding of HIS development. In particular it examines how methodological or technological choices affect HIS integration within the context of developing countries where multiple players exercise enormous power in the running of day-to-day business of healthcare service provision.

1.4. Research Context

This thesis addresses the problem of HIS integration in developing countries. Although findings can be applicable in any settings, the focus is on the context of a resource constrained countries. The study was conducted in Zanzibar, Tanzania, and is part of larger action research project called Health Information System Project (HISP), that works to develop and implement HIS in various developing nations in Africa, Asia, and Latin America. HISP believes on integrated HIS, and works to develop standards and tools to facilitate data collection, processing and presentation and to enhance informed decision making (Braa et al., 2004). Technically the project emphasizes on the use of open source products and standards, while giving attention to organisational issues related to HIS development.

The selection of Zanzibar case is based on both theoretical and practical motivations. Practically the Zanzibar healthcare sector which established general sector reforms in late 90s and a focus on HIS in early 2000s was in urgent need to receive assistance on the development of its HIS. My Masters research (Sheikh, 2005) focused on how routine management information system can be improved. Primarily, this can be considered as the beginning of the general HISP initiatives in Zanzibar. Following the completion of the Masters Degree, I was involved in the HIS project in Zanzibar as HISP member. My experience in the project helped in framing my theoretical motivation as well as having

the quest to continue working in the same project with the mission to address challenges associated with the HIS integration.

1.5. Summary of Empirical Findings

This thesis is based on the empirical findings of five papers whose data were collected during the study period for this thesis. The papers are listed below, and their contributions to the research questions are mapped in table 1.1.

Paper I: Sheikh Y. H. 2010. Power Imbalances and IS Implementation: A Case of Integrated Health Management Information System in Zanzibar. *In*: Nunes, M. B., Isaías, P. & Powell, P. (eds.) *IADIS International Conference Information Systems 2010*. Porto, Portugal. IADIS Press, pp. 258 – 266.

Paper II: Sheikh, Y. H. & Braa, K. 2011. Mobilising Local Networks of Implementers to Address Health Information Systems Sustainability. *Electronic Journal of Information Systems in Developing Countries*, 48, **6,** pp.1 – 21.

Paper III: Sheikh, Y. H. On Being Specific about Power: Institutional Dualism in Information Systems Integration. *Submitted to Journal of Health Informatics in Developing Countries.*

Paper IV: Sheikh, Y. H. Revisiting Participatory Design: A Critical Examination of User Participation in Participatory Information Systems Development. *Reviewed and preparing for resubmission to Information Technology for Development.*

Paper V: Sheikh, Y. H. and Nyela, E. Analysing the Power of Technology in the Institutionalisation of Health Information System: an Actor-Network Analysis of Information Systems Integration. *Submitted to the African Journal of Health Informatics.*

These papers altogether contribute to "How to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision"

The contribution of each paper is mapped with sub questions as presented in table 1.1 below:

Table 1.1 Mapping of contribution of each appended paper in relation to the research questions

Research Question	Paper I	Paper II	Paper III	Paper IV	Paper V
RQ1.a What are the health information system's *institutional characteristics* that shape HIS integration in Zanzibar?	XX		X	X	
RQ1.b How does the *power interplay* between HIS stakeholders affect development and institutionalization of the integrated HIS?	X		XX	X	XX
RQ1.c What *design strategies* can be used to foster integrated HIS?	X	XX		XX	XX

Key: XX – major contribution; X – minor contribution

1.6. Structure of the Thesis

The thesis is organised as follows. Following this introductory chapter which has developed the research motivations and questions, chapter 2 presents reviews of relevant literature on HIS development challenges in developing countries and trends in IS integration to relate this study with the ongoing research in the domain. The chapter also introduce important concepts from institutional theory and power followed by the conceptual framework that is used for this study. Chapter 3 presents the context of the study. Research methods and methodology are presented in chapter 4, and chapter 5 presents empirical findings as presented in the papers. Chapter 6 presents research contributions and conclusions.

Chapter 2: Literature Review and Conceptual Framework

In this chapter, I present the related literature in HIS integration and a theoretical framework adopted for HIS integration in this study. Section 2.1 presents HIS literature in the context of developing countries highlighting the need for integration and challenges towards integration. I then, in section 2.2 present discussion on IS integration perspectives. A discussion on the core concepts built from institutional theory and power that are used to build the conceptual framework of the thesis is presented in sections 2.3 and 2.4 followed by the conceptual framework in section 2.5.

2.1 HIS in Developing Countries: Highlighting the Need for Integration

It is widely believed that proper HIS would highly help to improve the healthcare sector, by providing a useful tool to assist in planning, monitoring and evaluation. However, in developing countries the status of HIS remains an issue of high concern. Consequently, the envisioned efficient and responsive healthcare service provision programmes prove difficult to be realised. The HIS in places are often under-performing where problems of data quality (Wilson et al., 2001, Chilundo et al., 2004, Rubona, 2001) and lack of information culture (Wilson et al., 2001, Chaulagai et al., 2001) persist.

Factors cited as the root cause of under-performing HIS in developing countries include under-developed HIS infrastructure, inadequate skills levels, high workloads of the data collection staff, and more important, the organisation of HIS themselves. The healthcare sector is experiencing fragmented information systems, usually collecting repeated data that fail to address the sector-wide needs and inconveniently using the same staff who are already overburdened due to high workload caused by the large number of clients and patients they serve (Mosse and Sahay, 2003, Sheikh, 2005). To improve efficiency and efficacy of the service provided, there is a need for evidence-based care and care

management. Moreover due to high involvement of different stakeholders including donors, there is increasing demand to improve accountability (HMN, 2008).

As a result of the stated needs, HIS in developing countries has evolved in haphazard and fragmented way. Different programmes focusing on control of particular diseases such as Malaria, HIV/AIDS, TB, or on special services such as immunisation, child health, nutrition, or reproductive health, or programmes that deals with support in medical supplies or capacity development has developed specialised information systems to help in planning, monitoring and evaluation of the service they are offering. Usually these programmes receive fund from bilateral and multilateral donors, and in most cases one programme receives support from multiple sources making the situation complicated in terms of information demand and accountability (Lippeveld, 2001, HMN, 2008, Braa et al., 2004, Chilundo and Aanestad, 2005).

In recognition of the potential damage caused by information systems fragmentation, countries and donors are seeking a greater degree of integration, facilitated through the use of ICT based data warehouse techniques. These data shall come from different sources at different levels, both national and sub national and shall be based on core indicator sets necessary for healthcare management (HMN, 2008). Rather than centralising design and management of the HIS as it has been the past experience (Lippeveld, 2001, Mwaluko et al., 1996), the design should seek a balance between the top-down initiatives dictating data demand and the bottom-up actual data demand and use of information systems tools in order to involve all necessary stakeholders in the design process.

Consequently, this will help in minimising risk of HIS failure by narrowing what Heeks (1999) refers to rationality-reality gaps in information systems development. This refers to the gaps that arise the formal, rational way of HIS design which often mismatches the behavioural reality of the healthcare organisation (ibid). It is this behavioural reality of the healthcare organisations that accounts to the complexity behind HIS integration, and thus, viewing from wider perspective that goes beyond the technical configurations. This conception is established in the next section.

2.2 Trends in IS Integration and the Socio-technical Approach

"Information systems integration aims at enabling the realization of collaborative activities among autonomous organizations by means of integrating the business functions supported by their respective information systems" (Costa et al., 2008) p. 777. In the past decades, organisations have increasingly engaged in IS integration in support of ever interdependent business processes within and outside organisations (Djavanshir and Khorramshahgol, 2007), to the extent deemed by many as a 'holy grail' (Kumar and Hillegersberg, 2000). Consequently, this has attracted attention from research community with intention to contribute on how better integration can be achieved.

Two schools have emerged, with the traditional school basing the debate on the technical aspects of integration. The primary discussion on this school is dominated by how to develop standards, gateways, models and the selection of the right technology to facilitate systems integration. When it comes to dealing with the existing system, a major concern has been on how to deal with legacy systems. As demands for enterprise-wide information systems increase, legacy systems cannot easily be eliminated because there is usually no time and justification to eliminate them (Hasselbring, 2000), and hence can only be replaced by integrating them through well-defined standards in order to build applications that are adaptable to business and technology changes. Thus, researchers and practitioners alike, work on how to make the right balance between autonomy, heterogeneity, and distribution (ibid, p. 37). This school perceive integration as the process of formulating right approaches to manage these issues.

Different IT disciplines work to address these issues. These include parallel and distributed systems, database systems, software engineering, artificial intelligence, and multimedia systems (Hasselbring, 2000). In software engineering, for example, a concern is on the design of adequate software architecture, design patterns, software components composition, proper use of extensions and middleware tools, and methodological approaches to integration (ibid p. 34 – 35). Generic systems integration architecture comprises of three layers: business, application, and technology layers. At the core is the need for semantic interoperability among the distributed and heterogeneous systems (Park and Ram, 2004). Semantic interoperability deals with the problem of data sharing

between systems designed in different approaches and in different technologies. Thus, research in this area deals with developing semantically interoperable system environment that manages various semantic conflicts among different systems (ibid p. 597, see also Naumann et al., (1999)).

At the next level is the syntactic interoperability, which deals with technological solutions to ensure application-level interoperability. Research on this area focuses on developing standards, specifications and tools for application integration (Chari and Seshadri, 2004), with special emphasis on enterprise application integration (EAI). Standards such as XML that is used for schema and data interchange between sources, and web services such as SOAP –Simple Object Access Protocol, are used to address the application-level interoperability problem (Park and Ram, 2004). The issue of standards is given high priority in this area. Standards offer flexible integration as there is flexibility in terms of freedom components are given, and are considered long-term cost effective (Chari and Seshadri, 2004).

To sum up, researchers and practitioners alike have put much effort on technicality of design and development and leave aside the organisational and social side of. To highlight this, Djavanshir and Khorramshahgol (2007), surveyed priority areas on key process areas of IS integration as perceived by amongst IS integration researchers and practitioners, and in the list of 15 top priorities, all but one involved only technical aspects. The only process in the list that deals with organizational affairs is impact analysis, which also deals with post integration effects and has nothing to do with design and implementation processes. Should this viewpoint sufficiently describe the engineering and art of integration, businesses would not be struggling with IS fragmentation, considering a number of products both proprietary and open source available in the market.

To highlight the issue on broader perspective, Alexander (2004), on the book review edited by A. Prencipe, A. Davis and M. Hobday, titled 'The Business of Systems Integration' puts on:

> "Systems integration means, obviously enough, putting together components from different places to form a single correctly functioning system. This in turn means that the task straddles engineering design (of whole systems, as well as of components and their interfaces) and business

organization and management… Thus, engineering meets economics, and often politics as well" (Alexander, 2004) p. 160.

However, this call has not received much attention. While there is considerable recognition of IS development outside purely technical perspective (See for example (Aanestad et al., 2003, Berg, 1999, Berg et al., 1998, Bostrom and Heinen, 1977a, Bostrom and Heinen, 1977b)), IS integration is still predominantly viewed as a mere technical endeavour. It is apparent that if a more elaborative description of IS development is that which view it as a socio-technical process, a clear picture of IS integration shall also be built from the same perspective. However, this does not mean that the extent of the problem of individual IS implementation will be equal to that of IS integration. Integration is about bringing together working information systems to serve a common purpose, and hence can be viewed as a process of standardising systems and practices (Ellingsen and Monteiro, 2006). Information systems comprise technical artefacts (software, hardware, manuals, and paper forms), organisational routines and procedures, and people working with those systems. All these issues need to be addressed during design and implementation phases in order to provide sufficient opportunities for user led evolution (Hartswood et al., 2003).

People and individual units running the individual information systems have profound interests in their individual systems. This multitude of stakeholders' interest result into a constant competition in securing resources and power among them. Those who have resources are looking to extend their influence, while those who have not are fighting to acquire some, and often are subject to power of the haves. In this context, it is hard to assume that integration is wanted by all actors, or at least not in the same way (Sahay et al., 2009).

Our challenge is then how to perceive integration in such environment. Chilundo and Aanestad (2005) caution that integration is not the quick fix it is promoted as. The main concern is not to strive for the (unattainable and dysfunctional) ideal of completion, perfection and seamless integration, but to live with a 'reasonable' level of mess. In order to attain an acceptable integration the context calls for approaches that are 'on the guard' continuously, and where threats and opportunities are monitored, assessed and reacted to

on an ongoing basis (Aanestad et al., 2005). These ongoing processes of negotiations shape and reshape the existing institutions and are subject to power relations among actors involved. Sheikh and Titlestad (2008) point out that an integrated data repository approach can influence these negotiations in a positive way, as by providing all stakeholders with their key (essential) indicators through the integrated data repository (Sheikh and Titlestad 2008), "vertical programmes may come to rely on these national core indicators, and realize that collecting separate datasets is not necessary for effective monitoring and evaluation" (HMN 2007, p.52).

Looking at the nature of the healthcare sector, as presented earlier, there is a need to zoom in into the complexity behind integrating HIS from the various health programmes that operate in the healthcare sector. Programmes not only embody HIS technical solutions but also embody established work routines and social institutions that are often poorly aligned with the national systems for data reporting. These programmes often have an independent decision-making structure and an internal system for information reporting and resource distribution. These systems are directly linked to policy and procedure of technical and financial support from donor agencies. Political legitimacy must be secured in a situation where there may be frequent political discontinuities among key stakeholders including foreign aid agencies, all having different interests and agendas. Indeed, it is this institutional fragmentation that accounts for the major part of complexity behind HIS integration.

Recent studies on HIS integration in developing countries have revealed that integration is a complex and politically charged activity. This implies that even in situations where actors agree in principle, to work on integrated HIS, the actual implementation often prove to be difficult, despite successful development of the technical solutions (Aanestad et al., 2005). Studies point out to the social, organisational and political configurations as the axis of HIS integration (Aanestad et al., 2005, Sahay et al., 2009), as integration generally implies standardisation to practice and systems (Ellingsen and Monteiro, 2006). This apparently responds to the complex nature of the healthcare sector in developing countries, and could shed light on how to reduce failure rates of HIS projects (Berg et al., 1998, Heeks, 2002, Heeks, 2003, Berg, 1999).

This thesis contributes to this strand. While the thesis does not denounce the importance of technical aspects of HIS integration, by analysing HIS integration in Zanzibar it argue for, and focus on approaches to deal with the social and organisational issues alongside the technical development. The thesis highlights the history of the existing HIS for different programmes and the institutional establishments of the programmes in order to build a picture on how this affects the integration process. The thesis examines actions and reactions during the implementation process and the emerging trajectories resulting from interaction between actors involved, sources of power of each actor and the result of power play between actors and its effect in the HIS integration process. With this respect, the thesis contributes to not only conceptualisation of integration as socio-technical process, which the base arguments are already done, but rather on how integration can be achieved from this perspective.

2.3 Integration as Institutionalisation of Tools and Practices

Conceptualising HIS integration as socio-technical process implies a broader insight on how do we develop technological solutions to adapt with the social and organisational settings. This also implies how the present settings are also affected by the new technologies. The socio-technical analysis of integration, thus, requires a more precise definition of what is HIS integration. Integration involves not only the merging of technological solutions but the processes, routines, and workplace norms that are usually well established within the existing systems. Thus, in this context integration can be regarded as standardisation of systems and practices (Ellingsen and Monteiro, 2006), and with the intended long term goal of sustainability, integration shall be viewed as a process of institutionalising the new integrated technical artefacts and associated routines into the organisational settings. By institutionalisation, I refer to the concept from new institutional theory (Meyer and Rowan, 1977) meaning the new information system will be taken-into-granted within the working community (Scott, 2008). The information system at this stage is "no longer considered as innovations, but as unnoticed and unremarkable tools that people take-for-granted in doing their work … [they] are noticed only when they break down" (Silva and Backhouse, 1997) p. 390.

Institutional theory has its roots from sociology, economics, and organisational sciences. In IS studies, the theory has become increasingly important, especially in analysing how the social, cultural and organisational features shape the IS development and implementation. Orlikowski and Barley (2001) discuss the prospects of the theory in analysing how the regulative processes, normative systems and cultural frameworks, shape the design and use of technological solutions. These are the formal and informal constraints that entail how people within the organisations work and consequently affecting implementation of technological solutions. In institutionalism terms, these are called 'institutions' and are different from formal organisations. According to Scott (2008), institutions are "comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, that provide stability and meaning to social life" p.48. They are social structures that have attained a high degree of resilience. A highly institutionalised practice makes its followers think of no alternative (Scott, 2008, Zucker, 1977), and are considered as 'rationalised myths' (Meyer and Rowan, 1977).

Institutional theory can be used to describe the current perception of information technology as well as the strategies for implementing IS. For example, Avgerou (2000) describes the current diffusion of IT as the result of belief in the rationalised myth established by the outspoken benefits that IT offers. Thus, she asserts, developing countries adopt new IT projects not necessarily because of the confidence on its successful development and use, but rather because it has become a myth and so people never think of arguing over whether the project will deliver the promises.

On the other side, which is of interest for this study is on how the theory can be used to describe strategies to which new IS projects can be established in a particular organisation in order to achieve the profound benefits. This is because IS development, and integration in particular, not only involves the technical developments, but also involves realigning resources, people, and procedures and norms of the old systems into the new system. For this purpose, we can use the theory to explain how the HIS integration can better be achieved, thereby identifying those procedures, norms and routines that accompany the existing HIS, as well as how the new system (integrated HIS) can be

adapted into the present settings and the subsequent diffusion into the environment to reach a state of taken it into granted (Scott, 2008) by its user community.

The process of institutionalisation occurs in three stages of habitualisation, objectification, and sedimentation, (Tolbert and Zucker, 1996). At sedimentation stage there is externalisation of facts and routines and we consider an institutionalised technology or practice (Berger and Luckmann, 1967). Thus, institutionalisation arises from the ongoing use and embedding of technology in work practices, and hence becoming part of the practice (Baptista et al., 2010). Drawing from various literature and as observed in their study, Baptista et al. (2010) p.177 outline the following properties of institutionalised information system:

i. The system become representative, that is, there will be seen as the property of the community rather than driven by some individuals' interest

ii. The system become part of the formal function of the organisation

iii. The system is embedded in and closely aligned with the ongoing functioning of the organisation

iv. The system become important part of the organisation where it is well integrated with the key business process that is supposed to support

v. Members become familiar with it and perceive it to be normal feature of the organisation

vi. Become easy and natural to use.

HIS integration involves a continuous process of negotiations bringing together various actors with their operational procedures and institutional arrangements (Piotti et al., 2006). Several factors affect the choice of the path and outcome. For example, the overlap between the newly introduced institutions and the old and in particular the informal and formal may determine the way the new innovative solutions will be diffused and finally institutionalised (Piotti et al., 2006). Furthermore, the tension between innovation and conservation resulting from the power of the installed base influences the

design of the new solutions both during the design and implementation stages (Lanzara, 2008) and subsequently affecting its institutionalisation. Thus, integrating information systems of various health programmes, each serving more like an independent organization, needs a careful consideration to these factors, in addition to the others. To address this situation, the concept of institutional logic offers an ideal venue to discuss the present in relation to innovation.

Institutional logic refers to "set of practices –behaviours, institutional forms, ideologies– that have social functions and are defended by politically organised interests. Individual actors may not be aware of these logics" (Alford and Friedland, 1985) p.11. Institutional logics are the determinants of the institutions in practice, and incorporate a set of meta-theories to explain how the institutions shape heterogeneity, stability and change (Thornton and Ocasio, 2008). Friedland and Alford (1991) argue that individual and organisations behaviours can only be understood through the societal context they belong. They present society as an inter-institutional system comprising several institutions intermingling to each other. These institutions are "both supraorganisational patterns of activity through which humans conduct their material life in time and space, and symbolic systems through which they categorise that activity and infuse it with meaning" (Friedland and Alford, 1991) p.232. They further assert that institutions cannot be analysed in isolation from each other, but must be understood in their mutually dependent, yet contradictory relationship. For example, the structure of capitalism, based upon private ownership and legally free wage workers, not only is internally contradictory, tending inevitably toward economic and political crisis, but externally contradictory to its relationship to state, democracy, and family (ibid).

Institutional theory has provided a clear meaning on what is an institutionalised system and stages of which an institutionalised system passes. Through the concept of institutional logic, it also gives an analytical tool to assess the extent to which innovation is likely to succeed or be constrained. However, it does little to describe how to achieve this (Currie, 2009). This study, due to time limitation, does not seek to assess the extent of HIS institutionalisation, and rather focuses on examining what is on the ground in order find practical solutions that will help in the institutionalisation of the integrated HIS. To

do so, concepts from the theory of power are used in order to build a complete conceptual framework that will help to adequately study the situation and the institutionalisation process. In that respect, the study will empirically contribute to what is already known in the institutional theory about how and the extent the existing work routines, organisational procedures and norms that constitute the healthcare organisation, shape HIS integration agenda. This includes understanding dynamics of actors' involvement as well as the procedural establishments.

2.4 Power and IS Institutionalisation

The concept of power is central to understanding of any society. Apart from this general recognition of the importance of power, the inherent nature of HIS development and implementation, and integration in particular, draws special importance. As I have discussed in the previous section, the process of HIS integration shall be viewed as the process of institutionalising the technical tools and associated procedures into the existing organisational routines. In no doubt HIS integration offers a stage of potential conflict between actors, and hence an arena for power plays. This power play can either foster or hinder institutionalisation (Silva and Backhouse, 1997), and hence change agents need to strategically exercise power for institutionalisation to occur (Silva and Backhouse, 2003).

Before continuing with the discussing on exercise of power, I first define what power is. Avelino and Rotmans (2009) compare power in relation to society as the way gravity force is related to the earth:

> Power is a social force just as gravity is a physical force. In the same way that enables us to be physically attached to earth, power enables us to be embedded in society. Power is, as such, an inherent part of the society and the 'human condition' (Avelino and Rotmans, 2009: 550).

Avelino and Rotmans (2009) built this thesis from Luhmann (1984)'s theory of society, which view power as symbolically generalised medium of communication in a given society in order to deal with structural contingency of a complex and evolutionary society. The basic argument built here is that power resides in, and is exercised, in a society. There are two main schools of theories of power, resource based theories and structure based theories. The resource based theories are mainly based on the works of Max Weber, who introduced the distributive approach to power analysis (Weber, 1978), and the work of

Talcott Parsons who view power in the collective approach (Parsons, 1957). The structural approach is based on Foucauldian analysis established on the works of Michel Faucault (Foucault, 1979, Foucault, 1982), and the post Foucauldian theorists (Heiskala, 2001). While the discussions on the different theories of power takes the rivalry form, indeed the approaches are supplementary to each other and the approach to be used for any analysis depends on the nature and complexity of the phenomenon to be investigated (Heiskala, 2001).

Resources based power

Max Weber defines power as "the probability that one actor within a social relationship will be in position to carry out his own will despite resistance, regardless of the basis on which this probability rests" (Weber, 1978: 53). In this context, power is considered as actor-specific resources used in the pursuit of self-interests. Weber's conception of power is referred to as distributive power since it has zero-sum effect, meaning that in a power relation between two persons, a and b, (a → b) an increase in a's power means a decrease in b's power, and vice versa (Parsons, 1957, Mann, 1986).

Parsons (1957) extends this discussion of power into collective forms, where he argues that power is a generalised facility or resource in a society, denouncing the zero-sum argument as the sole way to explain power play scenario. In this conception power is considered as the capacity of a social system to mobilize resources to realize collective goals (Parsons, 1957). Parsons arguments imply that power is both shared and can be increased (Parsons, 1957, Mann, 1986), and has both distributive and collective functions (Parsons, 1957). The collective mode supplements the distributive mode by discussing it in the wider context of a society in which the distribution game happens (Heiskala, 2001).

The structural approach to power

The structural approach is based on the works of Michel Foucault (Foucault, 1979, Foucault, 1982), in which power is viewed as a network of relations. Another important development on this conception comes from the identity of the subjects, which represent a state of the network. This differs from the resource based approach in which identities

of individuals are believed to be predefined (Heiskala, 2001). However, these differences do not make the two approaches absolutely unrelated. Indeed, Kusch (1991) attempts to present both approaches to power as relation by using Foucault's definition and apply it to as internal relations rather than external.

The internal relation means that there is identity dependency between the individual actors concerned, and the power of one actor is not reducible because of the power of the other. Examples of internal relations are parenthood and love. For example, a relationship of a child and a mother is irreducible and is internally defined. This analysis focus on mechanisms of power (Foucault, 1979), where actors are tied to each other through the mechanisms of power and is transmitted through them by shaping their identities (Foucault, 1979). With a focus on the mechanisms of power, the structural approach is not concerned on the micro relationship of individuals rather the macro, institutional and strategic relationships. This thesis analyses these macro, institutional and strategic relationships that are sanctioned by various actors in the HIS integration process.

2.5 Circuits of Power and Institutionalisation of IS

On the topic of subject and power, Foucault (1982) outlined three distinct qualities of power: its origin, its basic nature, and its manifestation. By itself, power does not exist, or at least is not interesting to discuss about it. It is through how it is exercised, and through its effect, one can make a meaningful analysis. Thus, an interesting discussion is on the power relations instead of mere fundamental supposition on power. Foucault (1982) suggests the analysis of power relationship at the level of carefully defined institutions[1] rather than the relationship between individual actors, since at this level the forms and logic of power relations are clearly identified. He further emphasises that the fundamental point of anchorage that defines that relationship shall be outside that institution.

Hence, analysis of power relationship must meet certain number of criteria (Foucault, 1982):

   i.   There must be a form of material or ideological differences between actors. The HIS integration project present ideological as well as material differences between

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[1] As referred in Institutional Theory. Discussion on institutional theory was presented in previous section.

the actors. The logic behind promoters of integration is different from those behind individual programmes IS. Material differences are also evident.

ii.   There must be objectives for exercising the power be it maintenance of privileges, accumulation of profit, bringing into operation of statutory authority, exercise of a function or trade, developing technological solution, etc. The objectives of the HIS integration project is to deploy a technological solution to promote shared data collection as well as improving data quality.

iii. There must be means of bringing power relations into being, e.g. threat of war, effects of words, means of economic disparities, means of control, systems of surveillance, etc. There also may be in the means of technology use. The HIS integration project uses technological solutions and associated surveillance mechanism to bring the new power relations.

iv.   There must be some forms of institutionalisation such as traditional pre dispositions, legal structures, customs, etc. The new integrated HIS challenges the existing programme-based HIS which are well institutionalised.

v.   As power is exercised in a society with diverse fields of possibilities, there must be some form of rationalisation where the effectiveness of instruments and certainty of results matter. The promoters of HIS integration project presents the rational benefits of integration which as a whole the HIS cannot be obtained by operating multiple HIS.

Clegg (1989) introduced the Circuits of Power framework to highlight the contextual nature of power. The framework integrates different views of power and stresses the fact that power is relational, it flows within a particular community through different modalities and felt through its effect (Clegg, 1989, Clegg et al., 2006). (Silva and Backhouse, 2003, Silva and Backhouse, 1997) use the circuits of power framework to assess institutionalisation of IS. Institutionalisation of IS or any other innovation requires efforts and resources. These efforts and resources are either source or are results of power exercise. Power exercised in this arena cannot sufficiently be described from only

one dimension of power, and the circuits framework provide a comprehensive framework that mixes different type of power, and hence is ideal for analysing IS institutionalisation (Silva and Backhouse, 2003).

In this thesis however I seek to use the framework as a guiding framework in the HIS integration process. The application of the framework will thus lead us to understand the relationship between the authority and resource distribution within the Zanzibar healthcare, and hence build understanding factors that need to be considered during implementation in order to boost institutionalisation of the integrated HIS.

The Circuits of Power framework comprises three circuits, each describing different types of power. The three circuits are: episodic circuit, systemic integration circuit, and social integration circuit. According to this framework power circulates in the three circuits, integrated through obligatory passage points (OPP) (Clegg, 1989), which represents what the change agent wants others to do (Figure 2.1). When the IS is fixed as an OPP, it is institutionalised. At this stage the IS will be considered legitimate and its operation will be taken for granted by all members (Silva and Backhouse, 1997, Silva and Backhouse, 2003).
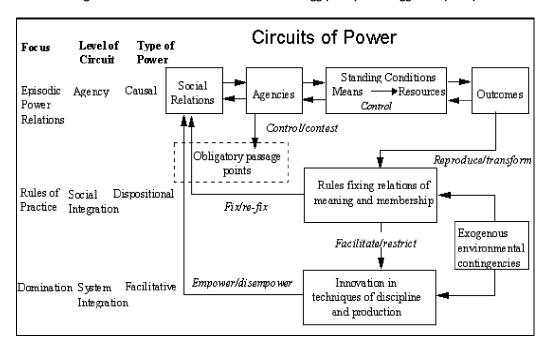
Figure 2.1: Frameworks of Power. Source: Clegg (1989) and Clegg et al. (2006)

Episodic Circuit:

The episodic circuit represents the individual actions in a power relation. At its simplistic description is the power relation where a person A makes person B do things which otherwise B would not do. The type of power exercised in this circuit is causal power, or 'power over' where A exercises the power by pushing B through OPP. In order for this to happen, there is a role of agency and capacity of A to control resources. Agencies are however constituted within social relations and hence two persons relationship will not be suffice to describe the power relations. This is extended in the other two circuits –circuits of social integration and system integration (Clegg, 1989, Clegg et al., 2006).

The Circuit of Social Integration:

The circuit of social integration emphasises dispositional power, and provides conditions for exercising power. It extends the fact that the episodic effects tend to reproduce or transform the existing structures of power relations, the structures that govern meanings and membership in organisational fields (Clegg, 1989, Clegg et al., 2006). The circuit of social integration integrates both legitimate and illegitimate dimensions of power; the legitimate side being the formal rules governing the organisation or organisation field, and the illegitimate being the informal rules that shape how people live. The episodic outcomes, which are the results of the episodic circuit, tend to transform or reproduce the social balances, and consequently redefine the OPP. As identities are transformed, the social relations in which they are manifested are also changed (Clegg et al., 2006) p.241.

The circuit of System Integration:

The circuit of system integration deals with facilitative power, and is the highest level circuit. The analytical focus in this circuit is the ability of power to achieve collective goals. Changes in rules fixing relations, that occur in the social integration circuit usually facilitate or restrict innovations in techniques of discipline and production. Eventually, this will empower or disempower the existing social relations seeking to stabilise the episodic field. This will lead to recreating the existing OPP or creating new ones, especially if material conditions of production are altered (Clegg et al., 2006, Clegg, 1989).

Obligatory passage points (OPP)

Obligatory Passage Points (OPP) are the bottom line of framework of circuits of power. With its origin from the 'sociology of translation' and 'actor network theory' (Latour, 1987, Callon, 1986), OPP are used in the circuits of power framework to explain how change agents exercise power by compelling others to comply with changes they are proposing by passing through particular channel. They do so by forming alliances and control of resources needed to achieve the change agents' goals. These alliances are usually constituted of heterogeneous mix of people, rules, technologies, and material conditions used by the agent, and are referred to as actor-network.

Translation and Inscription

The term actor-network is the key concept of actor network theory (ANT) referring to a combination of people, technological artefacts, rules and regulations that altogether create a meaning. ANT offers a viable platform to discuss how the change agents use power to appeal to other actors to do what they want them doing (Callon, 1987). It does this by studying the mechanics of power as actors develop them as they construct and maintain the actor-network, or the OPP.

An interesting point within ANT and which is of importance in this study is its rejection of the control of human actors' mastery of technology. ANT focuses on the organizing powers of combinations or on the effects of an association rather than direct intentional and consciousness source of power (Latour, 1986). Power exercise in this perspective gives more credit to those who are able to enrol, convince and align others into alliances, not necessary the powerful ones. In ANT this is called translation. It is a process through which the innovation is taken and adopted by the stakeholders where interests and solutions are developed and evolved, and order and stability is achieved. These actors usually have contradicting interests, and through translation process actors re-interpret and re-present ideas of change agents as their own ideas. It is through the translation process where ordering effects such as devices, agents, institutions, or organizations are generated (Star, 1991). The result of this adaptation and evolution is the actor-network, or the OPP. At this stage the change agents obtain the right to express and represent other silent actors they have mobilised (Stanforth, 2006).

When introducing new technologies, this alignment can be reached by exercising power embedded in the technology introduced, and hence designers influence others –the silent actors, to perform behind the interests of the technology innovators. This is called inscription. It refers to the way material resources embody interests meant for structuring possible actions of others. This is for example seen on how a particular technology is designed in the way the designers want users to do, as Akrich puts on:

> Designers […] define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of "inscribing" this vision of the world in the technical content of the new object. I will call the end product of this work a "script" or a "scenario." (Akrich, 1992) p.208.

The inscribed scenarios of action define roles to be played by users and the system, and if well inscribed and followed can be a source of institutionalisation. In this way the technology becomes an actor imposing its inscribed program of action on its users (Grindley, 1995 , Akrich, 1992, Monteiro, 2000). Furthermore, the strengths of inscriptions are not fixed, depending on the type of user and use environment. In some cases the effect of inscriptions may be different from those intended by the designers (Monteiro and Hepsø, 2000, Aanestad, 2002).

User Participation, Empowerment and Power Relations

The previous sections have presented a theoretical underpinning to study the HIS integration, first conceptualising HIS integration as a process of institutionalisation, and second, describing institutionalisation as a process of power play between actors involved. Highlighting the socio-technical nature of HIS integration, the process needs multiple and supplementary efforts to address both technological as well as the organisation barriers to integration.

Translation involves a mix of human and non-human actors in a context where multiple powerful players are involved. HIS integration involves lots of politics. Systems designed may result into actions that are politically determined or solved, for example, changing nature of job and privileges staff get. Also the design and implementation often will encounter political pressures that may be opposing to the system's goals (Beck, 2002). Intrinsically, deliberate resistances may be experienced regardless of the technology

developed and the level of inscriptions the technology features. One of the approaches used to minimise the chance of this resistance is participation of those actors in the design process.

User participation is a well-founded agenda within Participatory Design (PD) body of research. The prime motives behind PD is on how to deal with the concern over imbalance between technology innovators and users (Beck, 2002), through involving future users of technology in designing their own solutions (Bødker et al., 2000, Bjerknes and Bratteteig, 1995, Bjerknes et al., 1987). It is argued that by involving future users in the design, first, it will improve the knowledge upon which systems are built, second, it enable users to develop realistic expectations as well as reducing resistance to change, and third, it helps to increase workplace democracy by giving the members of an organisation the right to participate in decisions that are likely to affect their work (Bjerknes and Bratteteig, 1995, Bødker et al., 2000).

With these characters, PD has some resemblances with the some user-centred systems development approaches. However, what makes it unique is the political agenda, which aims to increase workplace democracy by giving equal rights to people with little or no power –the end users, giving them influence on their work situation through work arrangements and participation in decision-making (Bjerknes and Bratteteig, 1995).

The ideas behind PD have significantly influenced how information systems are developed. For example, researchers and developers alike, have used PD to improve systems development techniques through prototyping and business process reengineering in order to provide better products as well as enhancing domain knowledge for the newly developed products (Asaro, 2000, Puri, 2003). In the public sector, a considerable number of studies in IS developments have been documented, expanding nature and context, and adapting to varying contexts including those in developing countries (Byrne and Sahay, 2007, Puri et al., 2004, Madon and Sahay, 2002). This study focuses on this political agenda of PD, seeking to analyse the conflicting interests between actors involved in the HIS integration in Zanzibar. Historically, HIS has been used as tools to collect programme specific data, usually reflecting to the needs of external donors who support

the various programmes. This highly gives power to programmes and their respective donors to make decision on the type of data collected as well as the design and layout of data collection tools. Apparently, incorporating end users in decisions concerning design of the HIS challenges power structures of that particular healthcare management structures.

Thus, for the institutionalisation to occur, participation of these actors during design and implementation of the integrated HIS is highly important. The question however, remains on how these actors could effectively participate considering the long established power structures within the healthcare sector. Traditionally PD is a bottom up process. However, the context in developing countries where bureaucratic top down systems prevail, do not favour the traditional bottom up approach (Puri et al., 2004, Mosse, 2000). Thus, it is important to always consider modality and timing of participation. In the study of HIS development Puri et al. (2004) described the role of government officials in leading the process reflecting the power structures within the bureaucracy. Despite labelling the project as participatory, this, their argument goes, was necessary in order to avoid challenging the existing power structures that are not in favour of self-initiated bottom-up initiatives. This was intended to give time for the process to be gradually nurtured.

This approach however, has its challenges. Contrary to the political agenda aimed at empowering the lower level staff, who are the primary users of tools, this may facilitate the widening of power gap between participants coming from the different levels of hierarchy and hence reinforcing the interests of the already powerful (Cooke and Kothari, 2001). This is because participation involves wider range of issues including responsibilities, knowledge and access to resources, giving an advantage to the powerful actors over the less powerful (Jonsson, 2003), who can use the participation agenda to grip their power (Cooke and Kothari, 2001, Asaro, 2000).

Power structures and dominance patterns between facilitators and participants, and between donors and beneficiaries are complex prompting needs for closer scrutiny. However, proponents of participation have become naive in discussing these complexities

(Cooke and Kothari, 2001). Social structures and individual agencies also play important role in shaping the participation process. Thus, it is important to also understand individuals' motivations to participation rather than basing on rational assumptions about motives towards participation (Cleaver, 2000). This study tends to disclose these complexities, whether supportive of rational PD argumentation of empowerment, and how it fosters or hinders institutionalisation of integrated HIS.

2.6 Summary and Theoretical Approach

This thesis aims to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision with a case study from Zanzibar, Tanzania. In doing so relevant literature have been reviewed in this chapter. First, the chapter highlighted the problem of HIS fragmentation in order to highlight the need for sustainable integrated HIS. Second, I have conceptualised HIS integration from the socio technical perspective underscoring the nature and context of HIS. Thirdly, the chapter presents important concepts that are used to analyse and discuss the HIS integration. Viewing integration as institutionalisation of tools and practices, I draw upon concept of institutionalisation from institutional theory (Meyer and Rowan, 1977) and Circuits of Power (Clegg, 1989) to build the theoretical framework that is used to study how the HIS integration process was perceived and results realised in line with its institutionalisation, contributing to both theory and practice.

The theoretical framework is built on recognition of the socio-technical nature of HIS integration, justified in section 2.2 and on which the thesis itself contributes. As an analytical lens, the Circuits of Power framework (Clegg, 1989) is used. The Circuits of Power framework integrates different views of power, and hence offers a comprehensive way of analysing the HIS integration from the institutionalisation standpoint. Silva and Backhouse (1997) and Silva and Backhouse (2003) use the framework to assess institutionalisation of IS.

In this thesis however the framework is used as a guiding framework in the HIS integration process. The application of the framework will thus lead us to understand the relationship between the authority and resource distribution within the Zanzibar

healthcare, and hence build understanding factors that need to be considered during implementation in order to boost institutionalisation of the integrated HIS. Throughout the three circuits of episodic, social integration, and systemic integration, the thesis uses the following core and extended concepts to provide a comprehensive framework of analysis:

1. Obligatory Passage Point (OPP) or the actor-network in ANT terms. The target of institutionalisation of the HIS is to become OPP within the healthcare sector. An institutionalised HIS will compel the programmes and other actors to only use the integrated HIS, and its members especially those used in the data collection staff shall comprehend the legitimacy of the integrated HIS as they shall take for granted of its existence. An example of this could be the airlines' enforced booking systems where the travel agents are obliged to. Thus, the thesis will explore the sources of episodic, dispositional and causal power and how the different interventions move the HIS on the path to be fixed as OPP.

2. Translation and Inscriptions. The concept of translation is used to describe power exercise as a means to enrol, convince and align other actors in order to fix the integrated HIS as an OPP, where the integrated HIS is taken and adopted by the stakeholders with different interests, where interests and solutions are developed and evolved, and order and stability is achieved. It is through the translation process where ordering effects such as devices, agents, institutions, or organizations are generated (Star, 1991). The thesis also uses the concept of inscription to analyses how power embedded in the technology introduced affect the way this alignment can be reached by providing a venue for indirectly influencing other actors.

3. Participation and Empowerment. The arguments have been made that incorporating end users in decisions concerning design of the HIS challenges power structures of that particular healthcare management structures. Thus, in order to facilitate the institutionalisation of the HIS the thesis promote user participation and analyse how the traditional bottom up process can be used in the

context of well-established top down power structures of the healthcare sector. In line with other studies conducted in other developing countries (Puri et al., 2004, Mosse, 2000), the thesis examines modality (who, and why) and timing of participation, and how the outcome affect the path towards the institutionalisation of the HIS. The thesis tends to disclose complexities behind user participation in this context, whether supportive of rational PD argumentation of empowerment, and how it fosters or hinders institutionalisation of integrated HIS.

Chapter 3: Research Settings and Context

In this chapter I present context and settings of the research. The chapter starts by presenting the settings, where political history, geography and economic status of Zanzibar is presented (section 3.1) to build the base of our discussion. This is followed by the status of healthcare (section 3.2) and administration of healthcare services provision and the role of vertical programmes in section 3.3 and 3.4 respectively. Management structure of HIS is presented and section 3.5, and finally in section 3.6 the project under discussion (HIS integration) is introduced.

3.1 Political History, Geography, and Economic Status of Zanzibar

Zanzibar became an independent member of Commonwealth of Nations in December 10, as a constitutional monarchy under the name of Sultanate of Zanzibar, following nearly century long British protection (colonialism). One month later, in January 12, 1964 a revolution led by leftist party the Afro Shirazi Party (ASP) established a peoples' republic. In April 26, 1964, the People's Republic of Zanzibar united with Republic of Tanganyika to form the United Republic of Tanganyika and Zanzibar, which was later renamed to United Republic of Tanzania, hereafter referred to Tanzania. The two governments system that was setup after the union resulted into Tanganyika surrendering all her sovereignty to the United Republic while Zanzibar remained autonomy in many aspects that were stated to be non-union matters. Healthcare service provision was declared and remains to be among the non-union matters. Thus, the Zanzibar Ministry of Health is the sole authority over healthcare service provision to the Zanzibar population, while the Tanzanian Ministry of Health is only responsible for Tanzania mainland (formerly, Tanganyika).

Zanzibar is considered as a country within the united republic as described in the Zanzibar Constitution of 1984, as amended in 2010 (10th amendment). The country comprises two main islands of Unguja (often referred to Zanzibar) and Pemba, together

with several islets surrounding the two main islands. The total area covering the land is 2,332 square kilometres. The total area for the whole Tanzania is 945,000 square kilometres. Administratively, Zanzibar is divided into five regions, three in Unguja and two in Pemba and further into ten districts, each region having two districts. The administrative and commercial capital is Zanzibar city, located in Unguja Island. For smooth management, every ministry of Zanzibar Government has an office in Pemba. The official languages are Swahili and English. Zanzibar is the birthplace of Swahili and hence it is the mother tongue of all Zanzibaris. It is spoken and used in much government business compared to English, though it is very common to see written Government correspondences in English. This includes most statistical tools, such as those used for health data collection.

In 2011 the Zanzibar population amounted to 1,319,228 (2011 estimate), out of 45,875,221 that of Tanzania[2]. Out of this population, 44.2 percent is under the age of 15 years while 3.9 percent is over the age of 65 years. Thus, nearly half the population is in the economically non-productive age. Population growth is estimated to be 3.1 percent. The largest town is Zanzibar City located in Unguja Island. Other important towns are Chake Chake and Wete located in Pemba Island. Around 40 percent of the population live in the urban areas, with high urbanisation rate.

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[2] Population estimate for 2011 based on the 2002 National Population and Housing Census.
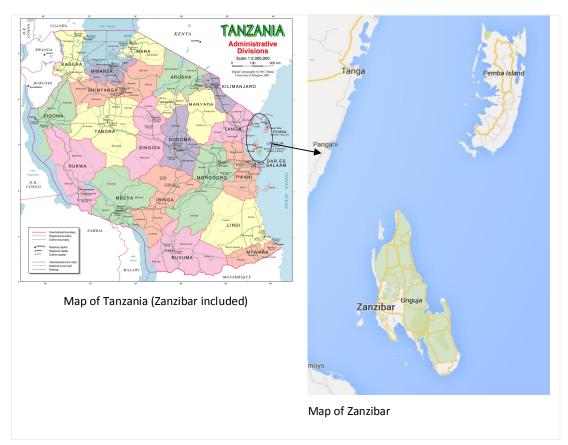
Figure 3.1: Map of Tanzania (left) with zoomed map of Zanzibar (right)

Map of Tanzania (Zanzibar included)

Map of Zanzibar

From mid 60s Zanzibar has been in continuous economic decline. By late 90s the Zanzibar Government was experiencing high budget deficits, and the per capita income was alarmingly decreasing. This led to the formulation of the Zanzibar Poverty Reduction Plan, which did a thorough review of the economy and outlined measures to alleviate the absolute poverty by 2020. Strategic areas were outlined including improving public services such as education, health, water and electricity supply. Despite these efforts, the economic situation is still in unsatisfactory level. In 2010, the economic growth was recorded at 6.4 percent but accompanied with high inflation rate of 8.1, low per capita income USD 303 (approx. TZS 434,000) and high budget deficits (ZIPA, 2007). The 2011/12 budget (TZS 613 billion approx. USD 383.125 million) is expecting 55 percent (TZS 340 billion, approx. USD 212.5 million) of donor contribution with the Zanzibar Government contributing to the remainder.

3.2 Zanzibar Healthcare and Social Service Profile

The Zanzibar healthcare service provision is basically based on post-revolution ASP health policy that emphasised equity on service provision between rural and urban as well as between groups. The policy underlines the role of state as the service provider and in particular it stressed on improving healthcare infrastructure by building new hospitals and dispensaries, equipping them with all necessary supplies and serviced by locals, replacing the British. The policy also emphasised on preparing effective health education to enable citizens to prevent themselves from contacting communicable diseases (MoH, 1999).

The implementation of this policy went well for the first ten years when Zanzibar was enjoying a buoyant economy. More health facilities were constructed across Unguja and Pemba, staffed by local doctors and nurses and all healthcare services were given free of charge. In late 70s, the Zanzibar economy was badly destroyed mainly by price drop of cloves, the country's main export. With struggling economy, this highly affected the provision of health services. Until mid-90s the per capita visit to health facilities dropped to below 1%, largely caused by unavailability of services and medicines in the health facilities which were all owned by the state.

With a lot of ambitious projects that were setup as revolutionary promises, the sector had to rely on support from donor agencies that started to work in mid 80s to support special programmes. These programmes focused on specific diseases such as Malaria, TB, and HIV/AIDS and also on specialised services that aimed at improving primary healthcare services. In late 1990s the Zanzibar Government introduced new health policy, which among other things established the role of private sector in providing healthcare services as part improving service provision as well as highlighting strategic areas that needs to be addressed, amongst them the strengthening of monitoring and evaluation tools to help improving the sector performance.

Despite the collective efforts undertaken by the government and developing partners through the health programmes, the healthcare status is still not in satisfactory level.

[3]Maternal mortality rate (MMR) stands at 221, while infant mortality rate (IMR) is at 51. Life expectancy at birth was recorded at 57 years in 2002 census, an improvement from that of 47 years in 1988 (Country Health Profile, 2007. MoH). There has been high reduction of malaria, from a prevalence rate of around 40% in 2005 to less than 1 in 2011. However, other tropical diseases such as pneumonia, diarrhoea remain high. Non communicable diseases such as diabetes are also on the rise. HIV prevalence stands at around 0.6. The existing programmes are involved in talking disease as well as providing specialised services such as immunisation, reproductive health, and child health in order to prevent curb diseases burden as well as improving the wellbeing of the population. This also contributes to the need for multitude data collection efforts.

3.3 Healthcare Administration

The Zanzibar healthcare system comprises the public and private sector, with the public sector serving the majority. However, the Ministry of Health has the overall responsibility for policy setup, management and service provision. Despite recent efforts to decentralise the healthcare service delivery management, the sector management is still heavily centralised, with decisions being primarily made at the Ministry central office and the operating vertical health programmes.

Healthcare administration is divided into two health zones – Pemba Zone responsible for Pemba Island and Unguja Zone responsible for Unguja Island. The Zones are further divided into health Districts (same as political administrative districts) with four districts in Pemba (Micheweni, Wete, Chake Chake and Mkoani), and six in Unguja (North A, North B, West, Urban, Central and South). Each district is managed by a team of six, called District Health Management Team (DHMT) and very recently data managers titled 'district surveillance officers' have been recruited to work in each district; the same is for the zones where ZHMT is in-charge of each zone.

Healthcare service is organised into three levels; primary, secondary and tertiary healthcare. However, in practice the higher level healthcare institution usually provides

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[3] MMR is based institutional records only. IMR is based o the 2010 survey data. Source: Zanzibar health information bullettin, 2012.

the lower levels care. Thus, service is basically based on the proximity of the population. The total number of all health facilities in 2010 was 211[4].

Primary Healthcare (PHC): This is the lowest level of healthcare service provision, and consists of level 1 (PHCU) and level 2 (PHCU+) public primary healthcare units, private dispensaries and four primary healthcare centres (PHCC). The four PHCCs are small hospitals (also known as cottage hospitals) serving as the immediate referral points in the rural areas that are far from higher referral system. Two of the four cottage hospitals are located in Pemba Island (Micheweni and Vitongoji) and two in Unguja Island (Kivunge and Makunduchi).

Secondary Healthcare: This is the second referral level comprising the district hospitals. Currently there are three district hospitals (Wete, Chake Chake and Mkoani) roughly with 100 bed capacity each, all located in Pemba Island. Also there are a considerable number of private hospitals mainly in Unguja Island, concentrated in urban areas.

Tertiary Healthcare: This comprises Mnazi Mmoja Referral and Teaching Hospital, located in the Urban District in Unguja Island. The hospital main campus (bed capacity: 400) is located at the Stone town. The hospital incorporates Mwembeladu Maternity Home (bed capacity: 34) and Kidongo Chekundu Mental Hospital (bed capacity: 110), which are located in different sites a few kilometres from the main site. The hospital provides referral services for the whole population of Zanzibar and also provides the secondary healthcare services for the Unguja Island as well as primary healthcare for the nearby population.

3.4 The role of vertical health programme

Healthcare service provision heavily relies on the operation by vertical health programmes. These are programmes that are involved in providing services for diseases of public health importance such as malaria, tuberculosis, HIV/AIDS, helminthiasis, as wells as providing specialised services such as reproductive and child care. To facilitate their service provision and also to report to their financial sponsors (external donors), the

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[4] Ref: www.zanhealth.info / www.zanhealth.go.tz; Accessed: 15.12.2011.

programmes are also involved in data collection activities. The following programmes operate in Zanzibar and have been at the centre of HIS reform. Detailed description of the actual involvement in the new HIS for each programme is provided in the case description in chapter 4.

Expanded Programme for Immunization (EPI):

EPI deals with providing immunization services to women and children. The immunization services include vaccination against tetanus for pregnant women as well as other women of reproductive age in order to prevent neonatal tetanus during delivery, as well as routine vaccination to protect children from immuniseable disease such as polio, tetanus, diphtheria, pneumonia, etc. An emphasis is on children under one year, and indicators are measured to monitor the progress. There are frequent mass campaigns for children vaccination. This is one of most active and efficient programmes in both service provision as well as proper documentation, despite the high workload they have basically caused by small staff. The programme depends mainly on WHO and the Ministry of Health itself to fund the supply of vaccines. There has been a dramatic increase in vaccination coverage with national average siding with the MDG and ZPRP targets.

Reproductive and Child Health (RCH):

This is one among the oldest programmes. The programme covers many services; family planning, antenatal services, delivery services, postnatal services, child care, and to some extent sexually transmitted infections as they are also related to reproductive health. The services are offered at different levels both at primary, secondary and tertiary care. Some of these services are also linked to other programmes. Due to this wide coverage the programme sees itself working as umbrella programme, often leading to clash with other programmes in data ownership. The programme has experienced changes of sponsors for its programmes. Since the establishment of the integrated HIS in 2005 a number of donors has supported the programme at different times, with implications on the type of data collected and hence design on the data collection forms used, consequently affecting the whole HIS integration process.

Nutrition:

Nutrition programme is one among the smallest programme with least resources. The programme basically deals with monitoring children growth, assessing nutritional status and

distribution of vitamins supplements to children. In doing its works there is always a blurred boundary between the work of the nutrition programme, EPI and RCH programme. The programme usually relies on government budget. In some cases, UNICEF has sponsored some of the programme's activities. When the integrated HIS was established, the nutrition programme did not have a form that specifically collects data for them; rather all the data were collected in RCH form. This was reflection of the history as the inherited forms did the same. Also the programme did not have enough resources to take care of their data, for example, when the project started the programme did not have computer of its own. Thus the data manager had to rely on collecting data from EPI and RCH programmes.

Zanzibar Malaria Control Programme (ZMCP):

With the reduction of malaria incidence from around 40% in mid 2000 to less than 1% in 2011, ZMCP is considered to be one of the most successful programmes in Zanzibar, and its works are highly acknowledged in the region. The programme deals with all interventions related to fighting Malaria in Zanzibar with a focus on all groups including pregnant women and children. The interventions include distributing medical supplies, malaria testing equipment and reagents, special treatment of pregnant women, household spray to kill malaria-spreading mosquitoes, distribution of treated bed nets, and public awareness campaigns for those interventions. Thus, the programme collects data covering wide domain.

With the change in disease incidence the programme is in the continuous state of changing interventions, from disease fighting to preventing disease come back. This highly affects the type, nature and frequency of data collected, and consequently the tools used.

Zanzibar AIDS Control Programme (ZACP):

ZACP is among the largest health programmes in Zanzibar. It commands a large manpower, huge financial and material resources. For many years, HIV prevalence has been recorded at 0.6 or less. However, with the risk the disease poses many donors are in support of the programme. The support covers wide area of interventions, from testing and supply of anti-retroviral to public health education and life support to those affected such as supply of food, clothes and home based care. The programme extends it services to also include care of sexually transmitted infections sharing responsibility with the RCH

programme. Age and social groups are considered very important when providing services and hence data collection. Often different donors may have different requirements and hence causing inconsistency in data collection.

Zanzibar TB/Leprosy:

Zanzibar TB and Leprosy programme is also one of the big programmes but often maintains low profile in terms of data collection activities related to the Zanzibar HIS. The programme is highly linked to the Tanzanian National TB and Leprosy programme to the extent that they directly mimic the Tanzanian National TB and Leprosy information system. In fact, as far as TB and Leprosy is considered Zanzibar is just considered as a region in Tanzania, different from the mainstream healthcare services and as implemented in all other programmes. In recent developments, ZACP streamlined some of the data collected by TB and Leprosy programme to their data due to the link between HIV/AIDS and TB.

3.5 HIS Management Structure

The HIS structure is organised at four levels; the health facilities, districts, zones and national level. The health facility level comprises health facilities which are the primary data collection point. For the primary healthcare this comprises of PHCU, PHCU+, PHCC and private dispensaries. For the hospital system it consists of hospital wards and specialised clinics of each hospital. With the exception of Mnazi Mmoja Hospital, which directly reports to the HMIS Unit, the cottage and district hospitals are supposed to report to the DHMTs of their respective districts.

DHMTs are responsible for ensuring all health facilities within their respective districts are supplied with the data collection forms. They are also responsible for fetching the filled in data collection forms, perform quality checks and provide feedback to the health facility staff. Data entry into the computer system (DHIS) takes place at the district level. One officer, District Surveillance Officer (DSO) is responsible for all data and information related activities. The post of DSO was established in 2008 to address the challenge of DHMT staff in consistently dealing with the data. Prior to their establishment, District Health Officers were de facto data managers. The post of DSO is

not part of official DHMT but process is underway to make them part of the team. Once this is done, the DSOs will have equal power in decision making within the DHMT, and hence influence the DHMT in using data for planning, monitoring and evaluation.

Data flow between the different levels has been in the continuous process of transformation, mainly depending on the technology in place, and technically in support of the changing agenda that aims at enhancing data flow. This is discussed in the various papers that form this thesis.

3.6 HIS Integration Initiatives and Project Progress

3.6.1 Project Background and My Role

This research is based on the fieldwork during my PhD research project spanning the period of August 2007 to May 2011. It is however shaped by my Masters Degree research and my participation in the same project as researcher under paid contract between July 2005 and July 2007. The project is mainly related to the integration of data collection and reporting system. This process includes revising data collection forms from different programmes and creating common set of data collection forms. It also involves introduction of a software system used as data warehouse and reporting solution within the Ministry of Health hierarchy, as well as necessary training to support HIS operation. District Health Information Software (DHIS), an HISP product has been used. The training focused on how to use data collection forms, how to use DHIS, data analysis, and information use.

The HIS integration project dates back in November 2004 when a joint survey was conducted to outline the status of the HIS in Zanzibar. The survey identified three major issues that needed to be addressed: first, lack of clear information strategy, second, problem of human capacity, and third, incomplete and fragmented systems that only reflects needs at the top level. (For details see Sheikh, 2005). Results of this survey opened doors for HIS reforms in Zanzibar. In August 2005, the University of Oslo, under HISP was contracted to undertake the HIS development, with a focus on integration, computerisation and enabling data and information use. The initial HISP contract was for two years, and was extended for another one year. Since then, HISP has been having a

presence and influence on HIS project either through HISP researchers' participation, or through short term contracts for HISP members.

3.6.2 The HIS Integration Project in Zanzibar

The HIS integration project in Zanzibar comprises three major components. The first component involves setting up data standards to enhance data sharing between programmes and other stakeholders. This was facilitated through designing data collection forms under the concept of minimum indicator and data sets. The indicator and data sets are meant to produce shared and comprehensive system that collects all necessary data that will help in healthcare planning, monitoring and evaluation for all stakeholders including the programmes. To make the data meaningful, a set of indicators was introduced. This was meant to replace the individual programmes data collection tools.

The second component involves developing software data warehouse solution to facilitate data storage, analysis and presentation. District Health Information Software (DHIS) was introduced for that purpose. The third component involves developing human and institutional capacity to support the new integrated HIS. The three components are interrelated and are analysed in a timeframe pointing out to project progress and evolution. The components are presented in the form of case units. The discussion is based on outlining key institutional establishments that foster or hinders the HIS integration process as well as the emerging trajectories resulting from power asymmetry between actors.

Throughout the project implementation, both the data collection tools and the software solution underwent transformation reflecting the evolving and often conflicting needs of the actors. This is also reflected in the capacity development programme to support the system, and is outlined in table 3.1. Details of the events are outlined in the individual papers forming this thesis.

Table 3.1: Chronology of important events during project implementation with emphasis on the duration of my PhD work

Period	Activities and interesting issues
2005 – 2006 (prior to PhD commencement)	Setting up initial data standards – October 2005: All programmes participated and agreed to use the shared data collection system. HISP/UiO led the development process sponsored by DANIDA. - *Two systems of data collection were developed, one for hospital and one for primary healthcare (health facilities)* - *Programmes that had well organised forms (e.g. EPI) had little changes made to their data collection forms, while programmes like ZMCP that fetched data from different sources agreed to get data collected through various forms as long there is a software solution to filter and give all the required data.* - *Other programmes such as ZACP and RCH had overhaul review and each had a number of 'dedicated' for collected their data.* - *It was agreed to revise the forms annually to reflect new requirements of all programmes but stick to the concept of minimal data and indicator sets.* - *Also agreed that programmes can introduce additional data collection forms to capture data that are not captured in the mainstream HIS, but it should be approved by HMIS Unit.* Software data warehouse solution: - *DHIS 1.4 was introduced as the official HIS reporting software solution.* - *Two databases were developed, one for each system (hospital and primary healthcare). The main database installed at the HMIS Unit and instances installed at districts, zones, hospitals, and programmes* - *Reporting from one level to the other was through export/import feature of the DHIS from districts to HMIS Unit which then update all other nodes. Transfer is by using external storage system or email. There was potential for delays.* - *Built in Microsoft Excel Pivot Tables used for data analysis. Templates were developed to simplify use.* Capacity building: Training organised for staff at all levels. HISP deployed local and international staff in the training - *Health facility staff were trained to use the new forms. Training organised by HMIS Unit/HISP with DHMTs which received training prior to proceeding to health facilities.* - *DHA, DHO and one more selected DHMT member, ZHA, ZHO and one selected ZHMT member were trained ho to do data entry, export/import and simple analysis of data captured within their districts/zones.* - *Programme data officers trained to use DHIS1.4 with emphasis on data import, and the use of built in Excel Pivot tables for data analysis*
2007	- *First annual data collection tools review in January 2007* - *EPI and Nutrition programmes remained with the same data requirements. This continues in the coming years. However, EPI complains data delays.* - *Outpatient form is revised to incorporate new age categories and sex (this continues to evolve over the coming two year).* - *ZACP sponsor (Medicos Del Mundo) whose originally designed forms served as the model in the new HIS forms withdraws. ZACP gets new requirements from the new sponsor and does not notify HMIS Unit. ZACP use old registers and EpiInfo database. It however, fails to get data from the system it has introduced.* - *ZMCP continues using data captured by DHIS and linked to their workbook, along with other systems which were agreed.* - *RCH rarely updated their database and often they denied authenticity of data collected through DHIS. DHAs labelling themselves as 'RCH Coordinators' sporadically collected data for RCH.* - *Healthcare management Indicators introduced, some are programme specific, while other are based on MDGs and Zanzibar Vision 2020 and Mkuza.* - *Data cleaning and data use workshops introduced. The workshop was led by senior consultant from UiO. These workshops were aimed to instil hands on practice on the use of DHIS to generate data that will be used for healthcare management. The workshop also targeted at equipping the local HISP/HMIS team with skills to continue in the further workshops.* - *At least half of the initially trained DHMT members do not participate regularly in the data collection using DHIS1.4. Other DHMT members within respective districts identified for in house training but the results were almost the same.* - *The reporting structure fails to timely update Zones. Zones feel sidelined and do not act to push DHMT officers who deserted their data responsibilities.* - *The WHO sponsors the development of HMIS Guideline. The process was later taken by DANIDA.*

2008	- Second annual data collection tools review and programmes' independent review
	- ZACP hired a consultant to review all its data collection forms. New forms introduced with different age categories compared to other programmes. Some district staff comply with ZACP demands.
	- DHIS 2 was adopted as a standalone system to capture ZACP data while the mainstream HIS used DHIS 1.4, some data for ZACP still followed the proper channel but the programme never used them.
	- Parallel reporting system (sending exported data to all programmes when emailing HMIS Unit) to reduce delays introduced. Despite all programmes' cry of data delays, only EPI and ZMCP benefits. Nutrition Programme is not connected to the internet with the only solution being to rely with the HMIS Unit/HISP update procedure. Other programmes never open the email attachment
	- ZMCP continues using data captured by DHIS1.4 with automated link to their specifically designed workbook, along with other systems which were agreed.
	- DHIS 2 introduced by HISP international consultants. The software was aimed to address the problems of reporting experienced in DHIS 1.4 along with benefiting from integrated GIS features. However, the HISP local team and HMIS Unit feel the time is not ready and they need to focus on building capacity on the existing technologies and data use. The installed system was never used.
	- District Surveillance Officers (DSOs) recruited to serve the position of data focal persons at all districts. This idea was proposed by HMIS Unit/HISP in 2007 to address the problem of the previously trained DHMT members who did not have interests in working with the new integrated HIS and instead collaborated with programmes that had some diverts.
	- Data cleaning and data use workshops continue. The first Health Bulletin introduced and the process to prepare the bulletin was led by HISP international consultants. The bulletins continue to be produced in the coming years with local HISP/HMIS staff gradually taking lead position.
2009	- ZACP agreed with HMIS Unit/HISP to review the programmes data collection forms. New forms with different data requirements and layout were generated. The forms differed significantly from those agreed in 2006, basically because of the new donor requirements. Age categories were totally different from other programmes affecting design in the DHIS.
2010	- April 2010, DHIS 2 database was set up and hosted at the HMIS Unit server. One database for both the hospitals and primary healthcare systems was developed. DHIS 1.4 served as the official source running in parallel with DHIS 2 until December 2010.
	- ZACP new data collection tools are automated along with all other forms in the new DHIS2. The forms were not used in DHIS1.4
	- RCH introduces new data collection forms following consultancy services by senior officers from Tanzania Mainland. The new forms set have potential disruption to other programmes and the whole set was rejected during stakeholders meeting.
2011	- DHIS 1.4 was phased out and DHIS 2 declared the only formal source of data.

3.6.3 Actors and Roles

The HIS integration involves many actors both internal (programmes, administrative offices, individual people, etc.) and external (donors). While internal actors in some cases explicitly state their interests, external actors present their interests as inscribed in the demand and tools which relevant programmes are required to use. Consequently, this has an effect on the HIS integration process. The list of these actors and their contribution to the HIS integration is as shown in table 3.2 below. This list include information that have been collected during research period only, and not beyond.

Table 3.2: Internal actors actively involved in the HIS integration

Actor	Level	Resource base	Authority base	Influencing
HMIS Unit	National	MoH budget DANIDA (2004-to 2011): Italian Cooperation (2009-to 2011): Extra manpower from HISP	Well established gaining status of 'data programme', although the mainstream healthcare administration is through zone and districts	Health facility and hospital staff, DSOs.
EPI	National	WHO MoH Budget	Small but well established. Service provision at all levels and hence command a strong base to zone, districts and health facilities staff	Health facility, district officers, zone officers and HMIS
ZMCP	National	GF, PMI, Italian Cooperation, ADB, etc. Well established systems of data recording and reporting alongside the mainstream HIS to cater for the diverge needs	A well established programme, and well respected due to its effort to eradicated malaria in Zanzibar	Health facility, district officers, zone officers and HMIS
ZACP	National	Various organisation support ZACP, including Medicos Del Mundo, GF, WHO, etc., at different time. Does not have consistent data collection strategies	The programme enjoys much financial and material resources and hence commanding a strong base to zone, districts, and health facility staff.	Health facility, district officers, zone officers and HMIS
RCH	National	UNFPA, WHO, etc. Due to changing donors, the programme does not have consistent data strategy	The programme enjoys much financial and material resources and hence commanding a strong base to zone, districts, and health facility staff.	Health facility, district officers, zone officers and HMIS
Nutrition	National	MoH, UNICEF Poorest programme in terms of cash and material resources	Largely relies on other programmes such as RCH	Health facility, district officers, zone officers and HMIS
MMH	National	MoH, hospital revenues obtained from some service provision, and sporadic support from donors.	Well established, though not effective data collection scheme.	Hospital staff, programmes (also influenced by)
ZHMT	Zone	DANIDA	Given authority to oversee districts, though often bypassed.	Health facility, district officers
DHMT	District	DANIDA	Full responsibility to health facility within the area.	Health facility

The interplay between the actors, power asymmetry and how power is exercised, as well as how the established institutions affect the HIS integration process are explained in different papers that forms the collection of this thesis. This is discussed in chapter 5.

Chapter 4: Research Methodology

This chapter presents research methodology used to study the empirical settings and analyse the empirical materials in order to come with the findings. The chapters starts by presenting the epistemological choice that was followed in the study (section 4.1), and section 4.2 present the research design. Data collection and analysis are presented in section 4.3 and section 4.4 respectively.

4.1 Epistemological Choice: Interpretive

Epistemology refers to the assumptions about knowledge and the way it can be construed (Hirschheim, 1992, Cavaye, 1996). A research in social science can be either of the three epistemologies: positivist, interpretive, and critical (Myers, 1997, Orlikowski and Baroudi, 1991).

Positivist research is build under assumptions that the study phenomenon is defined by the priori fixed relationships that are typically investigated with structured instrumentations. The primary goal is to test a hypothesis or a theory in order to increase predictive understanding of phenomena, and later be used to draw inferences about the phenomenon from the sample to the stated population. The exception is on descriptive studies which are mainly concerned in presenting the 'objective' factual events of importance, rather than basing the arguments on theory or hypothetical testing. Positivist case studies, with or without simple descriptive statics (frequencies and percentages), for example, fall under this category (Orlikowski and Baroudi, 1991) pp. 5-6.

Interpretive studies take assumption that knowledge of reality is socially constructed and can be acquired by exploring the meanings people assign to a particular phenomena and the domain of their action. In this respect, it is argued that knowledge is not value-free, since the researcher uses her/his perception in guiding the enquiry and that the researcher interacts with the human subject, associating their own subjective and intersubjective

meanings, and hence changes perception of both the enquirer and the subject (Walsham, 1995a, Walsham, 1995b, Orlikowski and Baroudi, 1991, Myers, 1994, Walsham, 1993). This subjective perception of research contrasts with the objective perception in the positivist approach where the data collected can objectively used by researcher to test hypothesis or theories (Walsham, 1995a). In interpretive studies, the intent is not about achieving generalization, rather to deeply understand the structure of a phenomenon within cultural and contextual situations, and how it can be used to inform other settings (Walsham, 1995a).

Critical studies concern issues of historical and cultural contingency and aim to critique the status quo. Critical research differs from positivist and interpretive on its nature to critically evaluate and transform the social reality under investigation (Orlikowski and Baroudi, 1991). The focus is to examine any contradictions and conflicts in order to help overcoming any oppressive social relations (Bernstein, 1978).

The study of any scientific discipline must be in the cause of what the particular discipline is about (Banville and Landry, 1989). Accounting for the socio-technical nature of IS (Bostrom and Heinen, 1977a, Bostrom and Heinen, 1977b, Berg et al., 1998, Berg, 1999), the study of IS integration must be involved in studying the human and organizational aspects and hence interpretive research can be useful due to its potential to produce deep insights into the context and hence drawing meanings people and organisations assign into their context. This helps to studying the information systems phenomena, including its management and development (Klein and Myers, 1999).

Thus this study is primarily interpretive, with some critical qualities on my aim to challenge the status quo by introducing changes during the research. In order to study the social, economic and political aspects along with the technical issues related to IS integration, it was not useful to quantify the findings based on predetermined hypothesis, as it is the case in positivist research. The selection of interpretive approach was meant to get insight of the context, studying the power relations between actors, and the institutions that shape the actions of those actors. While gaining insight of the context, the study also aimed at introducing changes to the existing system with a focus on

improving the existing system as well as empowering system users. As part of the project development team member, I actively participated in the design and development activities comprising software and paper forms design and capacity development aimed at improving user skills and awareness building towards data use. This entails my research design in the form of action research, as discussed in the next section.

4.2 Research Design: Action Research

Action research (AR) is a research approach used to investigating the introduction of technology in an organization. AR has dual aims; introducing changes and studying the outcomes, and generating knowledge from these outcomes (Baskerville, 1999, Baskerville and Wood-Harper, 1998, Checkland and Holwell, 1998). Based on the interpretive epistemological ground of my research, I seek to build a deeper insight of the nature and challenges involved in HIS integration through studying the context and at the same time help to improve the situation. The results from either of the activities (study and practice) are inputs to the other in an iterative manner.

AR involves an iterative process whereby through taking part in a change process the declared framework of ideas, roles of the researcher and participants, and methods are revised as lessons unveil (Checkland and Holwell, 1998). Baskerville (1999) describes action research to be "grounded in practical action, aimed at solving an immediate problem situation while carefully informing theory" (Baskerville, 1999: p.3). AR has increasingly become accepted as a way to generate very relevant research findings on technology in its human context (Baskerville and Wood-Harper, 1998). In concern with the IS, it is argued that a deep understanding is build when attempts are alongside made to change the social situations and the practices underlying the IS (ibid).

AR is characterised by cyclic process where different phases in each cycle feed to the next phase. A more common AR type is canonical AR (Davison et al., 2004) where five-phase cycles of diagnosing, action planning, action taking, evaluation and specifying learning persist. In this research, however, I adopted an evolutionary approach where the phases are taken as evolutionary steps. An evolutionary approach to AR has been used in HISP project (Braa et al., 2004), which this research is part of. This evolutionary approach was

necessary to cater for the needs that arise as a result of interventions and also reflecting to the dynamic nature of the healthcare sector. Thus, activities related to diagnosing, action planning, action taking, evaluation and learning were carried out depending on the situation and the urgency of reflecting to that situation. Furthermore, due to my deep involvement within the research, which was a challenge by itself, it was not realistic to make strict and clear phasing within the project implementation. Table 4.1 below outlines the main activities that I was involved throughout the PhD project duration. These activities coincide with the data collection.

Table 4.1: My role in the project, January 2008 – May 2011

Period	Place	Nature of the work	My role
January 2008 – July 2008	HMIS Head Office, district	- Annual revision of data collection forms and updating DHIS1.4 to suit revised data collection forms. - Participation in data cleaning and data use workshops, preparations of Annual Health Bulletin. - Assisting the programmes in getting data (manually updating their databases and updating the excel pivot tables) - Day to day activities at HMIS Unit	- Local facilitator working with the HMIS team in design as well as training and support to HIS users at national and district level.
January 2009 – July 2009	- HMIS Head Office, district. - Italian Cooperation Office, Unguja and Pemba	- Annual revision of data collection forms and updating DHIS1.4 to suit revised data collection forms. - Participation in data cleaning and data use workshops, preparations of Annual Health Bulletin. - Assisting the programmes in getting data (manually updating their databases and updating the excel pivot tables) - Revision and re-integration of data collection tools of RCH - Assisting in training facilitation of epidemiology and HIS sponsored by Italian Cooperation - Day to day activities at HMIS Unit	- Local facilitator working with the HMIS team in design as well as training and support to HIS users at national and district level. - Assistant facilitator (epidemiology training). The lead facilitator came from Italian Coorperation.
January 2010 – August 2010	- UiO, Oslo. - HMIS Head Office.	- DHIS 2 database setup and configuration at UiO - Annual revision of data collection forms and updating the database (both DHIS 1.4 and DHIS2). - Participation in data use workshops, preparations of Annual Health Bulletin. - Revision and re-integration of data collection tools of RCH - Day to day activities at HMIS Unit	- Local facilitator working with the HMIS team in design as well as training and support to HIS users at national and district level.
January 2011 – May 2011	- HMIS Head Office. - Programme offices	- DHIS 2 training and support. - Data use facilitation in data use workshops, preparations of Health Information Bulletin. - Day to day activities at HMIS Unit	- Local facilitator working with the HMIS team in design as well as training and support to HIS users at national and district level.

In order to build proper unit of analysis of the study, a qualitative case study was adopted. A case study was useful in this research due to its capacity to building a deeper understanding of the context (Cavaye, 1996) something that was important in order to study the dynamics of HIS integration in Zanzibar. It enables "the capturing of 'reality' and detail by studying a phenomenon in its natural context... [it] aims to contribute to knowledge by relating findings and generalizable theory" (ibid, p.229). Multiple case studies enable the researcher to relate the differences between findings in different cases paving the way to relate to the generalizable theory.

Since the HIS integration project in Zanzibar is an ongoing project, to understand the context, outcomes of the different actions and reaction of the actors involved, a longitudinal case study was adopted. IS researchers have used longitudinal case study to explore organizational contexts when introducing IS and studying the consequences of the introduced technology (Walsham 2001/1995; Avgerou 2002), presented in timeframe.

The selection of the case is not neutral. Indeed it is the case itself which shaped my research agenda. I have been involved in the HIS project in Zanzibar since 2004, and I did my Masters research in the same project. Working in the same project after my Masters degree influenced the selection of my research context, since I come from Zanzibar and HISP is actively involved in HIS activities in Zanzibar.

The main case (HIS integration in Zanzibar) is illustrated into three sub cases, primarily based on the main activities involved in the project. The main activities were identified in the feasibility work of the project in 2004 and consequently adopted in the project implementation (see Sheikh, 2005). These sub cases act as the units of analysis for the main case. The sub cases which are extensively covered in the paper collection of this thesis are: 1. Design of data collection tools, 2. Software adaptation and implementation, and 3. Capacity development. The three sub cases are used to explore tensions that arise as a result of integration. These tensions are viewed from institutionalist perspective, that is, the results from established institutions and underlying power asymmetry between actors, and the subsequent emerging trajectories.

Staff participating in data analysis and epidemiology training, which I was co-facilitating.

An example of new forms introduced by RCH programme after the consultancy service in 2009. The consultant developed the forms out of context, for example, in Zanzibar health sector does not use Region, and no defined age categories. RCH accepted the forms only to be rejected by others during stakeholders meeting.

MINISTRY OF HEALTH AND SOCIAL WELFARE - DIRECTORATE OF HOSPITAL SERVICES
DISTRICT:_____   REGION:_____
MONTH:_____   YEAR:_____

	SERVICE TYPE	NUMBER OF CLIENTS SERVED PER SITE								TOTAL
F	Post Abortion care (PAC)									
	PAC by MVA									
	PAC by Sharp Curettage									
	PAC by Missoprostol (3 tablet state oral)									
	Total PAC									
G	PAC Family Planning									
	FP Counselling after PAC									
H	PAC Family Planning									
	IUCD Insertion after PAC									
	Depo users after PAC									
	Pills users after PAC									

A custom Ms Excel workbook for ZMCP with automated link to DHIS Ms Excel Pivot Tables. This was developed by HMIS/HISP to cater for the programmes custom needs and the programme never interfered with the whole system.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand Total
23460	21260	23209	16808	20614	22120	20924	19712	14588	13453	15296	15879	227323
23591	21434	23449	17006	20848	22301	21147	19941	14716	13585	15434	15971	229423
2	3	4	3	2	9	2	5	1	2	10	2	45
2	7	11	3	4	2	4	3	2	0	3	1	42
131	174	240	198	234	181	223	229	128	132	138	92	2100
10	14	10	11	13	23	6	4	4	1	6	2	104
13403	11284	12373	9430	12310	13292	12023	10602	7487	6418	7337	7391	123350
550	603	705	443	613	687	582	528	339	400	548	535	6533
5	9	38	41	21	54	47	48	28	33	43	43	410
10057	9976	10836	7378	8304	8828	8901	9110	7101	7035	7959	8488	103973
616	644	877	573	670	919	657	602	1351	594	651	1193	9347
216	16	86	482	354	168	109	72	155	90	45	64	1857
72043	65424	71838	52376	63987	68584	64625	60856	45900	41743	47470	49661	704507

disease	month	Under 5 years			5 years and above			TOTAL CASES			DEATH	
		New	Reattendance	Referred	New	Reattendance	Referred	New	Reattendance	Referred	Under 5 of age	ye
10 malaria	Jan	10057	616	216	13403	550	5	23460	1166	221	2	
malaria	Feb	9976	644	16	11284	603	9	21260	1247	25	7	
malaria	Mar	10836	877	86	12373	705	38	23209	1582	124	11	
malaria	Apr	7378	573	482	9430	443	41	16808	1016	523	3	
malaria	May	8304	670	354	12310	613	21	20614	1283	375	4	
malaria	Jun	8828	919	168	13292	687	54	22120	1606	222	2	
malaria	Jul	8901	657	109	12023	582	47	20924	1239	156	4	
malaria	Aug	9110	602	72	10602	528	48	19712	1130	120	3	
malaria	Sep	7101	1351	155	7487	339	28	14588	1690	183	2	
malaria	Oct	7035	594	90	6418	400	33	13453	994	123	0	
malaria	Nov	7959	651	45	7337	548	43	15296	1199	88	3	
malaria	Dec	8488	1193	64	7391	535	43	15879	1728	107	1	
malaria	Tot	####	9347	1857	####	6533	410	2E+05	15880	2267	42	

Figure 4.1: Some snapshots taken during fieldwork

4.3 Data Collection Methods

Data collection method refers to research tools and techniques which may be used to collect empirical evidence (Cavaye, 1996). These can be quantitative or qualitative. In this research a number of data collection methods were employed. The selection of the

methods was based on the nature of the study as well as the researcher's role in the project. Based on interpretive epistemological viewpoint, the selection of qualitative data collection methods were important in order to better explore and hence build a deeper understanding of the case as the qualitative methods take the advantage of naturally occurring data (Silverman, 2001). Studying the institutions related to the HIS integration and understanding the power relations between actors and their effect, it was important to focus on the socially constructed nature of the HIS domain and context (Denzin and Lincoln, 1994).

Data collection methods used includes participant observation, document analysis interviews, and group discussions. Deploying multiple data collection methods also referred as triangulation was important in order to collect as complete set of data as possible (Silverman, 2001).

Participant observation

The nature of the case I have worked on was that I was actively involved in day to day activities related to the HIS development and implementation and use. This led me to consider participant observation as the main data collection method. While generally observation is effective qualitative data collection method, participant observation has two advantages; first it give the chance for extended observation which gives a deeper understanding of what people are doing in the natural settings, without a fear of being observed. Second, by participating in the work you are studying it gives the advantage of seeing and understanding the study phenomenon, firsthand (Silverman, 2001).

In the course of this study, I had opportunity to work with staff of different cadres at various levels:

- National level: this includes staff at the HMIS Unit, vertical health programmes, and ministry officials. The type of work includes design and review of data collection forms, software demonstration, and reports presentation during quarterly and annual feedback meetings, data use workshops and health data bulletin preparations. What was important to observe relating to the research

theme is how people debate and argue on various issues related to data and the HIS process, including data flows and ownership. Typical work period was between two to three hours of which I could do my observations.

- Zonal level: this includes zonal health management team. Primarily my contact with the zonal health managers is during data use workshops and tools review, meaning it is limited to up to two contacts per year.

- District level: this involves working with district medical officers, district surveillance officers (DSO), and to some extent other district health management team members. Districts are the pivotal implementations point of the HIS especially the DHIS. I thus, spent much time with district people just equally as the time spent at the HMIS Unit. The nature of my observation resembles those at the national level. Districts are responsible for supply of new data collection forms, collecting filled in data collection forms and keying in the collected data into DHIS. This implies that contradictions and tension that are the results of established institutions and power asymmetry are more experienced at this level.

- Hospital and health facility level: the work of the hospital people involve data collection, filling into DHIS, analysis and use. Apart from working with the hospital people onsite, I was also involved in the data use and feedback workshops dedicated for hospital managers. Health facility staff were in the beginning involved in data collection forms review but later on the process minimised the number of participants and only managers starting at the district levels were invited. During the course of this study my direct interactions with health facility staff have been limited.

Document Analysis

As participant observation, I extended my data collection methods to include analysis of some documents prepared at different levels. Documents analysed include quarterly reports of various levels, annual reports, policy documents, and forms and software tools designed by programmes outside the mainstream HIS. While these documents were

brought for discussion to assess HIS development, quality check and control as well as design consideration for the evolving HIS, my intention as researcher, was more than what the other people in the team had. I took the review of the document to the next level where the aim was to understand interpretation and feeling of those people who prepared and worked with those documents, as well as trying to probe the agenda behind, especially for the tools developed by programmes outside the mainstream HIS. This helped to supplement to my observations and data collected in interviews and discussions.

Interviews and Group Discussions

Interviews and group discussions were held for two purposes: one, to clarify what I had observed, and two, to seek what I could not get in my observation. I adopted open ended interviews, often with interview guide. Since the purpose was to fill the gap or clarify my observations, open ended interviews are very suitable due to its capability to offer flexibility and freedom for more elaborations of the matter in question (Silverman, 2001). Number of interviews at different levels is shown in table 4.2 below. Respondents were interviewed multiple times, predominantly at their offices.

Table 4.2: Summary of interviews conducted

Level	No. of respondents	No. of interviews	Nature of questions asked
National (HMIS and Programmes)	9	18	Issues related to data requirements (e.g. why they need some particular data), issue arising from the use of the integrated HIS, technology and design choices (HMIS staff)
Zone	3	3	Issues related to availability of data at the zonal level, relationship between zones and districts/programmes/HMIS unit and how they affect the HIS process.
District	20	40	Questions focused on problems and challenges encountered in using DHIS. Districts interaction with higher level and lower levels. How districts are engaged in data analysis and use within their respective districts, and issues related to contradicting demands by programmes
Hospital	7	14	Questions focused on problems and challenges encountered in using DHIS. Interactions with programmes in relation to data needs. How hospitals are engaged in data analysis and information use.
Health facility	21	33	Issues related to supply and use of data collection tools, participation in the meetings with senior officers, effectiveness of training. Also needed to clarify those which I got from the top level.

Group discussions were held as means to get a shared view on what pertains the HIS integration. Group discussions were usually carried out during common activities such as data use workshops, health bulletin preparations, and tools reviews. None of the interviews or group discussions was tape recorded. Due to my level of involvement in the

HIS activities, it did not sound natural to organise recorded interviews. Respondents also preferred un-recorded discussions. Both interviews and group discussions were carried out in Kiswahili, the mother tongue of the participants and National language.

4.4 Data Analysis and the Use of Theory

Data analysis in qualitative research starts as early as data collection begins (Silverman, 2000). At the core of data collection process of this study is participant observation. During observation notes were usually taken, preliminary analysis conducted to give insight on the direction of data collection as well as contributing to the research agenda.

Overall, data analysis took place in three stages. First, during data collection where unfolding events were compared with the general theme of the study providing room for further investigation, second, while writing papers that are part of this theses, data were analysed in relation to themes that are particular to individual papers. Inputs from paper review process also helped to shape the progress of the research report. Third, during thesis writing in which the analysis considered inputs from previous stages. Findings of individual papers were combined along with findings that were not presented in those papers to have a synthesised analysis in relation to the research questions.

Generalisation in qualitative research is challenging, often leading to question on whether it is possible to have generalisable results. Silverman (2000: 111) outline four ways in which qualitative data can be generalised: combining qualitative research with quantitative measures of populations; purposive sampling guided by time and resources; theoretical sampling; and using an analytical model which assumes that generalisabilty is present in the existence of any case. In this research, generalisation is made in the form of theoretical sampling. "Theoretical sampling means selecting groups and categories to study on the basis of their relevance to research questions, theoretical propositions, and explanation or account to be developed" (Mason, 1996 cited in Silverman, 2000: 105). Theory was used both to shape data collection as well as the analysis (Walsham, 1995a).

Conceptual framework that guides this research is based on understanding institutions that shape the HIS integration process, viewing those institutions from power lens. Thus,

data collection and analysis focused on events, activities, debates and document evidences that portray the work of the existing institutions and actors' struggle for control.

Chapter 5: Research Findings

This chapter presents empirical findings of this study. The main case –the HIS integration project in Zanzibar is divided into three main components: design and development of data collection tools, design of software data warehouse for the integrated HIS, and training. All papers presented that form the collection of this thesis are based on the empirical material from any of the three components. Sections 5.1 to 5.5 summarise findings of the individual papers, and a synthesised summary of the thesis is presented in section 5.6.

5.1 Paper I

Sheikh Y. H. 2010. Power Imbalances and IS Implementation: A Case of Integrated Health Management Information System in Zanzibar. *In*: Nunes, M. B., Isaías, P. & Powell, P. (eds.) *IADIS International Conference Information Systems 2010*. Porto, Portugal. IADIS Press, pp. 258 – 266.

This paper is based on the general assessment of the HIS integration project in Zanzibar, for the period from August 2005 to July 2008. The assessment is based on the organisation of project implementation and analyse the relationship between actors involved in the project, past hierarchical experience and the new bureaucracy that was set up to run the new HIS. The paper draws from the socio-technical approach to IS integration and conceptualise integration to be beyond the technical integration, rather a broad process of institutionalisation of the integrated HIS into the existing bureaucracy. In this respect, the paper analyses the existing power structures emanating from the existing administrative authorities and resources distribution amongst the major actors, and assesses its impact on the implementation of new integrated HIS.

The HIS implementation is organised on the following hierarchy: health facilities responsible for data collection, district offices who collects data from health facilities and enter them into software data warehouse and subsequently report to the higher levels that

includes zone, central HMIS Unit and health programmes. The paper unveils power imbalance between the main actors: the health programmes, zone and the HMIS Unit, in relation to the setup of the new HIS as opposed to the original settings. Contrary to the original setting where each health programme collected data independently and directly to the health facilities, the new HIS envisioned the use of integrated and shared data giving the overall responsibility of overseeing the integrated HIS to the HMIS unit.

This new setting proved to be challenging, primarily due to institutional differences from the management bureaucracy of the new HIS, where a newly established HMIS Unit is put on top of HMIS bureaucracy replacing the historically powerful programmes. The HMIS unit failed to acquire supportive power resources such as finance, human and material resources, as well as administrative authority, which are crucial for the exercise of power to institutionalise the new HIS; consequently lacking legitimacy to preside over the new responsibility, posing a clear challenge to integration and subsequent institutionalisation of the integrated HIS. In the past, and the situation continues to be, these power sources are distributed between programmes which control resources, and the zones which have administrative authority over the districts and health facilities. The resource-based power resides in the programmes. This power is necessary for creating the social order. On the other hand the zone offices have administrative authority, power over which it is necessary in keeping order within the bureaucracy.

An alternative strategy is proposed aimed at mobilising the power redistribution between the actors. The strategy is based on the use of internet technology to reduce the bureaucracy where the districts are required to report to all higher level entities as an email copy of HMIS reporting, rather than waiting for HMIS unit to forward data to programmes. The suggested arrangement aims to reduce data delay and improve feedback system. Consequently, this would help in redrawing power distribution between the actors involved.

5.2 Paper II

This paper is based on the concept of 'networks of action' (Braa et al., 2004) in conjunction with the concept of communities of practice (Lave and Wenger, 1991) to address the problem of sustainability in HIS integration. The paper contributes to practical approaches to building robust and sustainable local networks that will participate in the wider networks of actions in order to foster local learning and subsequent institutionalisation of the HIS. Empirically, the paper is drawn from the training component of the HIS integration project in Zanzibar.

The study reveals that building communities through organised practical works helps to build such networks at the lowest level of the HIS bureaucracy, enhancing learning at minimal resource usage. To make the networks themselves sustainable, participation in the larger networks of similar activities to enable wider exchange of knowledge and material resources is similarly important. This direct involvement not only helps in knowledge and resource exchange but also helps to forge political establishment which is highly important in influencing decisions concerning HIS related issues. Thus, the paper acknowledges the importance of the existing multi-networks mode, as outlined in the networks of action concept, as a means of exchanging knowledge and resources, and hence fostering sustainability. Likewise, the paper argues, sustainability relies much on having strong local teams comprising dedicated personnel, within the healthcare organisational bureaucracy, capable of acquiring and sustaining such learning.

One important aspect in developing those teams is identity building. The paper demonstrates that these local networks worked in the form of communities of practice, where knowledge sharing is facilitated through organised practical works where individuals meet to demonstrate their work, and consequently facilitating fast and cost effective learning. The paper also reveals that there is no universal way of mobilising these networks. As the case demonstrates, the first hypothesis of developing the existing staff (DHOs and DHAs) failed due to difficulty in changing their identities.

5.3 Paper III

Sheikh, Y. H. On Being Specific about Power: Institutional Dualism in Information Systems Integration. Submitted to *Journal of Health Informatics in Developing Countries.*

This paper extends the arguments built on paper I, where an alternative practical solution proposed was to overcome issues of missing reports, where a double reporting was proposed through an email copy sent to programmes and zones while sending data to HMIS Unit. Theoretically, the paper takes the integration project in the theme of institutionalisation of the new integrated HIS. The paper discusses the power play between internal actors involved and views integration as a process which involves a multitude and opposing forces. On one side, are the champions of change (HMIS Unit and HISP) with rational agenda to offer a platform for comprehensive and shared data collection system which that will facilitate information use for healthcare sector planning, monitoring and evaluation. On the other side are programmes, which despite the agreement to work on the integrated HIS, they appeared to and are still influenced by the historical perspective of HIS and hence influencing the path towards integration.

In particular, the paper explores the contradicting underlying logics behind the new integrated HIS agenda and the old fragmented HIS operated by individual programmes. The paper discusses the institutional duality as a source of implementation tensions, and highlight how power took over rationality in the implementation process.

5.4 Paper IV

Sheikh, Y. H. Revisiting Participatory Design: A Critical Examination of User Participation in Participatory Information Systems Development. Reviewed and preparing for resubmission to *Information Technology for Development.*

The paper is based on the discussions on rhetoric of participatory design (PD) in information systems (IS) development. While PD is applauded for empowerment and improving the work life democracy, among its quality criteria, this can prove challenging when the context present power contests among the actors. Empirically, the paper draws on two case studies that are part of the main project to design and develop the integrated health information system (HIS) in Zanzibar, which are: i) designing data collection tools

and ii) designing HIS guidelines. The article compares and contrasts the level of participation within hierarchical settings that comprises data collectors, managers and donors. Power and dominance structures have been pointed out to be determinants of the extent of user participation.

The two cases provide three scenarios for analysis: where there is high participation, constrained and limited participation, and symbolic participation. First, in the design of hospital data collection tools, where data collectors are also data users, participation was at high level. Second, in the design of primary healthcare data collection tools, where data collectors and data users (managers) are different, participation was constrained and limited only to data users and left out the actual users of data collection tools. Third, in the case for preparation of HIS guideline, interests between donors made participation largely symbolic.

The article highlights PD challenges in developing countries especially in the context where power and dominance patterns resulting from the existing socio, economic and political establishments exist. The article has two findings:

First, the article reveals that the existing hierarchy and dominance patterns shape user participation both positively and negatively. In the event data collectors (end users of the tools) and information users were the same people as it is the case of hospital system, the level of participation was nearly the same to all actors. However, in the case of tool design for primary healthcare, where health facility staff act as data collectors, while data users are drawn from a hierarchy of district, zone, and programme managers, participation was largely influenced by the actors' ranks to the extent that the health facility staff (the actual users of the tools that were designed) felt they did not have the right to equally participate and discuss the matter.

This dominance pattern was also experienced in the HIS guidelines preparations exercise, where donor donors who were apparently in fight for domination used participation agenda as a tool to legitimise their decisions. In this case, DANIDA who is the main sponsor of the HIS sensed that there was a political agenda by the WHO in sponsoring and providing technical support to develop the guidelines. Although the process that was

led by the WHO was locally groomed and depicting high level of participation, DANIDA decided to reinvent the wheel in order to dismiss the WHO initiatives. Although the DANIDA sponsored initiatives were largely symbolic (a foreign consultant's was technically presented for endorsement), DANIDA used its influence to bring the same actors to endorse their sponsored work overriding the work of the WHO, and hence making the participation agenda symbolic.

Second, the article argues for reconceptualising the meaning of user when referred to PD. This is observed in the case of designing data collection tools. In the context where data collectors and data users are different, the design process, and in particular the way we organise the settings of user participation, needs to be carefully planned by considering constraints of both users, that is, the data collectors who use the tools, and the data users who are the secondary users of the tools but have much say on the type of data to be collected, but have little concern of tools usability as compared to the data collectors. The article proposes two types of users: those who directly interact with the data collection tools and those who benefit from the use of those tools, that is, data users. If the beneficiaries overpower the direct users, the risk is that only some design issues may be considered important. With tools layout playing important part in their usability, those who are directly interacting with the tools must also fully participate.

5.5 Paper V

Sheikh, Y. H. and Nyella, E. Exploring the Power of Technology in the Institutionalisation of Health Information System: an Actor-Network Analysis of Information Systems Integration. *Submitted to the African Journal of Health Informatics*

This paper draws empirical data that compare three cases of DHIS utilization as a software solution for HIS in Tanzania. In the first case, DHIS 2, a web based open source software was put into use in the Tanzania (Mainland[5]) to offer integrated healthcare data warehousing where regulations governing the HIS are not properly established, and bureaucracy strongly prevails. In the second case, we compare the same version of software (DHIS2) implemented in the Zanzibar HIS, where regulations governing the

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[5] Tanzania Ministry of Health is only responsible for Tanzania Mainland, while Zanzibar Ministry of Health is responsible for Zanzibar.

HIS are being enforced along the prevailing bureaucracy. The third case is also drawn from the Zanzibar HIS comparing with the earlier period when DHIS 1.4 (a desktop version of the software) was the official data capturing and reporting tool (extended from paper 1).

Theoretically the discussion is based on actor-network theory (ANT) which is used to describe the socio-technical configuration of the HIS integration. In particular, the concepts of inscription and alignment are used. The empirical material is construed towards understanding power relations between actors involved and how this affects the coordination of integration routines between the actors in order to achieve the goals of HIS integration. The pivotal point of the discussion is the role of artefacts (software and regulations) in facilitating this coordination. Thus, the paper views integration as a process of network building where a number of actors, humans and non humans are involved. This network building process needs to consider the nature of the technological artefact (stand alone or web based system) and the manner in which it is implemented (decentralized or centralized), coupled with the policy and guidelines which inscribe and prescribe the use of the system. The article reveals this combination as an important factor that determines success or failure of the network building process (the HIS integration process) in the backdrop of myriads of heterogeneous actors with multiplicity of interests.

5.6 Summary of Findings

The next chapter synthesises the findings in the papers and the theoretical framework, discussing implications to both theory and practice and highlights overall contributions of the thesis.

Chapter 6: Implications and Conclusions

This chapter identifies and discusses the contributions studying this thesis. This study aimed to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision with a case study from Zanzibar, Tanzania. Drawing from empirical findings presented in chapter 5, the chapter discusses those finding based on the theoretical approach build in chapter 2 in order to answer the research questions that guided this study (sections 6.1). In doing so, the thesis contributes to theoretical perspective in HIS integration (section 6.2). This is further elaborated to give contribution to practitioners and policy makers (section 6.3). Concluding remarks which summarises the work of this thesis finalises the chapter.

6.1 Responding to Research Questions

This research addresses the question of how to understand and promote HIS integration given the highly entrenched fragmentation of healthcare service provision. In doing so, three sub questions were developed, and are now discussed in relation to findings against the literature.

6.1.1 RQ1.a What are the health information system's institutional characteristics that shape HIS integration in Zanzibar?

To answer this question, I discuss the HIS integration project in Zanzibar aiming to unpack procedures, routines, and cultural establishments within the Zanzibar healthcare sector, in order to understand their effects whether fostering or hindering HIS integration. Since this study aimed at challenging the status quo, exploring these profound issues is very necessary in order to understand the course of development of the proposed changes, and hence practically contributing to solutions that will help to the institutionalisation of the integrated HIS. In that respect, the study also provided an empirical ground to contribute to the institutional theory about how and the extent the

existing work-routines, organisational procedures and norms that constitute the healthcare organisation as well as dynamics of the actors' involvement shape HIS integration.

The study adopted the socio-technical perspective of HIS integration, and hence viewing integration as a process of *institutionalisation* of those routines and procedures. A focus on institutionalisation is a way to further underscore a process-oriented perspective. A process-perspective on HIS integration is already acknowledged (Ellingsen and Monteiro, 2006) but the lens of institutionalisation helps emphasise it. The study affirms the importance of understanding the existing routines and procedures due to its role in forming part of the initial conditions in the processes leading to new institutions (Greif, 2006 cited in Scott, 2008). The thesis contributes to this understanding by outlining main issues, empirically found (in paper I, III, and IV) to shape the HIS integration in Zanzibar. Furthermore, the study examines the underlying causes and effects of those issues centring the discussion on the concept of institutional logics (Friedland and Alford, 1991), as presented in the literature. I now discuss the important issues found in the study.

Hierarchies

HIS development in developing countries and integration in particular is charged with the complexity related to both technology and organisational issues. Studies have pointed out to various issues that results into underperforming of the existing HIS, one of them being the organisation of HIS themselves. Vertically organised data collection systems serving vertically organised service provision by several programmes features the context, and despite the call and efforts to implement integrated HIS serving sector wide information needs, challenges still remain.

Findings from this study recognise the role of bureaucracy and in particular hierarchical structures in shaping HIS integration. The organisation of the Ministry of Health is a typical bureaucracy, where both the Ministry itself and the health programmes operate under well established hierarchical structures. As presented in the papers as well as in chapter 3 (research context), service provision and hence data reporting is organised at

different levels with the lowest level of service provision and data collection hierarchy being health facility level, both primary healthcare centres and hospitals. At the middle level are the districts and zones, and programmes along with the MoH headquarters serving as the topmost (national) level. I discuss this hierarchical structure from the historical perspective, that is, prior to HIS integration, and outline its establishment and how this affect the HIS integration process.

Prior to HIS integration, programmes have organised service provision and data collection through these hierarchical structures, though operating as multiple hierarchies where each programme operates on its own. This partly serve as the organisational requirements for accountability as needed by the financiers of those programmes, but also has an enduring effect on the way people do things within the healthcare bureaucracy creating identity and a source of power for those involved. As empirical data from the papers show, all programmes involved in the HIS integration project showed concerns on timely availability of data because they are required to report to their financiers on regular basis, some with specific deadlines For example, EPI is required to report on the 10th day of every month for data reporting of the previous month. Accountability is one of the important logic behind data reporting, because these reporting not only catered for the financiers' information needs, but also an indication of what a specific programme does on the ground.

The existing hierarchical structures also play important role in creating power structures within the healthcare bureaucracy, emanating from both resources (Lukes, 1974) and authority (Foucault, 1979) one has. Explicitly including the notion of power is a way to underscore more strongly than existing literature tends to do the political nature of HIS integration. As findings of this study suggest, these hierarchical settings also were viewed as a source of power, with those at the top exercising power over those at the bottom utilising resources at their disposal. The act of some programmes (ZACP and RCH) to deviate from the mainstream integrated HIS that was agreed by all parties and reverting to their programme based data collection system proves how top programme officers who have been enjoying enormous power over the districts and health facility staff could not easily relinquish what they have been enjoying for a long period. This is also observed in

the new HIS hierarchical structure, where after three years of its operation, there are those in the HMIS Unit who see data reporting hierarchy as a bridge to grip into power. This is evidenced when a non technical senior HMIS staff questioned the use of DHIS2, which was intended to curb unnecessary bureaucratic data reporting procedures, explaining the procedure as loose and uncontrolled, as she/he puts on (paper V): *"Another question is who is in-charge? If everybody will access data before we conduct quality check, how can they use the data?"* To them, collecting data at the central HMIS Unit was a source of pride and influence over others, and in long term amass a power base on the unit.

Another interesting issue these profound hierarchies bring is a form of identity staff build upon. Due to a prolonged vertically organised service provision, staff at different levels, and more interesting, at the lower levels (districts and health facility where they are required to work as teams with collective responsibilities), have build programme based identity. The structures of DHMT, for example, clearly give responsibilities of each individual to serve for the whole healthcare sector within their respective districts, but often staff identified themselves with programme specific roles, for example, most district health officers identified themselves as RCH coordinators and hence prioritising service provision and data collection to RCH programme.

Information Culture

Another important establishment within the healthcare setup is information culture. Information culture refers to the policy and management environment and the incentives to use information for decision-making, as well as to the experience and attitudes of managers and planners with respect to the role of information in improving health system performance (RHINO, 2001). Previous studies have identified information culture as one among the indicators of HIS success (Mosse, 2005). Thus, having the right information culture is among the important characteristics of institutionalised HIS, an indication of its close alignment and continuous support to the organisation the HIS serves (Baptista et al., 2010). The HIS integration project in Zanzibar, as it is the main agenda within the HISP network, promotes availability and use of information to all actors at all levels. An interesting finding of this study is how previous experience in information use affect the HIS integration.

It is believed that when a truly integrated HIS is achieved, that is, when the integrated HIS is institutionalised could be a facilitator of data availability and hence improve information use (HMN, 2008, Sheikh and Titlestad, 2008). This study reveals that information culture in the present settings of fragmented HIS is also useful in promoting HIS achieving integration itself. The case presented in this research indicates that, those programmes that are built on the culture of using information at the programme level were eager to go for integrated HIS, and took advantage of each stage of development. This is seen from EPI, and to some extent ZMCP (the malaria programme). Thus, on other terms, institutionalisation of the previous programme-based HIS cannot be always the source of resistance for integration. Rather what is important is the logic behind the institutions and whether is contradicting to the logics behind the integration agenda.

To EPI and ZMCP, accountability was similarly important as the local use of data, and hence any solution that will facilitate timely availability of data was welcome. Contrary, ZACP (the HIV/AIDS programme) and RCH which seemed only to work towards accountability to their financiers, and which presented little evidence of data use, were resistive towards integration. For managers and staff of these programmes their programmes' HIS are taken-into-granted not from the generic perspective of the system to become representative, rather from the perspective of serving other people (their financiers) interest (Baptista et al., 2010).

6.1.2 RQ1.b How does the power interplay between HIS stakeholders affect development and institutionalization of the integrated HIS?

This question relates to RQ1.a. To answer this question, I outline the sources of power within the HIS bureaucracy, further exploring how actors exercised the power in their disposal whether in favour or in opposition to the HIS integration initiatives and how this affect the development and its subsequent institutionalisation. The study further examines in essence actions imposed by the change agents during the project implementation that aimed to rearrange the existing power structures in order to foster HIS integration. The thesis draws on empirical materials mainly presented on papers I, III, IV, and V that form the collection of this thesis. I discuss the findings in order to disclose implementation tensions between innovation –HIS integration, advocated and led by the HMIS Unit with

technical support from HISP, and conservation resulting from the power of the existing programme based structures –the status quo (Dhillon, 2004, Lanzara, 2008).

The discussion outlines the HIS integration project as an adaptive process using the Circuits of Power framework (Clegg, 1989), though used with some creativity, with the purpose of emphasising the contextual arrangements in which power was exercised. The thesis does not intend to make an assessment of whether the HIS integration project is institutionalised, rather it makes use of the framework to outline those trajectories and project transformations in order to build knowledge on how to better align the actors involved in such a complex project towards the envisioned goals of HIS integration, that is, towards institutionalisation. Clegg (1989), describing the framework, refers to this as defining and redefining an obligatory passage point (OPP) in which actors must traverse in order to realize the use of the new HIS. Practically, this implies data collectors, district, zonal, and programme officers, as well as other MoH officials are engaged in an evolving process of data collection, processing and use, using defined tools (data collection forms and DHIS), procedures, and guidelines, which collectively forms the OPP.

Project genesis: the initial episodic movements to instantiate the project
The HIS integration project commencement can be described as an act of power play between actors involved from the early stages of the project. The project champions (HISP and HMIS Unit), which according to the episodic interpretation of power is the A which would like the other players (programmes, zones, districts, and health facility workers), the B to engage in the integrated data collection process, and abandon the old fragmented HIS. The change agents approached this by exercising episodic power at their disposal, at that time, the joint decision to adopt the integrated HIS (authority), the official mandate of the HMIS Unit to work on all data related activities (authority), and the support of the new system by DANIDA which by its position as the main financier of the MoH garnered legitimacy from MoH (financial resources and authority), as well as the availability of DHIS which is freely available software solution for data collection, processing, and presentation (resources).

The change agents –HMIS Unit and HISP, drew upon the formal authority that was in the beginning agreed by all parties as the standing conditions that, along with participatory approach adopted in the project and training of tools, they managed to impose actions that in the end resulted into release and put into use the first set of standardised data collection forms that were used in hospitals and health facilities, database solution (DHIS 1.4), the agreed data flow guidelines which were intended to be developed to a written official guidelines in the future. An interesting point of discussion from episodic mode of power is on how far the standing conditions applied to all the ranks within the MoH bureaucracy.

The authority that was given to the HMIS Unit for project implementation was quite superficial. First, because the unit is relatively new compared to programmes, it was difficult to impose actions to the programmes that will lead to the use of the new HIS. Second, the HIS hierarchical structure does not go down to the data collection level, hence lacked enough power to impose sanctions to lower level staff in case of deviance. Third, due to a long time presence as the key service providers which also led them to deploy their programme-specific HIS, programmes command vast influence to staff at lower levels of the MoH bureaucracy (at district and health facilities). This implies that when programmes, which if they completely adopt the new system could be a turning point towards institutionalisation, refuse to adopt the new HIS could also influence the lower level staff at district and health facilities. This was observed when the trained district officers (DHAs) in most of the districts refused to work focusing their attentions in lucrative programme-based activities totally abandoning the new HIS. Had the HMIS had administrative authority over those staff, something which according to the formal organisation structure belongs to zonal office, there could be room for exercising power over them with potential advantage towards the new HIS.

The analysis of the data shows that despite the mandate given to the HMIS Unit at the project commencements, the standing conditions available to the HMIS unit were not enough to exercise power to all players to the extent of integrating the episodic power to the organisational practices. This, according to Silva and Backhouse (2003) occurs only when the change agents (HMIS unit and HISP) do not need to impose power to other

players and there is no substantive conflict and resistance. Empirical evidence from the paper shows that this was only achieved at the health facility level where staff regularly use the data collection tools and the district level after recruiting the DSOs where DHIS is in regular use. The integration of episodic power at the two levels has guaranteed data collection and flow up to the national level using the new integrated HIS tools. Thus, the change agents have managed so far to enforce their subjects (staff at these levels) to traverse through the OPP, indicating a prospect for sustainability. However, compliance by most programmes is still low.

Unfolding events towards social and systemic integration

So far I have discussed how episodic actions of power led to partial institutionalisation of the integrated HIS by succeeding to enforce staff at the district and health facilities to routinely use the new HIS (data collection tools and DHIS) as the main source of data collection within the Zanzibar healthcare sector. However, the primary goal of the new HIS is not just data collection. The goal is to offer a comprehensive tools and process that ensure data are captured and reach all the actors within MoH in order to facilitate the sector planning, monitoring and evaluation, and hence improve the health status of the society. This could only be achieved if the new HIS is integrated into the work life of programmes, which are the service providers, and the programmes shall consider the new HIS as part of their structures.

However, a description of power play based on episodic events cannot sufficiently describe how the new HIS can be integrated into the organisation structure, which is governed and influenced by the organisational rules and norms that determine how people work and behave. A comprehensive discussion will thus be the one that also include the remaining two circuits: the circuit of social integration and circuit of systemic integration. It is through these two circuits, according to Silva and Backhouse (2003), the change agents can make the subject accept the new HIS with subsequent institutionalisation.

The two circuits relates to the effect of the institutional characteristics that were discussed in RQ1.a, that is, hierarchies and information culture, which determines how different

actors involved in the project interpreted the HIS integration agenda and its implication to the project development as well as the consequence the project has to the structures of the organisation of each actor involved. In doing so, I outline the organisational rules and norms that place the change agents (HMIS Unit and HISP) and the subjects (programmes and others) in their respective positions, the meanings which members assign to the new HIS and how the unfolding events affect or change these interpretations with the subsequent effect on the new HIS. The discussion is based on a continuous observation of events as they occurred, both planned and unplanned, and outlines power interplay amongst actors as identified in Table 3.2.

According to Silva and Backhouse (2003) an information system will be socially integrated if there are no contradictions between the rules of meaning assigned to the IS by its members. Thus, in order to achieve this, the project champions needed to create environment that actors would have positive interpretations towards the new HIS goals. However, in line with the main institutional characteristics identified in RQ1.a, the study revealed contradictions on how the different actors perceived the HIS integration project, all reflecting to the difficulty in changing the status quo. The project was promoted with the promises to improve the quality of collected data, reduced workload to data collection staff, promoting information sharing amongst MoH players, and ease of access of quality data to promote evidence based decision making, planning, monitoring and evaluation for the healthcare sector in Zanzibar.

Although those potential benefits appear to be promising to all stakeholders, the programmes, whose existence rely on external organisations which fund them, did not view data collection process from the generic rational perspective as presented by the project promoters. To most of them, the new HIS was seen as inefficient and a source of data delays. This was observed in the early period of project implementation, where the reporting hierarchy that was created by the new HIS did not meet the programmes' deadlines of data reporting to their respective financiers. While this was true to EPI, which had strict monthly deadlines which are also part of their performance evaluation, to ZACP (HIV?AIDS programme) and RCH it was used as an excuse for reverting to their programmes HIS and introducing uncoordinated changes to their systems, which

according to the agreements should cease to operate. This is evident when more efficient solutions were introduced (DHIS 1.4 with parallel reporting and DHIS 2 reporting) the programmes' compliance remained low.

Another important observation on the way different actors interpreted the new HIS is that some saw the new HIS as a source of barriers to resources and privileges. The DHAs who were initially trained to serve as data focal persons because of their positions as health administrators within their respective districts, saw the new reporting hierarchy as having less privileges and hence preferring to abandon the data focal person roles, only to be replaced later by DSOs. Their self declared position of RCH Coordinators demonstrated the long built bond between them and the RCH programme which made the programme easily deviate from the mainstream HIS because they had people on the ground, although they gradually faced resistance from the health facility staff whom to a large extent complied embraced the new HIS.

Information culture also played important role on how different actors interpreted the new HIS integration agenda. As the empirical material suggests, programmes which demonstrated local data use such as EPI and ZMCP (malaria programme) had interpreted positively to the new HIS, and hence boosting their position in the new HIS, compared to those programmes which were more interested in serving their financiers' data needs. This finding concurs with those of Silva and Backhouse (2003) that regulations and rules that are inscribed into an information system that has been contested will favour the interests and goals of those who during the struggles held the strongest standing conditions.

Another finding of this study is on the role of power in shaping reality. The integrated HIS has been widely advocated as a solution to the ongoing problem of lack of comprehensive data to address the problem of poor healthcare provision in developing countries (HMN, 2008). It is to this backdrop the HIS integration project in Zanzibar was initiated, and its logic behind accepted by all major players and hence considered rational to all players. However, during the implementation process this common understanding was continuously reinterpreted, mainly reflecting to how powerful players exercised

power, and ultimately this affected what the people considered as rational in terms of data collection and reporting processes and goals. Its effect is seen how some programmes blindly complied to their financiers data needs without reflecting to whether those needs will help in local use or how much that will affect the whole system. This is witnessed in the ZACP and RCH actions to introduce new changes simply because those who have power over them –their financiers, had new data demands, and the programmes decided to comply without reasoning. Another empirical evidence on how power shaped reality is demonstrated in the case of HIS guidelines design where user participation was apparently used as a tool to legitimise what the project financiers needed, hence, utilising what is believed to be rational (participation) using the power at their disposal to accomplish their goals (paper IV). These findings concur with previous study by Flyvbjerg (1998) linking power and rationality, where those who can exercise more power can easily instil their agenda over the others even though it could be interpreted from the common sense as irrational, that is, the greater the power, the less the need for rationality (Flyvbjerg, 1998 cited in Clegg et al., 2006).

Linking to how power shaped rationality, the project throughout different periods went through transformation in the technological and implementation plan to try to diffuse tensions that resulted from these implementation tensions. First, the data capturing software and associated routines were changed to reflect the needs resulting of the evolving conditions of implementation and reactions of the actors; from DHIS 1.4 where whole reporting went through the HMIS Unit, to DHIS 1.4 with parallel reporting to programmes and finally to DHIS 2 where data are available online to all. This diffused the tension of resulting from data delays and ownership. Second, the recruitment of DSOs empowered the new HIS bureaucracy where a permanent position established solely for HIS activity at district level solved the problem of disruptive programmes' influence on data collection and distribution, showing signs of systemic integration and hence raising the prospect of its institutionalisation. To sum up, as it was revealed in the episodic acts, the actions and reactions imposed indicate some level of partial social and systemic integration, largely at the lower levels (districts and health facilities) and to some extent to some programmes.

6.1.3 RQ1.c What design strategies can be used to foster integrated HIS?

So what design strategies can be used to foster integrated HIS given the inherent and contextual nature of the healthcare sector as discussed in the first two research questions? This thesis, adopted the socio technical perspective of HIS integration, as presented in the literature review, and hence contributes to this discourse by discussing HIS integration challenges as presented in the literature, and relates to the findings (mostly from papers II, IV, and V). In doing so, the study contributes to devising practical approaches to HIS integration that promote sustainability of the integrated HIS. Thus, to answer this question, I discuss the findings in two main areas: implementation strategy, and capacity development.

Strategies towards Integration – policy and implementation issues

HIS Integration is a complex process. One reason leading to this complexity is the heterogeneous nature of the process itself inheriting empirical heterogeneity of the healthcare sector. Thus, the process is charged with complexity related to identifying and implementing right technological solutions that will provide standard tools for data collection and processing as well as standard procedures of implementation. This process of standardisation needs to be well planned in order to serve the historicity that define what the different players within the healthcare sector are doing and why they are doing it that way, and the need for dynamic and flexible solutions that serve the needs of the evolving healthcare sector. This thesis contributes to this discourse and outlines strategies that will help in resolving the existing differences between these players and consequently working towards a common vision that will help to achieve institutionalisation of the integrated HIS, specifying both policy and technological issues.

Findings of this study reveal that a flexible and adaptive approach to HIS integration contributes to the success of the HIS integration. This, as the empirical evidence from papers show, is needed at both policy level and technological implementations. As part of general conditions for the HIS integration agenda in Zanzibar, early in the project it was agreed that based on the status of the existing HIS serving individual programmes, a mainstream HIS that incorporate data from all programmes should be developed, and for

the case of specialised data that could be difficult to be collected from the mainstream HIS, programmes were allowed to introduce the additional tools to collect the data that would otherwise not be collected in the mainstream HIS. However, the introduction of any additional tool shall be agreed with the HMIS Unit in order to avoid chaos. This, partly serve to give freedom to programmes that guarantees their data demand but also helped in safeguarding the existence of the integrated HIS.

Thus, this study affirms to the significance of defining right standards that will give flexibility to HIS developers to carefully select components that need to part of the mainstream HIS (Chari and Seshadri, 2004). A clear example is from ZMCP (the Malaria programme) which was given this freedom, and despite collecting much data from their programme-specific HIS, the programme firmly complied with and relied on the mainstream HIS for the monthly data that were agreed to be collected from the mainstream HIS. Given the resources the programme has, it could be easier for them to reintroduce their own data collection system, as it was attempted by ZACP and RCH programmes. However, this flexibility helped in building trust to the new HIS, something which is important for the institutionalisation of the HIS. These policy level standards were facilitated through technological development where a gateway between DHIS pivot tables and custom Ms Excel worksheets for ZMCP was developed.

Another important strategy this study adopted which can be a lesson to HIS planners and implementers is on the need to develop political alliances within the implementation network. Previous studies of HIS integration in similar settings describe the process of HIS integration as an arena of political configurations (Sahay et al., 2009) where implementers are required to play around the political sphere and the deep rooted practices around the IS implementation (Mulugeta et al., 2007) including the social dynamics of an organisation shaped by core values, power distribution and mechanism of control (Silva and Hirschheim, 2007). Findings of this study concur with the previous studies and recognise the importance of engaging in a political process thereby establishing alliances with powerful and strategic partners if the interventions are to sustain. This is witnessed in a close collaboration and link made between HISP (international and local) who are the champions of the integrated HIS on one side, and

HMIS Unit (the HIS owner) and DANIDA (main financier) on the other side. The purpose of this alliance was to seek trust amongst implementation actors as well as gaining influence in decision making. A vivid example of key decision that was influenced by HISP was the idea of recruit new staff to serve the position of data focal persons at the districts (DSOs). This decision highly boosted the prospect of the new HIS.

Strategy for Capacity Building

One of the major obstacles to HIS development that affect sustainability is the lack of the right manpower to maintain the systems developed. Previous studies have pointed out to difficulties in developing and maintaining IT staff (Kimaro and Nhampossa, 2005, Kimaro, 2006) due to high demands of skilled IT professionals by other sectors including the lucrative private sector. The problem also caused by lack of public health staff who are skilled enough to be able to analyse data and hence aiding in making right decisions for the healthcare sector.

This study, as findings in paper II reveal, has developed a strategy to develop capacity within the healthcare bureaucracy in order to sustain the integrated HIS. The strategy identified two areas which need to be developed, IT and data management, and outlines how to forge durable workforce that will work towards developing and sustaining the integrated HIS. As a strategy to develop IT technical skills, though might be seen generic, an important step taken was to develop local teams at two levels; first developing a team of trained staff within MoH (at HMIS Unit), and second, preparing local university staff that will serve as a backup to support the Ministry in case the IT staff turnover, a common scenario in countries where IT skills are still underdeveloped. This is part of the HISP approach in developing sustainable HIS in developing countries.

Thus, the thesis contributes to forging these local teams, by first adopting the HISP concept of network of actions (Braa et al., 2004) and extends this concept with practical approaches on how to develop a local team that will benefit from the larger network and hence positively affect the long term existence of the integrated HIS. In this respect, the thesis acknowledges the importance of participating in these networked interventions in order to benefit from wider exchange of knowledge and material resources, as it was the

case in Zanzibar where active engagement of the HISP international consultants helped in building capacity of the local consultants who used to be the bridge between the international team and the local staff within the MoH. Likewise, the thesis argues for strategies for developing the local team within the MoH that will serve the whole HIS bureaucracy. This helps in making the local-international link sustainable as well as prospering sustainability of the HIS.

In order to build the local team within the healthcare bureaucracy, the study built a hypothesis that a strong team of data and system (DHIS) users shall come from the current staff within the healthcare bureaucracy. Thus an HIS team was developed and trained amongst staff at zonal, district, and health facility levels, with the core team comprising the district officers who based on the new HIS structure are the axis of the integrated HIS. This would impart knowledge at minimal resource usage to people who used to work with the previous settings believing that once they buy in the new integrated HIS agenda it could reinforce its institutionalisation. However, this did not work as planned, as it was demonstrated by the act of deviance by the DHAs. Firstly, despite potential benefits of the new system, there was less incentives and little political will and power to keep them aligned, contrary to the time when programmes independently deployed their HIS. More important is however, on the way we failed to redefine identity of these staff.

Thus, identity building is a very important step in building such networks. Findings reveal that building communities through organised practical works helps to build such networks at the lowest levels of the HIS bureaucracy. This is experienced from both the health facility (data collection) level as well as the district level. At the health facilities a shared identity of service provision and data collection is long built amongst the staff. Thus the new procedures behind the integrated HIS cemented their identity through brought on advantages of reduced workload and improving their understanding of the data they usually collect. At the district level a shared identity towards the integrated HIS was only developed after the recruitment of DSOs following the failure of DHOs and DHAs team to work on the new HIS. The DSO network enjoyed a fresh start, rather than a predefined identity and ways of working which was much influenced by

programmes. This facilitated an easy way to instil values and agenda of the new HIS. In practice, this team was developed by engaging them in continuous process of learning by doing, through organised meetings (data use workshops, preparation of health bulletin) in addition to their daily data recording and analysis within their respective districts, and hence forming communities of practice (Lave and Wenger, 1991) that actively and continuously engage in the learning process.

6.2 Summary and Implications to IS Research and Practice

This thesis has presented an empirical ground to understanding and promoting HIS integration given the highly entrenched fragmentation of healthcare service provision, a common scenario in developing countries. With the case study from HIS integration project in Zanzibar, and as I have discussed how individual research questions contributed to finding of this study, the thesis contributes to both theory and practice. The primary target audience are researchers and practitioners interested in developing and implementing sustainable HIS in low resources settings with a focus on HIS integration.

6.2.1 Implications for IS Research

The principal theoretical contributions offered in this study are the introduction of the notions of institutionalisation and power to explicitly and further unpack the dynamics of HIS integration. In so doing, this work draws on – but extends – earlier work on socio technical perspectives on HIS implementation in general (Piotti et al., 2006, Silva and Hirschheim, 2007, Mulugeta et al., 2009) and HIS integration in particular (Ellingsen and Monteiro, 2003, Aanestad et al., 2005, Ellingsen and Monteiro, 2006, Sahay et al., 2009).

On the notion of power and institutionalisation, the study adopted the Circuit of Power framework (Clegg, 1998) as a way to underscore the political nature of HIS integration. Specifically, what this study did is the use of this framework as a guiding framework for IS integration, and in particular within the healthcare sector in the context of low resources settings. In previous studies within the IS field, the framework has been used as a post implementation assessment framework to assess institutionalisation of IS (Dhillon, 2004, Baptista, 2009, Silva and Backhouse, 1997, 2003); none of these studies addressed the issue of integration. Thus, introducing the use of the framework in IS integration, and

particularly HIS integration in the context of developing countries where multiple players are in continuous contest, is a contribution by itself.

In recognition of the importance of the status quo in introducing changes, that is, the existing programme based HIS and their associated routines; the thesis underscored the role of hierarchies and information culture in shaping the power structures within the healthcare bureaucracy, and consequently shaping the path of HIS integration towards institutionalisation. Both hierarchies and information culture plays a role in defining the standing conditions for power play as well as defining the rules of meaning assigned to the different actors involved in the HIS integration process. Previous studies of HIS development identified the problem of information culture as one of the serious issues facing HIS in developing countries (Wilson et al., 2001, Chaulagai et al., 2001). This study extends this notion by emphasising on how the present level of information culture also affect integration of HIS, *the higher the level of information culture the more likely its members will adopt the integrated HIS*.

Another important contribution made by this study is on the role of power in shaping reality. The thesis reaffirms findings of the previous study by Flyvbjerg (1998) linking power and rationality, where those who can exercise more power can easily instil their agenda over the others even though it could be interpreted from the common sense as irrational, that is, the greater the power, the less the need for rationality (Flyvbjerg, 1998 cited in Clegg et al., 2006). This thesis contributed by providing more empirical evidence to that finding, and emphasises the fact that *in a highly contested environment such as in HIS integration in developing countries context, power highly shapes reality and in most cases it determines the fate of its institutionalisation*.

Furthermore, the thesis contributes to understanding how technology can play a mediation role in shaping the path of IS integration when the rational agenda, could be overpowered by the effects of the existing power structures, which in principle favour those who have more facilities to access and exercise power, and have been influenced by and are still in favour fragmented IS as it has been seen from the vertical programmes. The thesis contributes to the existing body of knowledge by empirically underscoring the

role of technology in shaping IS institutionalisation in such a situation where direct negotiations are hard to succeed. In particular, the thesis draws on the actor network theory concept of inscription (Latour, 1986, Callon, 1991) to empirically investigate and contribute to a discourse on this power-rationality relationship. *What is considered as the rational agenda could be inscribed into software and tools, as it was the case of DHIS2, invisible but affecting how the system should be implemented with potential towards institutionalisation.* In this way, the change agents assuming designer's role, as Akrich (1992) refers to, can have the chance to redefine what is rational by inscribing the agenda within the software solution – the artefact.

6.2.2 Implication for Policy and Practice

This study was conducted in the healthcare sector in the developing countries context where multiple actors influence the path of HIS integration. It is an action research study, hence being part of the action team in the project, I have made significant practical contributions to the project, and lessons learnt make are helpful to practitioners and policy makers working in HIS integration projects in similar settings, and also on general IS development. The thesis contributes to this by outlining strategies that policy makers and HIS implementers could consider during planning and implementation of integrated HIS in context where fragmented HIS prevails.

First, the thesis reiterates the importance of developing standards that define design of the HIS tools and the procedures that governs the HIS process. This process of standardisation needs to be well planned in order to serve the historicity that define what the different players within the healthcare sector are doing and the reasons behind their actions, and the need for dynamic and flexible solutions that serve the needs of the evolving healthcare sector. Those standards shall offer a room for flexibility and freedom for HIS developers to carefully select components that should be and what should be not part of integrated HIS (Chari and Seshadri, 2004). This flexibility helps to build trust of the new HIS, which in the long run facilitates the process of its institutionalisation. The thesis also acknowledges the importance of building political alliances and creating strategic partnerships within the organisational bureaucracy. These alliances and partnership help not only to build trust but also gaining influence in decision making, a

key to making decisions that earmark long term sustainability. This has been previously reported in studies from similar settings (Mulugeta et al., 2007, Silva and Hirschheim, 2007, Sahay et al., 2009).

Another important implication from this study is on the strategy of human capacity development to foster long term institutionalisation of HIS, in a setting where both IT and data experts are difficult to build and retain, and where support is usually through short term projects (Kimaro and Nhampossa, 2005, Kimaro, 2006, Manda, 2015). The thesis adopt and extend the concept of networks of actions (Braa et al., 2004) by practically suggesting and testing measures to develop local teams of implementers comprising of both staff within the MOH bureaucracy as well as from local universities, that together participate in larger global network of knowledge and resource sharing. Through organised practical works linked to the HIS integration activities, the teams are build around a shared identity that promote data sharing and continuous use of data, facilitating learning at minimal resources usage, and promoting long term sustainability of the HIS.

6.3 Conclusion

This thesis contributes towards understanding and promoting HIS integration given the highly entrenched fragmentation of healthcare service provision, a common scenario in developing countries. The study adopted interpretive strand of epistemology. It engaged the context and derived knowledge through active participation in the ongoing action research project to design and implement integrated healthcare information system (HIS) in Zanzibar, Tanzania.

The study conceptualised HIS integration as a process of institutionalisation of tools and practices and drew on the notions of institutionalisation and power, and specifically using the Circuits of Power framework, to explicitly and further unpack the dynamics of HIS integration, and to underscore the political nature of HIS integration. Theoretically the thesis contributes to the discourse of HIS integration in the context of low resourced settings. In so doing, the thesis drew on – but extended – earlier work on socio technical perspectives on HIS implementation in general and HIS integration in particular.

Theoretically, the thesis contributed to this discourse by first acknowledging the role of status quo in shaping HIS integration, and particular the role of hierarchies and information culture in defining the standing conditions and rules of meaning which members in the healthcare bureaucracy subscribes to and its effect to the HIS institutionalisation. Second, the thesis have realised the relationship between power and rationality, concurring with previous studies, and extending the finding to incorporate the complexity related to the contextual nature of HIS integration in the context of developing countries. Third, in response to the second finding, the thesis contributed to understanding how technology can play a mediation role in shaping the path of IS integration when power supersede rationalism. The study adopted the actor network theory concept of inscription, and offers an alternative approach to direct presentation of HIS integration agenda, by inscribing the agenda within the software solution –the artefact in order to avoid the open contests where the more powerful need not be rational to win.

Practically, the thesis contributed to developing strategies that policy makers and HIS implementers could consider for HIS integration in context where fragmented HIS prevails, both during planning and implementation stages. First, the thesis reiterated the importance of developing standards that define design of the HIS tools and the procedures that governs the HIS process. Those standards should be flexible enough to cater for the needs of different players, and to also cope with evolving nature of the healthcare sector, while at the same time accommodating tensions resulting from historicity. Second, the thesis acknowledges the importance of building political alliances and creating strategic partnerships within the organisational bureaucracy in order to build trust and gaining influence in decision making regarding implementation. Third, the thesis outlined a strategy for human capacity development to foster long term goals of institutionalisation of HIS, in a setting where both IT and data experts are difficult to build and retain, and where support is usually through short term projects.

One important lesson from this study is that institutionalisation of the integrated HIS cannot be measured by assessing whether we have reached a point of equilibrium; rather it is a journey that will always have some sort of fluidity, the journey that requires constant

efforts of "stirring a mixture of water and oil", as Heeks and Santos (2009) put it. Thus it is not worth discussing when we have reached integration; rather on how much the actors involved can beneficially balance with what they could have and what they could not.

6.4 Study Limitations and Future Research

This study was conducted in Zanzibar in the period 2007 to 2011, supplemented with material going as far back as 2005. In order to build a comprehensive picture of how the process of institutionalisation takes place, it could be more useful to follow the case for a longer period, and study the evolution of the HIS integration project when new players arrive and circumstances change. This is a limitation and a potential area for further research.

The study used the notions of institutionalisation and power to explicitly and further unpack the dynamics of HIS integration. While there is a growing research on the use of power or institutional theory to study HIS institutionalisation, the combinatory approach, which was used in the form of Circuits of Power framework, and in particular its use in HIS integration has not been acknowledged. This study is one of the early adopters, and to further this area, further research, with different empirical settings, is needed in order to prove its generalisability as well informing new theoretical insights.

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Appended Papers

Paper I:

Sheikh Y. H. 2010. Power Imbalances and IS Implementation: A Case of Integrated Health Management Information System in Zanzibar. *In*: Nunes, M. B., Isaías, P. & Powell, P. (eds.) *IADIS International Conference Information Systems 2010*. Porto, Portugal. IADIS Press, pp. 258 – 266.

Paper II:

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Paper III:

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POWER IMBALANCES AND IS IMPLEMENTATION: A CASE OF INTEGRATED HEALTH MANAGEMENT INFORMATION SYSTEM IN ZANZIBAR

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ABSTRACT

Health Management Information System (HMIS) integration is an extensive exercise that goes beyond the installation of hardware and software. In this research article I discuss the project implementation for the integrated HMIS in Zanzibar, Tanzania. The study explores power relations between main actors involved in the project: the vertical programmes, zonal offices and the HMIS Unit, and how it affects the overall implementation process. Theoretically I draw from the concept of power to analyse the implementation process, unpacking the obstacles met when aligning these multiple stakeholders to accept a common shared HMIS. The study reveals institutional differences from the management bureaucracy of the new HMIS, where a newly established HMIS Unit is put on top of HMIS bureaucracy replacing the historically powerful health programmes. However, the unit fails to acquire supportive power resources such as finance, human and material resources, as well as administrative authority, which are crucial for the exercise of power to institutionalise the new HMIS; consequently lacking legitimacy to preside over the new responsibility, posing a clear challenge to the 'actual' integration. The existing system outlines clear distribution of power between the actors. On the one hand, the vertical programmes maintain 'power to' which is necessary for creating the social order, accumulated in the resources they posses. On the other hand are the zonal offices that have administrative authority, that is, 'power over', which is necessary in keeping order. An alternative strategy is proposed aimed at mobilising the power redistribution between the actors.

KEYWORDS

Health information systems, power, integration, institutionalization.

1. INTRODUCTION

Developing countries are marked with a long history of fragmented information systems (IS) serving their healthcare sector. A principal reason mostly cited (Lippeveld, 2001, Braa et al., 2004, Aanestad et al., 2005, Chilundo and Aanestad, 2005) is the nature of service provision. Healthcare service provision is vertically organised into programmes engaged in providing service for specific diseases (e.g. malaria, Tuberculosis), specialised services (e.g. family planning, immunization), and the general sector management issues (e.g. drugs, human resources). The subsystems used in these fragments often overlap each other in terms of the data collected, and more interesting they use the same staffs, who in the end of the day are at the centre of problems – high workloads (Chilundo and Aanestad, 2005), scarce resources (Mosse, 2004) and less motivation (Lippeveld, 2001, Sheikh, 2005). Furthermore, the systems serve only to the respective programme needs, basically at the national levels and to their funding agencies.

Widespread efforts to loosen the tension have been reported (Lippeveld et al., 1992, Rubona, 2001, Braa and Hedberg, 2002, Braa et al., 2004, Lungo and Igira, 2008), though with a considerable number of reports on either full or partial failure (Heeks, 2002). The reform efforts consider integration of the various IS serving the healthcare sector as the new doctrine. In regard to this issue, Health Metrics Network (HMN) outlines that: "It will also be important to emphasize the integration of data from different sources at national and sub national levels" (HMN, 2008 p.18). The integration efforts have a sole purpose of providing a comprehensive health data to all managers at all levels of the healthcare sector. Data between health

programmes, health districts and health facilities can be shared, and comparable analysis can be made to compare performance between districts and health facilities within a particular district (HMN, 2008). Consequently, shared efforts and reduced data collection burden to health workers will improve data quality and reduce data administration costs.

The notion of Information Systems (IS) integration is however, often narrowly informed. In most cases the discussion is merely technical with an emphasis on the selection of proper approach and implementing right standards and techniques that suits best for the systems and environment under integration. However integration is more than that. "The task straddles engineering design (of whole systems, as well as of components and their interfaces) and business organization and management [.... Thus,] Engineering meets economics, and often politics as well" (Alexander, 2004 p.160). In the healthcare domain, especially in developing countries characterised by fragmented healthcare service provision supported by various foreign donor agencies, the situation is even more complicated. Questions such as who controls what and where, are relatively important when attempts are made to integrate the existing IS. This is because integrating these IS not only requires a system that enable proper and reliable data exchange, but also involves broader process of articulating interests and building alliances among these actors (Chilundo and Aanestad, 2005). The question of control implies power. Thus the process involves power interplay between these actors which often have contracting interests and ranging capacities of implementing those interests.

The objective of this paper is then; to explore the prevailing power relations between actors, emanating from the existing administrative authorities and resource distributions in order to understand its impact on IS integration. The study is empirically based on the process of implementing a computer-based integrated Health Management Information System (HMIS) for the Zanzibar healthcare sector.

2. POWER RELATIONS AND IS IMPLEMENTATION

A question of what power is, who uses it, how it is used and its impact on the subject has led to variant forms of the definition and categories of power itself. Keltner et al. (2003) asserts that "the definition of power vary according to the guiding question (e.g., "Where is it located?" or "How is it distributed?"), unit of analysis (e.g., societies, institutions, groups, or the individual), and outcome of interest (e.g., voting behaviour or emotional experience)" p.265. A common definition in the modern theories of power is that of Max Weber, who defines power as "the chance of a man or a number of men to realise their own will in a social action even against resistance of others who are participating in the action" (Weber 1978 p.926). Be it an individual or a group (e.g. an organization), power concerns on how these individuals or group of individuals achieve their goals and survive within the community.

With regard to the introduction of technological innovations, power is used by individuals or groups to influence others in the process to diffuse an innovation. Power appears in different forms and modes. Lawrence et al. (2001), in their seminal article conceptualising the temporal dynamics of the institutionalization process identifies two modes of power, episodic and systemic. Episodic power refers to relatively discrete, strategic acts of mobilization initiated by self-interested actors. Systemic forms of power work through the routine, ongoing practices of organizations. (ibid p.629-30). Based on the treatment of the target as either subject – actor who is capable of agency, or object – actor who is incapable of choice or whose choice is irrelevant of the effective exercise of power, they further describe power to appear in four forms: influence, force, discipline and domination. The dimension of power exercised affects pace – the time it takes for an innovation to diffuse throughout the field, and stability – the time during which the innovation remains diffused and legitimate (ibid).

In regard to IS development and implementation, the political element reflecting the stakeholders relationship, interactions and the impact of the context, either business, organizational, social or cultural around which IS implementation takes place highlights the role of power relations amongst the key actors in order to improve systems implementation (Peszynski and Corbitt, 2006). Having discussed IS integration as an broad process that extends its border beyond the integration of the technical artefacts, it entails that the process necessarily also involves the exercise of power by the change agent. For example, in their critical study of the implementation of the learning management system (LMS) at Newlands University, Peszynski and Corbitt (2006) argue that while at the lower level selection and implementation of the system followed the traditional professional software engineering principles, at the front cover, power and politics played

important role during both selection and implementation. In that they state, power relations were either expressed openly or enforced through rules, statutes, and policies that enabled the formalization and hence putting into routine use the new LMS.

Silva and Backhouse (2003) had previously argued that the "exercise of power is necessary to institutionalise an information system, which, once in place, becomes itself a source of power" (Silva and Backhouse, 2003 cited in Humes and Reinhard, 2007 p.3). Institutionalization, as expressed in the institutional theory, "denotes a distinct social property or state" (Jepperson, 1991p.144). It is a process through which "a social order or pattern becomes accepted as a social 'fact'" (Avgerou, 2000 p.3). In our case of HIS integration, how the new system becomes part and parcel of every day life of the various stakeholders of the healthcare sector. On their work of the study of implementing a computerized Integrated System for State Financial Administration (SIAFEM) in Brazilian State of Sao Paulo, Humes and Reinhard (2007) also emphasise the use of power for the institutionalization process. In that project, they state, "Initially, coercive power [by the governor] was used to impose the system. Later on, it was expanded and sustained by powerful actors that made use of institutional discourses to develop new systems [to cater for their departmental needs]" (ibid p.10, emphasis added).

The ability of the institutionalization agent to exercise the power was however a key criterion in determining success to the change process. Power is anchored in popular confidence and forms the basis of legitimacy to its agent. It "flows through the social order as a circulatory medium that positively reinforces authority through creative facilitative episodes as well as being involved negatively when deviance is punished" (Clegg et al. 2006 p.196). The former view is known as 'power to' and the later 'power over'. Usually organisations apply the 'power to' through its creative and facilitative mechanisms. When this fails 'power over' which is facilitated through authoritative sanctions is exercised (ibid). Power sources include administrative authority and resources.

3. RESEARCH SETTINGS AND METHODOLOGY

The empirical materials are drawn from the Zanzibar healthcare system. Zanzibar is a country that is part of the United Republic of Tanzania, semi-autonomous in various internal affairs including health. The country comprises two major islands (Unguja and Pemba) together with several islets, covering an area of approximately 2,600 sq km with a population of 1,155,065[1]. Zanzibar, just like other developing countries, is marred by health related problems including high Maternal Mortality Rate, Infant Mortality Rate, as well as high disease burden (MOHSW, 2008). Various programmes operate in the healthcare service provision, some specialising in specific diseases (Zanzibar Malaria Control Programme – ZMCP, Zanzibar AIDS Control Programme – ZACP and TB and Leprosy Programme), and some in specialised services (Reproductive and Child Health, Nutrition and the Expanded Programme for Immunization – EPI). This multi-programme healthcare system that is largely donor supported makes the Zanzibar case complex in terms of management despite its small size in terms of area and population.

Healthcare administration is organised into four levels; health facility, district, zonal and national levels. HIS is also organised into the same levels. In addition to service provision, health facilities are the primary data collector using registers and tally sheets that are summarised into monthly reports in the end of the month. Districts are in the second level, and are the general overseers of all health facilities within their respective districts, including collecting filled in forms, distributing medical and other material resources as well as supervising the health facilities. It is at the district level where data are electronically captured into the software system before are transmitted to the higher levels. Zones are just above the district level, and are responsible for all administrative activities of their respective districts. At the national level are the health programmes and the ministry headquarter where the HMIS Unit exists.

The study is based on the author's participation in an action research project to develop HIS in Zanzibar, as part of wider HIS development network termed Health Information System Programme (HISP). HISP is a global research and development network between universities and health authorities in the form of global South-South-North cooperation with a primary focus of improving HIS developing countries (Braa et al.,

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[1] Population estimate for 2007 based on the 2002 Tanzania Population and Household Census

2007). The author has been participating in the project from the early negotiations (2004), through project inception (August 2005) to July 2008. Throughout this period I have participated in the process to develop HIS including revision of data collection tools, software adaptation and customization, user training and support, and project planning and administration.

The research entails interpretive (Walsham, 1993) study within the action research (Baskerville, 1999) framework. Interpretive research assumes that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools and other artefacts. It thus, tends to develop a deeper insights into IS development and management since it helps the researchers to understand human thought and action in social and organizational contexts (Klein and Myers, 1999). My participation in the project entails an action research principle; aiming at improving the HIS at the same time developing a theoretical understanding (Baskerville, 1999). Applicability of action research in IS studies has been highlighted by Baskerville and Wood-Harper (1998), who argue that a deep understanding of IS is build when attempts are alongside made to change the social situations underlying the IS.

Data have been collected and analysed using qualitative methods. These include a number of meetings and discussions with several health workers and managers of different levels, including district and zonal health managers involved in the report collection from the health facilities, data entry and analysis at district and zonal offices; and programme data managers and HMIS Unit staff at the national level. While district managers were met during supervision and technical support activities at their work places, discussion with the zonal and programme managers were primarily during routine quarterly feedback meetings, and at data cleaning and data use workshops, where district managers also participate, as well as during technical support visits. Discussions with the HMIS Unit staff were held during regular meetings conducted between HISP staff and the unit, as well as during day-to-day activities. I also analysed various software used by the programmes (Malaria and EPI) and documents such as monthly and quarterly routine reports and policy documents.

4. CASE DESCRIPTION

4.1 Historical Background of HIS in Zanzibar

Healthcare provision in Zanzibar, like most developing countries is organised in vertical manner and is largely supported by external donors. These donors highly influenced the type and mode of information collected, in order to enable the donors make a proper follow up of the aid they give. The amount of support varies, with some programmes receiving much support and others less mainly because of the donor preferences on what is to be supported at a time.

Prior to HIS integration efforts, each progarmme collected their own data using their own tools. With programmes enjoying enormous support from different donors they were able to collect data, supply data collection tools and some of them even managed to have computer systems at their head offices. Along with the programmes, was the then Statistics Unit, that was responsible for collecting and summing up tally sheets for the outpatient cases of the health facilities in all districts. Staff who worked in this unit, who were primarily conducting clerical works, forms the majority of the present Health Management Information System Unit (HMIS Unit) staff. This fragmented system lead to redundant data collection efforts at the expenses of heavy workloads to the health facility and district staff and with no promise on quality data.

4.2 HIS Integration and the HISP Initiatives

In recognition of the situation, the Ministry of Health and Social Welfare (MOHSW) was keen to find solution to the prevailing problem, and as a starting point it established the HMIS Unit merging the then Statistics Unit, Epidemiology Unit and Research Unit. The unit was meant to undertake the overall responsibility of data collection, supply of data collection tools and information dissemination to the other stakeholders as well as organising training and technical support to the DHIS users and supervision to district and health facility staff. With a few extra workforce, the unit was formed largely with the former Statistics Unit staff. Although the HMIS Unit was intended to serve as the national data warehouse, supplying data to programmes, the weak human resource within the unit was an obvious challenge.

The second point was to review the existing data collection tools from different programmes and design new tools with a sole purpose of reducing data redundancy and facilitating data sharing among programmes. Efforts to design new registers, monthly, quarterly and annually aggregated data reporting templates were initiated, and were largely facilitated by staff from Planning Unit. However, a full scale implementation did not take place until August 2005 when HISP was contracted to undertake the development process. The project was funded by DANIDA under Health Sector Programme Support (HSPS) II.

With approximately ten years of experience from the same kind of projects in different countries, HISP approached the development in two strategic points. One, to continue with the revision of the existing forms, as it had been the ministry attempt, but with focus on minimum indicator and datasets that are essential for the healthcare system planning, monitoring and evaluation; and two, to implement a data warehouse software that will be used to capture the collected data and that serves as analysis tool for managers at different levels of healthcare administration. District Health Information Software (DHIS) was adopted and adapted to the Zanzibar healthcare context. DHIS version 1.4, a Microsoft Access based application that uses Microsoft Excel pivot tables at a presentation layer in addition to the built in report formats, was used. While HISP followed a slightly different and more advanced approach to the HIS development process, it maintained the same managerial approach to the project implementation that envisions an HIS where the HMIS Unit play the central role, despite its novelty and supplemented with the problem of shortage of qualified staff.

The new integrated HIS was intended to serve the larger community promoting decentralised information use, as well as implementing a centralised data warehouse at the HMIS Unit (Sheikh and Titlestad, 2008). To undertake the process, main actors were identified, who in the technical support of HISP, are responsible for the routine data collection, analysis and dissemination of information, as well as information use at their respective management levels. These include the HMIS Unit, the zonal and district offices, health programmes, and the health facilities at the bottom of the bureaucracy.

4.2.1 Integration on the Scene

The implementation of the new HIS enjoyed three advantages. First, the unanimous agreement with the programmes to continue with the revision of the data collection tools and the design of the tools organised into essential datasets reflecting requirements of all programmes. Second, the chosen software, DHIS offered all the required features for the automation of the new HIS, and as an added advantage it uses the existing platform (Microsoft Windows and Office), and furthermore it had no competitors. Third, there was no immediate requirement to integrate with other system used by any of the programmes, raising a hope of full DHIS takeover. The HISP team configured the software to adapt to the Zanzibar healthcare management structure.

Training of the DHIS followed by user support was planned and conducted but initially an emphasis was put in the district offices realising their pivotal importance in the smooth operation of the system. The district offices are the first level where data are electronically captured. Districts also serve the most important task of fetching the paper-based forms from the respective health facilities. In addition, districts had greater flexibility in manipulating their budgets to accommodate the HIS implementation activities. This is because DANIDA who is the major financial supporter had put much effort in the districts as part of wider reform process where decentralised healthcare management was considered important for the effective service delivery.

Later on, selected officers from programmes and zonal offices were trained to be able to work with the data exports from the districts. IT technical staff from the HMIS Unit (in the beginning were two but later on, one joined ZACP) were receiving hands on training through joint operations between HISP and HMIS Unit with the sole intention of knowledge transfer. However, the staff showed little interest as a result of too much work around them, and hence making the unit non-reliable for the overall management and support of the system.

4.2.2 Project Outcome

The integration project demonstrated three clear successes; one development of the shared data collection tools, two, the use of the database solution, and three, routine data flow from the health facilities to the district and to the HMIS Unit, though in a very close support and follow up by HISP. However two major problems arose. First, by over-emphasising the district offices, the new information flow left the Zonal Offices orphaned and hence discouraging them. An obvious challenge was realised when some district

officers who received training refused to work, and the zonal offices could not respond to the situation claiming that they are not part of it. As a temporary solution, HISP identified other interested people within the districts and gave them in-service training.

Second, a non-reliable data flow to the programmes amid the HMIS Unit failure to maintain technical staff to ensure regular data flow to all programmes. Data flow to the programmes was rather on ad-hoc manner where programmes received untimely data and only upon request. Programmes reporting structures go beyond the Ministry level. Each programme is supposed to report to its respective donor institutions on their agreed periods. Thus, the unreliable data flow to programmes persuaded them to struggle for alternatives. EPI for example, decided to fetch the data from the districts, but encouraged the use of DHIS by asking district to send printed custom report. These are DHIS special report formats that are identical to paper-based monthly report, but aggregated by districts. These data were then sent to the EPI regional office in Nairobi which requires country offices to report by the 10th of every month. Since the programme could not run for the updates in the districts, in the end of the year data that were sent to WHO were different from the official annual health bulletin published in Zanzibar. This was discovered during the preparation of the annual health bulletin. ZACP went back to its original systems, as it was emphasised by the programme data manager "we can only rely on your system once we get all the data we want". Malaria, Nutrition, and RCH could wait for the good luck or remind the HMIS Unit when they are in urgent need of the data.

In addition, programmes never rescheduled the resources they previously used, to support the new HIS in such activities like training, supervision and forms printing. Thus the HMIS Unit relied only on DANIDA to fund all the HIS activities.

4.2.3 An Alternative Approach

The discussion above clearly indicates that important actors (zonal offices and programmes) were missing on board new HIS. These actors were important for successful implementation of the new HIS considering their positions on the healthcare bureaucracy and their financial and administrative privileges they enjoy. An alternative solution aimed at increasing their participation was proposed. In this proposal districts are required to directly send data to programmes and zonal offices as an e-mail copy of the HMIS Unit (Fig 1), enabling programmes and the zonal offices to receive data on time. With principal data users (programmes) receiving data on time, the aim is also to encourage programmes to run for immediate quality checks and feedback the districts. This active involvement of both the programmes and the zonal offices will in turn catalyse their cooperation to the HMIS Unit and subsequently boosts its capacity.
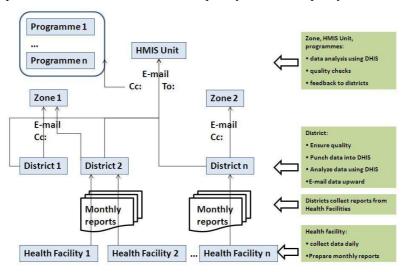
Figure 1. Proposed new reporting structure to reduce data delays. Source: Fieldwork.

Two programmes, which showed much interest in the proposed solution (Malaria and EPI), were selected for implementation. However, at this time both Malaria and EPI received Microsoft Excel database applications from their donors to be used as the reporting standards to them. To facilitate smooth data transfer, HISP staff developed a gateway solution where data from DHIS (through already prepared

Microsoft Excel pivot table templates) could be easily transferred to those applications. The gateway solution also enabled the programmes to get live updates every month. Until the time of writing, there were signs of improvements in timeliness. However, it is too early to discuss an improvement in data quality or sustainability of the solution.

5. ANALYSIS AND DISCUSSION

The HIS integration in Zanzibar has shown some success in, at least, data collection, but institutionalising it into the healthcare organisational bureaucracy is still a challenge. As the case depicts, the process of HMIS implementation involved integrating information systems of the various health programmes, at least on the data collection tools and efforts. However, the data related routines fall short of integration, signalling failure to the institutionalisation of the new HIS.

Since IS integration involves both technical and institutional aspects (Alexander, 2004, Chilundo and Aanestad, 2005, Sahay et al., 2007), it is certain that the technical solution will only survive if the related institutional environment is in favour of the solution. The institutional environment comprises actors (in this case health programmes and other offices) where the HMIS Unit seeks support and legitimacy (Finkelstein, 1992). In the new structure where the HMIS Unit takes charge, this support and legitimacy is crucial to institutionalise the new integrated and shared system. Alongside the institutionalisation of the new system, deinstitutionalisation of the old routines where each programme collected their own data using their own system and in their own resources must be facilitated without much sacrifice on the advantages those actors enjoyed, e.g. programmes getting timely data.

The new structure denotes a new social order, which must be established through the facilitative episodes of power largely invested in resources. Thus, with the HMIS Unit taking charge of the new reporting structure, it is important that the unit acquire power resources if order is to be established and maintained. Resources are crucial for operating 'power to' in order to establish the new order of the integrated HMIS. However, the HMIS Unit lacked enough power resources limiting its capability to overcome the opposing institutional forces that hinder the institutionalisation of the new HMIS. With the present situation where the HMIS is undergoing important transition, power is important in mobilising actors from the old system of fragmented HMIS to the new integrated and shared HMIS. Lacking sufficient financial, human and material resources, which are among key sources of power (Zimmermann et al., 2008) the HMIS Unit hardly wins support and legitimacy and hence fails to preside over the new HMIS. The HMIS Unit has not acquired enough resources nor has it managed to negotiate resource sharing from the programmes. Since the unit was established, it has been financially relying on DANIDA to support its routine activities such as forms printing, training and payment to the consulting staff. Lack of transport, small number of qualified staff and too many responsibilities to the available staff makes the unit unreliable for timely data dissemination, quality checks and proper supervision. Being resourceful implies one's capability to deploy power, because power is stored in these resources (Clegg et al. 2006), and this has not been the case for the HMIS Unit.

On this view of power, it is programmes that have been advantaged. Programmes have been enjoying financial and material resources supported by donor agencies. While the programmes possess no official authority over the districts and health facilities staff, they enjoyed the 'power to' facilitate their routines. This is acquired through the utilisation of these resources and hence building legitimacy through the provision of incentives and promotional activities such as seminars and training. Being resourceful, programmes also were able to get timely data or at least whenever they demanded since they can fetch them directly from districts or health facilities, responding to any informational requirements from their donors, to whom support and legitimacy is also sought. This contradicts with the new structure where programmes shall wait for data from the HMIS Unit.

The EPI attempts to fetch the data from the districts instead of waiting for the delaying HMIS Unit illuminates this difference. The programme decided to fetch the data in order not to harm the reputation they already have, maintaining their legitimacy to their resource providers, the EPI Regional office in Nairobi. To them the new routines seemed to risk their reputation and hence worth bypassing. While there was no clear evidence on the actual loss ZACP would gain in adopting the new system, the slow progress of the HMIS Unit legitimised the programme's withdrawal from the system.

The second scenario facing the HMIS process in Zanzibar is the administrative setup of the healthcare management bureaucracy. Despite the fact that the HMIS Unit is the general in-charge of the HMIS its

position within the healthcare bureaucracy does not give administrative authority over the other HMIS actors. According to the existing organisational structure, it is zonal offices that have administrative authority over districts and health facilities. Thus, the unit had no authority to discipline, for example, when the district managers refused to send data without the involvement of the corresponding Zonal office. The zonal offices are the one which have overall management authority to districts and health facilities. However, they felt marginalised due to frequent bypassing by the districts when reporting to the HMIS Unit. This means the HMIS Unit lacked authoritative resources to apply the 'power over' to the deviates who refused to abide to the new HMIS procedures.

To sum up, the new HMIS setup suffered legitimacy due to limited capacity to exercise 'power to' and 'power over' that were necessary for the institutionalisation of the HMIS in Zanzibar. The promoted new reporting structure is intended to mobilise the existing power resources possessed by other actors in order to align all actors to the new system.

6. CONCLUSION

In this article I have presented a discussion over power relationship between central actors in the HMIS integration project in Zanzibar, and how it affects the institutionalisation of the new HMIS. As the case depicts, the present organisation structure is not in favour of the new HMIS. The HMIS Unit was given immense responsibility without the necessary 'power to' exercise the responsibility in terms of human, financial and infrastructural resources to ensure smooth operation of the new HIS. The unit also lacked formal authority to exercise 'power over' the other actors who might be against the new structure, but are important for the smooth operation of the HMIS. The analysis shows that within the present settings, there are clear distribution of power between the three top actors in the new HIS – programmes, zonal offices and the HMIS Unit. The zonal offices has the authority to promote, demote or punish any staff within their zones. This 'power over' is very necessary when things go wrong as the case of district staff who refused to fill in the data. Programmes on the other hand, are resources sufficient, and hence by combining administrative authorities of the zonal offices and resources and reputation of the programmes, the HMIS Unit can attain power to overcome the hurdles to build its legitimacy to other HIS actors at the lower levels (district and health facility).

The prevailing institutional differences between the old and the new signal an obvious challenge to the HMIS integration exercise. The new management structure swerves the old established and very natural routines that programmes who, at the national level, are the principal data users, at least on its modest sense, to wait for the un-experienced, under-resourced and not well established HMIS Unit and which in principle has a limited capacity to use data apart from preparing reports such as health bulletin, to provide them with the data collected from the district. The result is, as it has been discussed, untimely and under reporting to the programmes as well as data inconsistency; the worst case being programmes reverting to their old systems.

Overall, the HMIS Unit suffered legitimacy on the broad process of HMIS integration, and so institutionalisation of the new HMIS. The proposed parallel reporting to HMIS Unit and programmes is intended to reverse the process to be more natural where data users (programmes) will have more responsibilities, such as timely quality checks and consequently this will help to improve the sense of ownership, which according to Zimmermann et al. (2008) will not only help to institutionalize the HMIS.

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2

MOBILISING LOCAL NETWORKS OF IMPLEMENTERS TO ADDRESS HEALTH INFORMATION SYSTEMS SUSTAINABILITY

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ABSTRACT

This paper addresses the problem of health information systems (HIS) sustainability in developing countries. Two interrelated questions are addressed. 1) How do we mobilise the local networks in the present settings of shortage of human and capital resources? 2) In which ways are these networks sustained for the sake of the HIS sustainability? With empirical material from the information systems integration project for the Zanzibar healthcare sector, the analysis is centred on the communities of practice concept in conjunction with the networks of action concept. The study reveals that building communities through organised practical works helps to build such networks at the lowest level of the HIS bureaucracy, enhancing learning at minimal resource usage. To make the networks themselves sustainable, participation in the larger networks of similar activities to enable wider exchange of knowledge and material resources is very important. This direct involvement not only helps in knowledge and resource exchange but also helps to forge political establishment which is highly important in influencing decisions concerning HIS related issues.

Key words: Health information systems, sustainability, networks of action, communities of practice, developing countries.

1. INTRODUCTION

Information Systems (IS) failure stories outweigh the success ones. In developing countries, and specifically in the healthcare sector, which this study is about, the failure rates are alarming. The problem of IS failure is presented at different levels. While some projects completely failed to take off, others failed to scale beyond pilot sites. Others which showed signs of success, also failed to sustain after the developer consultants/researchers left the project sites (Avgerou and Walsham, 2001). The reasons given include the nature of technology and the support mechanism associated with it. In most cases the technological solutions are designed in the developed countries context and imported to the developing countries. This proves difficult for developing countries to catch up in their context. Moreover, in most cases the projects are donor funded. This implies that the donor policies on the project implementation including the timing of the support are highly influential (Baark and Heeks, 1999; Heeks, 2002).

Usually these projects are established through commercial consultancy services and in some cases, as action research projects. Often the consultants or researchers come from the developed world. The most enduring challenge here is when the project sponsorship ends,

and the client organisations are left to carry on, with their own resources, and little knowledge, if any, left behind along with the introduced technology. The donor funding schemes are often for a short period, leaving the beneficiary organisation with un-matured systems (Heeks et al., 1999). Furthermore, the donor policies might require direct link between the donor and IS developing agent; often sidelining the most important actor, the beneficiary organisation in the crucial decisions concerning the project implementations (Kimaro and Nhampossa, 2007). All these are directly related to the problem of IS sustainability. Sustainability is crucial because IS are implemented to support the long term development programmes.

In addressing the problem of sustainability in Health Information System (HIS), Braa et al. (2004) introduces the concept of 'networks of action' for sustainable development of HIS. With this phenomenon, it is envisaged that changes must be established through networks of efforts that support each other if they are to sustain (Elden and Chisholm, 1993; Braa et al., 2004). In this study, we analyse the problem of sustainability based on the concept of networks of action, with a primary focus on how the networks are created locally and managed to be robust enough in alignment with the larger network. The study is based on the global research and development programme called Health Information System Programme (HISP). The 'networks of action' phenomenon is the underlying philosophy of HISP. HISP is a global network headed and initiated at the Department of Informatics, University of Oslo, responsible for the development of District Health Information Software (DHIS) implemented in 16 African countries and India, Bangladesh and Vietnam. DHIS is developed and used for reporting, analysis and presentation of aggregated health data at all levels.

Empirical materials are drawn from the HISP project implementation in Zanzibar, Tanzania. Drawing on the concept of 'networks of action', we examine the practical approaches on how these networks are locally created and sustained in order to foster local learning and subsequently institutionalisation of the HIS.

We first, acknowledge the importance of the existing multi-networks mode as a better means of exchanging knowledge and resources, hence fostering sustainability. Likewise we argue that sustainability relies much on having strong local teams capable of acquiring and sustaining such learning. These teams, in addition to the local supporters comprise dedicated personnel from within the client organisation, in our case, the healthcare sector. The objective of this article is to empirically analyse how these staff can be aligned to be active team members participating in the necessary learning process, and subsequently be part of the larger global network. With an emphasis on learning, epistemologically we base our discussion on the concepts from organizational learning and capacity development. The concept of communities of practice (CoP) (Lave and Wenger, 1991) is applied to explore how learning is promoted in environments where training is difficult to implement due to lack of resources.

To attain this objective, the following questions are addressed:
o *How do we mobilise the local networks of implementers in the present settings of shortage of human and capital resources?*
o *In which ways are these networks sustained for the sake of the HIS sustainability?*

In the next section, IS literature in success/failure viewpoint is reviewed, situating the study on the problem of sustainability. The concept of 'networks of action' (Braa et al., 2004) as a practical solution for sustainable IS implementation is later discussed. Finally community of practice concept is introduced in order to extend our conceptual framework to discuss the formation of the sustainable local networks. Then the Zanzibar case is described and later discussed in the subsequent sections.

2. HIS FAILURE: THE PROBLEM OF SUSTAINABILITY

The term 'sustainability' has various versions of definition depending on the field in use. In reference to IS, Kimaro and Nhampossa (2007) refer to it as the tendency of the system to endure over time and space and the ability of the system to become institutionalised. They relate sustainability directly to institutionalisation. Institutionalisation refers to the process where "a social order or a pattern becomes accepted as a social fact" (Avgerou, 2000, p.3). It refers to the process through which a technological solution becomes routinised into the organisational structures of which the technology is imposed to.

Sustainability is considered as a crucial factor in measuring success or failure of any IS. A number of literature in the IS domain have reported immense works indicating IS failure from sustainability viewpoint, with a significant number in the healthcare sector especially in developing countries (Heeks et al., 1999; Avgerou and Walsham, 2001; Heeks, 2002; Kimaro and Nhampossa, 2007).

Within the healthcare sector, the problem of sustainability is directly linked to both the healthcare bureaucracy – the Ministry of Health (MoH) and the donor agency supporting the MoH. The healthcare settings in developing countries is characterised by poor infrastructure, acute shortage of manpower as well as financial resources (Kimaro, 2006; Gordon and Hinson, 2007; Kimaro and Nhampossa, 2007). Thus, the under resourced organisation often proves difficult to sustain projects that were well equipped at the time of development. On the other side, the donor supported projects often underrates the importance of HIS sustainability. In most cases the policy of the donor agency emphasises on the management aspects that ensure success and accountability within the project framework, and put little effort on how the project will be run once the sponsored lifetime end. Kimaro and Nhampossa (2007), discussing HIS projects in Tanzania and Mozambique describe the scenario as "misalignment of the interests, roles and responsibilities of the actors involved in the process (the donors, developers and MoH)" (p9). As a result it affects planning for the future of the IS in question and consequently, leads to the problem of institutionalization being overlooked from the beginning. Thus, collaboration between these stakeholders plays a key role in sustaining changes (Kimaro and Nhampossa, 2007).

Heeks (2002) had earlier identified a spectrum of IS failure in developing countries, outlining the design–actuality gap as a major source of the failure. In relation to sustainability, three gaps are identified: resource gap when the aid is withdrawn, skill gap when key staff quits or experts leave and objective and value gap when senior-level champions go. Local improvisation of design and implementation is argued in order to reduce or close the gap. While it is always argued for a sustainability bound plan prior to the project commencement, it is of equal importance, the need for a flexible strategy where challenges are addressed when they arise. The sustainability frameworks encompass an inclusive routinization of the

IS where the three identified gaps can be narrowed down or closed. These are explained by Kimaro and Nhampossa (2007) and emphasised by Gordon and Hinson (2007). Kimaro and Nhampossa (2007) outline the need to create roles, responsibilities, and budget to ensure that the HIS becomes part of the existing organisational routines, as well as creating a pool of local experts who will take charge of the system once expert consultants leave. Furthermore, Gordon and Hinson (2007) emphasise recruitment of full time staff to work for the project instead of short term project specific recruits, allocating permanent resources such as office space and equipment and improvising project activities with the main organizational objectives. This paper contributes to the human resource aspect and takes the network approach in promoting sustainable human resources for IS.

Earlier, we introduced Braa et al.'s (2004) model for sustainable HIS development in developing countries, termed 'networks of action'. The model outlines the importance of knowledge creation in order to sustain the IS in question and is viewed in the capacity to share the knowledge and experiences amongst IS practitioners in the form of network. The model is discussed in the next section.

3. NETWORK OF ACTION FOR SUSTAINABLE HIS DEVELOPMENT

The concept of network of action has its origin from outside the IS domain. The concept is an upshot of struggle for sustainability of action research projects that were established in Scandinavia, apparently seen to be successful. Examples of these projects are the Scandinavian Iron and Metal Workers Union project (Nygaard, 1977) and the UTOPIA project (Bjerknes et al., 1987; Bødker et al., 2000). These projects are considered to have failed to sustain the interventions amid failure to spread the knowhow and forging alliances with similar groups. The clear message given here was a call for extending the classic single site action research interventions to networked interventions. The move are summarised by Elden and Chisholm (1993) on the introductory note to the special issue on action research titled "Emerging Varieties of Action Research".

Braa et al. (2004), presents HISP as large scale project to establish sustainable HIS in developing countries. The development settings comprise a complex political environment accompanied by a high level resource scarcity, a key challenge to sustaining HIS. Practically, the model underscores two important issues. First, the importance of establishing networks of sites, rather than singular locations, to facilitate necessary processes of learning and sharing of resources. Second, a mechanism for the vertical and horizontal flow of software, training, and sharing of experiences is suggested. While the vertical flow describes the movement along the hierarchy, the horizontal movement describes the flow between nodes of the same level within a country, for example, between districts and provinces, and across countries.

Braa et al. (2004) emphasise the need to establish networks that not only serve as support between countries, but also penetrate to the lowest levels of healthcare bureaucracy of a particular country. The spread of knowledge to these key HIS players is emphasised. For example, they mention Masters and PhD programmes offered by HISP that intends to produce researchers and practitioners who will sustain teaching and training programmes in their countries. This is in line with a continued collaboration between researchers and practitioners across the globe through the living HISP network. To extend the network to the lower levels of day to day practitioners with the MoH bureaucracy, our incorporation of CoP

concept will provide a solid ground for studying how knowledge is shared between these practitioners, and how this will affect the formation of robust network at the local level. The concept is discussed in the next subsection.

3.1   Communities of Practice and Knowledge Sharing

Community of Practice (CoP) was introduced by Lave and Wenger (1991) as an alternative conceptualisation onto how learning takes place between practitioners. The concept has undergone evolution on the focus of what is and why CoP. Throughout this evolution a focus has been shifting from sharing existing knowledge to new knowledge creation, from developing individuals' identity and learning to enterprise knowledge base and performance (Li et al., 2009). At the centre of it all is learning in the social environment. Wenger (2006) states that: 'communities of practice are formed by people who are engaged in a process of collective learning in a shared domain of human endeavour. [... They are] groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly'.

Three characteristics differentiate CoP from other communities. First the domain over which the community shares interests, this is the area in which members draw a common commitment. Second, members develop relationship that enables them to learn from each other, that is, they form a community through engaged joint activities, discussions, helping each other, and sharing of information. Third, members of CoP must be involved in some practice. They are practitioners who develop a shared repertoire of resources: experiences, stories, tools and ways of addressing recurring problem (ibid.). Cops exist in any organisation and are important due to their nature of forming a knowledge base for the organisation. They are nodes for the exchange and interpretation of information; they retain knowledge in active ways, since the exchange is on routine practices; they steward competencies and are home for identities (Wenger, 1998).

CoP are even more important to organisations that recognise knowledge as their key asset. With the problem of HIS sustainability in mind, they provide a prudent stage for knowledge creation and exchange between actors involved in the HIS design, development and implementation. Knowledge exchange has been identified as a spearhead by Braa et al. (2004), in their conceptualisation of Network of Action for sustainable HIS development. While the emphasis has been on the formal training as part of the project such as PhD, Masters and Certificate programmes, the project also features elements of CoP. These are facilitated through various platforms such as meetings and discussions, both physical and virtual. Thus, CoP concept can be useful in expanding our conception on how these networks operate, and subsequently, how HIS sustainability can be achieved.

Brown and Duguid (2000) extend the concept of CoP to incorporate internet communities, in what they call networks of practice (NoP). Geographically, NoP are considered to be boundary-less making it possible for teams to have direct virtual interaction of sharing knowledge and experience. However, considering the developing countries context, direct involvement is inevitable. This is because politics and power are major driving factor for IS development. In this respect, networks of action can be used to close the gap between teams (networks) in different sites.

4.   RESEARCH CONTEXT AND SETTINGS

Zanzibar is a country[1] that is part of the United Republic of Tanzania. The nature of the united republic, gives autonomy to Zanzibar on several affairs where the Zanzibar Government is the sole authority. Healthcare sector is part of those authorities under the Zanzibar Government. The country comprises two major Islands of Unguja and Pemba along with several islets that together cover a total of 2,600 sq km with a population of 1,273,834[2], and a population growth of 3.1. Zanzibar is among the densely populated countries with a population density of 399. 44.2% of the population is aged under 15 years and 3.9% is over 65 years (NBS, 2003). Administratively, Zanzibar is divided into five regions, three in Unguja and two in Pemba, which are further divided into ten districts with each region having two districts. Zanzibar City, which is located in Unguja Island, is the political and financial capital. However all government institutions have sub offices in Pemba.

Major problems underlying the healthcare sector in Zanzibar are disease burden. Despite great success of reducing Malaria which was the main public health problem, other diseases are still alerting. Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) are alarmingly high at 422[3] and 54 respectively (MOHSW, 2009). The health sector, despite enjoying sufficient infrastructure, faces serious shortage of staff in almost all important cadres. This has also been affecting the overall HIS, though there are some improvements compared to the past.

4.1   Healthcare Administration

The Zanzibar healthcare sector is predominantly government owned, though some private health facilities and hospitals exist. However, like most developing countries service provision is highly dependent on the external donor agencies which support several 'vertical' health programmes. This includes, Expanded Programme for Immunization (EPI), Reproductive and Child Health (RCH), Zanzibar Malaria Control Programme (ZMCP), Zanzibar AIDS Control Programme (ZACP), TB/Leprosy and Nutrition. These programmes being key drivers on the service provision, in some way influence the overall HIS development in Zanzibar.

The management and supervision of the healthcare services is organised into four levels, the healthcare facility where services are provided, the district office, zonal office and the national level. The healthcare facility comprises the Primary Healthcare facilities, the district hospitals, and the private hospitals. The district office comprises a team of six officers known as district health management team that is responsible for administering all the health facilities within the particular district. The health districts are the same as the political administrative districts. The zonal office comprises a team of six officers known as zonal health management team and is responsible for overseeing the districts and health facilities within the zone. There are two zones, one representing each major island of Unguja and Pemba.

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[1] The Zanzibar Constitution of 1984 as amended in 2010 (10th amendment) explicitly states the status of Zanzibar as a country with her territorial boundaries.
[2] Population estimate for 2010 based on the 2002 Tanzania Population and Household Census
[3] Based only on the institutional MMR

5.   RESEARCH APPROACH AND METHODS

This study was conducted as part of HISP project implementation in Zanzibar from July 2005 to August 2009. The study used an action research process, involving iterative process whereby taking part in a change process the declared framework of ideas, roles of the researcher, participants, and methods are revised as lessons unveil (Checkland and Holwell, 1998). Action research is an interventionist mode of enquiry where the researcher is interested in seeking and disseminating knowledge to the research community at the same time solving practical problem of the research subject (Susman and Evered, 1978). There are different types of Action Research (Baskerville and Wood-Harper, 1998). However in this research, Canonical Action Research (Davison et al., 2004), characterised by iterative, rigorous and collaborative process was employed.

To unveil the sustainability strategy, we divide the study into two major cycles each comprising the five phases of diagnosing, action planning, action taking, evaluating and specifying learning (Susman and Evered, 1978). The first cycle took place during the period of July 2005 to January 2008. Lessons learnt formed the basis of rethinking the training and support strategy to reflect the needs for creating sustainable local networks. The second phase was from February 2008 to August 2009. In this period, contrary to the first phase, technical support was considered as the building stones for the project. This included training and supervision accompanied with a light dose of technical support that gave end users enough time to practice solving their own problems.

Data collected are based on the researcher's involvement in various project implementation activities. The first author has been participating in the project implementation such as data collection forms design and review; software configuration, customization and user training; data collection staff training; and various management activities within HISP and HMIS office. Table 1 shows activities within the two action research cycles. The second author has primarily participated through correspondence with the first author who has been in the field and through data analysis.

Data were collected using qualitative methods. Open interviews were conducted to 20 staff at the health facility level, two from each district in January 2008. Thirteen open interviews were conducted with the district and hospital staff in March 2009. Considering the role of an action researcher, participant observations, document analysis, meetings and discussion as part of daily activities that include routine support, training and supervision also contributed to the data. Notes were kept and later analysed.

Data has been analysed through an iterative process of identifying themes that are related to the development of sustainable HIS. The themes identified were then related to the theoretical concepts –networks of action and communities of practice. Subsequently, analysis of the practical approaches to addressing the problem of HIS sustainability was developed through the networked interventions approach, notably how to forge networks of implementers at the local levels and how to make the networks sustainable.

Table 1: The Two Action Research Cycles

Cycle 1: July 2005 – January 2008		Cycle 2: February 2008 – August 2009	
Diagnosing (July 2005)	- Review of the recommendations made by the joint HIS survey conducted in 2004. Problems identified are fragmented HIS that does not serve the needs together with under skilled and overburdened staff.	Diagnosing (February	- The district team (DHOs and DHAs) failed to work. An alternative was to appoint a new team. The hypothesis was changed from that of promoting the existing staff to recruiting fresh graduates who have not been influenced by the present settings and give exclusive data responsibility.
Action planning (initial planning: Aug – Sep 2005,	- A plan to revise the data collection tools. The strategy was made to develop tools that capture minimum data and indicator sets necessary to cater for the MDGs, ZPRP and programme needs - Selection of software for the data warehouse solution. DHIS was selected - Prepare implementation plan: identify pilot areas and plan for roll out - Training plan prepared and key users identified at health facilities, districts and national level. The selection was based on the existing staff.	Action planning (February 2008)	- Request the Ministry to recruit new data staff for all districts and hospitals - Revise the support strategy to enforce more hands on practice to the DHIS users and link this to every day work - Quarterly data use workshops were proposed
Action taking (Sep 2005 – December	- Major revision of data collection tools - Training of data collection tools (health facility staff) - Software customisation, configuration and installation to pilot sites - Software configuration and installation to all sites - Software (DHIS) training (district –DHOs and DHAs, hospital, zones, HMIS and programme staff)	Action taking (March 2008 – May 2009)	- In service training to the new recruits was made ate the HMIS unit office - The new recruits assumed their positions as district surveillance officers - Quarterly data use workshops and annual data cleaning were conducted. The staff prepared and presented their district profiles based on the data from DHIS - Advanced training on data interpretation (including epidemiology) and use was conducted

Evaluating (January	- Investigating the use of data collection tools at health facilities
	- Investigation software (DHIS) use
	  o Interviews were conducted
	  o Observations were made
		Evaluating (May – July	- Investigate software use, including data entry, processing and information presentation
			- Interviews were conducted and observations during and after workshop meetings were made

Specifying learning (June 2008)	- The working hypothesis was supported at health facility level but not at district level. This led to change in strategy for the district level. - Input for second cycle	Specifying learning (July	- The new hypothesis was supported by district surveillance officers. A sense of responsibility and an shared identity was gradually built through shared work practices assigned to them as part of support strategy. The team appeared to be stable.

6.   HIS INTEGRATION IN ZANZIBAR
In this section, the HIS integration project in Zanzibar is presented, focusing on issues related to sustainability. The project is discussed in two action research cycle. In order to do that, we begin by presenting the client-system infrastructure, that is, the project settings comprising the collaborative research and practice team.

6.1   Project Setting – The Client-System Infrastructure
The client-system infrastructure (Baskerville, 1999) comprises the HISP team (local and international consultants, and PhD and Masters Students), HMIS team (Ministry of Health) staff, and at some point the WHO, DANIDA and Italian Cooperation experts. The Italian Cooperation was involved in the second cycle only. The composition of local and international members in the HISP team presented a stage for a wider knowledge and resource sharing that has been crucial in the project implementation. The international HISP consultants came from India, South Africa and Norway. While Indian and Norwegian consultants were computer experts who supported the project software, consultants from South Africa were public health experts whom to a large extent helped in design of data collection tools and data interpretation. At the core of project implementation is the 'action team' comprising the HMIS unit staff together with local and international HISP consultants.

6.2   First Action Research Cycle
The aim of the HIS integration project was to design and put into use a comprehensive HIS that caters for the needs of all health programmes and that will be the source of healthcare management data to all stakeholders. Thus, the development team comprising both the research and practice team planned to study and propose solution to the prevailing HIS problems.

6.2.1   Diagnosing
The first cycle diagnosing included the review of findings from the joint survey conducted in 2004 whose findings were presented in a stakeholders' meeting in November 2004. This also reflects findings of the study in 2004 (Sheikh, 2005). In particular, the following problems were revealed:
    1. A fragmented system where each programme collected their own data, often overlapping but never shared.
    2. Data collected were not inline with the ongoing healthcare reform that envisages improved healthcare services in accordance with the Millennium Development Goals (MDGs) and Zanzibar Poverty Reduction Plan (ZPRP).
    3. Under skilled and overburdened staff working for data at all levels (health facilities, districts, zones and national level).

6.2.2   Action Planning
The project implementation team identified three major areas of implementation to be part of action plan, in order to address the above problems. First, revision of data collection tools with a target to attain minimum data and indicator sets that are necessary to provide information to cater for the MDGs, ZPRP and programme specific needs. Second, to develop

a data warehouse solution that will be used to capture the collected data, processing and producing relevant information. District Health Information Software (DHIS) was selected for the purpose. Third, training the prospective HIS staff, including data collection staff at the health facilities, DHIS users at districts, hospitals, zones and HMIS Unit, as well as health programmes. Selection of the trainees was based on the assumption that those people who have been previously working with data shall form the key HIS staff component. Thus, at the health facilities it was decided to train the prescribers and nurses working at the mother and child healthcare departments were selected. Prior to the project implementation, the staff have been routinely working as the data collection staff. At the district level, district health officers and district administrative officers were put to be in-charge of data collection and processing within their respective districts.

On top of this, the HISP agenda was to set up a link between the core data staff from the health facilities, districts and the national data managers with the international network of data operators, users and planners in order to share experience across the countries and to create the sustainable team that can get support from other HISP sites. Thus, HISP worked as a network comprising both the locally recruited consultants plus international consultants.

6.2.3   Action Taking
The action plan specified a pilot stage where four districts, two in Unguja and two in Pemba, and two hospitals in Pemba were selected for implementation over a four months period – September to December 2005. Full scale implementation began in January 2006. The project was supported by DANIDA. During this period, apart from software customisation and data collection tools review, a major focus was training and support in order to create an environment for project sustainability. The vision was to create a strong local team comprising the healthcare staff, which will be the core HIS implementation team and that will work for a longer period as part of the larger network.

The training programme was designed to orient data collection staff to the general concept of integrated HIS, new tools used, definitions of the terms used and how to collate data from the daily registers and tally sheets to the monthly summary forms. At the district level, the focus was on the software use –data entry, analysis, report preparations and electronic data reporting. The training was organised at each district.

DANIDA also offered scholarships to 16 staff to undertake a certificate programme in health informatics at the University of Dar es salaam. The scholarship was organised in two groups, one in 2006 and the other in 2007. This programme is jointly organised with the University of Oslo (UiO), and is part of the HISP initiatives to strengthen the local networks of HIS personnel. The same staff who attended the HIS training from districts, zones and hospitals were selected to attend the course. This course was organised in an international sphere and was intended to expose the managers to the larger networks hoping to create alliances with other HIS personnel from different countries as well as expanding their horizon on the HIS issues. Supplementing these trainings is the routine support of the HISP staff to all DHIS implementation sites.

To support the training, the action team visited each district, hospital and zonal office once a month and whenever a need arose. The action team also interacted with other HISP developers and implementers across HISP implementation sites through online discussion

forums and email groups. During this period, apart from knowledge sharing, new versions of DHIS were regularly released from South Africa, based on countries demand. Thus, the Zanzibar team not only benefitted from its own demand but also from other HISP implementation countries' demands that proved to be suitable for the local needs.

6.2.4   Evaluating

Overall, the project was a partial success, with health facility team showing promising development and sustainability challenges arising from the district team.

We perceive the project a success in terms of data collection at the facility level in two viewpoints. First, the ability to improve data quality delivered by the health facility staff from time to time, evidenced by improved data quality in the annual health bulletin. To the matter, the HMIS head expressed her views.

> *I am pretty confident with this year's bulletin. Data from the previous year (2006)are really doubtful. Looking on the facility utilisation rates from last year, for example, how can you have total headcount for under five years higher than the overall total headcounts? Obviously the staff did not understand its meaning in the first time.* (Head, HMIS Unit, July 2008)

Second, the ability of the health facility staff to keep a constant working team, which over the time horizon recognise their improved work capability and the contribution made by the new system on reducing the data collection workload as well as making sense of the data they collect. Many health facility staff shared similar opinions on the matter.

> *The new tools are simpler to use compared to the old ones. But it usually takes time to master anything. I am now more familiar with the way data are collected.* (Health facility staff, January 2008)

> *We have fewer forms. They are easier compared to the previous ones, because you do not need to think of every programme. When I have filled in the data for nutrition in the RCH form, for example, I have finished my job.* (Health facility staff, January 2008)

This group does not have regular meeting places to discuss the data they have collected, but often use any stage to raise their concerns. For the first two year of HIS project implementation, the group was involved in the annual data collection tools review workshops which includes managers from district and the higher levels. While the main objective of the workshop was tools review, the staff used the workshops to discuss problems they face on using the new tools, and acknowledged the ability to learn from each other.

> *When you hear problems from other people then you think that it is not only you. Sometimes you even hear new things which you did not experience or think about... it is good if we meet often because we share concerns on the fate of our data.* (Health facility staff, January 2008)

An interesting point with this group is that, data collection had been their daily responsibility. To them, the new system had liberated their working conditions thereby reducing the workload as well as improving their understanding of the data they collect. Despite the fact that, there are no regular meetings between them, there is a common identity built in them that data collection is their responsibility, and hence any system that simplifies their lives is welcome. As a result, this has led to a stable network.

At the district level, the situation was different. An overall evaluation shows a fair success, notably improved data coverage, and to some extent, improved data quality from all districts. However, to analyse the project success in sustainability viewpoint, we point out to the actual involvement of the trained district officers in the daily HIS activities, and a correlation between them and the work of the HISP staff. The findings show a high drop off of their involvement to the daily HIS activities. In fact, until the beginning of 2008, only two out of the 20 trained district officers had a firm commitment to routine use of the DHIS. Moreover, until August 2009 only three out of the 12 HIS certificate graduates from the University of Dar es salaam were connected to routine HIS, none of them from the districts. Responding to enquiries, the staff complained of too much responsibilities imposed to them. In reality, however, their priorities were on the lucrative programmes' assignments, which through a long period have been source of alternative income to top up their salaries. Subsequently, new staff amongst district personnel were trained, and in some cases the less skilled co-opted members who have very little authority were trained. However, this did not solve the problem.

HISP pressure to demonstrate results also contributed to severity of the problem. While HISP agenda is to develop and empower the local staff of the ministry of health to improve their level of ownership to the new HIS, DANIDA –the project sponsor and the HMIS unit are more enthusiastic to see the results. This is because DANIDA local office is accountable to Danish Embassy in Dar es salaam. The situation is also escalated by the fact that there were no clear HIS performance indicators in place, the question of what is demonstrated was therefore more important rather than who is demonstrating. This forced the local HISP staff to work to close the gaps left by underperforming district staff just to make sure that every thing is going smoothly in the eyes of DANIDA. Consequently, some districts staff felt less responsible as long as things are working properly.

During a visit to one district, a district officer called his colleague to tell him to bring the forms in order to give us to fill into the DHIS; to which we responded '*we have come to give support to you on the DHIS use, not to enter the data*'. In another district, one officer monopolised the use of the computer, which was already installed with DHIS and originally dedicated to the DHIS usage. Message was left to the newly DHIS recruit (a co-opted district team member) that nobody should 'touch' that computer, because he is using it for his 'important work'. A clear message from these staff is that 'HIS is not their primary task or not their work at all'. To solve this problem they had to use another computer for DHIS data entry.

6.2.5   Specifying Learning
This section presents reflection of the first cycle. An emphasis is put to the sustainability strategy as planned and executed by the action team –HMIS and HISP staff and divided into

practical and theoretical reflections. The practical reflection, which is the basis for the second cycle is discussed here, and the theoretical reflection is discussed in the discussion section as a comparative analysis and discussion between the two cycles.

There are three things worth noting as lessons learnt from the first cycle, which are relevant for our sustainability project. First, the ability of the local HISP and national HMIS to keep connected with the global HISP network. To a large extent, this has helped to empower the local team through software updates, technical support and knowledge sharing accommodated through physical meetings and discussions, as well as online discussions.

Second is the ability to extend the team to the district and health facility level. Our hypothesis in planning for the sustainability strategy here presents both success and failure at different levels. While it reasonably can be argued that at the health facility level, the project was a great success, at the district level is different. The difference comes from how the two teams were involved in the day to day activities of the new HIS. Although the selection of the trainees was based on the same hypothesis –selecting those who previously used to be data staff, one factor was forgotten – how the staff personally benefitted from the previous system. Financially, the district staff benefitted from individual programme working as their data focal persons, and hence selecting these people to work for only one integrated system could undermine their financial opportunities. This point to the need to revise the plan, as discussed in the next cycle. The health facility staff, who in principle, shall also have been benefiting from those programmes incentives, perceived the process in a positive way. To them the new system made life at the office easier by reducing workload and easy of use of the new tools. The team embraced the new system and expressed desire to learn from each other.

Third, the HISP (including the researcher) loyalty to the HMIS unit and DANIDA led to increased HISP influence within the HIS decision circle. This helped to raise the HISP influence in decision making and to rethinking our hypothesis as outlined in the next cycle.

6.3   Second Action Research Cycle
The second cycle is mainly based on the change of strategy for creating a sustainable team at the district level. This is the result of the stated failure, by the district team in the first phase. The cycle represents activities from February 2008.

6.3.1   Diagnosing
Lessons from the first cycle identify a failure at the district level. This failure is not on the view of conducting daily HIS activities, rather on making a robust team to take responsibilities of those activities. The action team identified this problem and came up with a new approach –a fresh team that has not been influenced by the previous procedures may be the right choice in fostering sustainable working team at the district level.

6.3.2   Action Planning
The new action plan comprised of two major activities. First, recruit new staff from college and assign an exclusive data role. The assumption here was that, with fresh graduates it could be simpler to instil the HIS values to them compared to those who already had defined their own values and identity. Second, to change the support strategy where the newly recruited staff were required to work more independently and to prepare and present reports that are of

day-to-day use. The plan also outlined a need for routine meetings where the new recruits are required to present HIS and health profile of their respective districts. The purpose of this plan was to forcefully create a bond between training and system and information use.

6.3.3 Action Taking

Following the HMIS unit request, the ministry recruited fresh graduates who just finished their Diploma in Public Health at the College of Health Sciences Zanzibar. Due to budgetary constraints, there was no formal HIS training to the new recruits as opposed to the previous group. Instead they were attached to work at the HMIS Unit office for one month where they received hands on training of the new system starting from the data collection forms to DHIS usage. The recruits also had chances to visit the districts when HISP staff were conducting routine support. After the one month orientation, ten staff members were distributed to the ten districts serving new posts as District Surveillance Officers (DSOs), and three remained at the HMIS Unit. By the end of April 2008 all the DSOs had already taken their positions in their allocated districts. The DSO post is not part of the official district health management team rank but a negotiation is in the process to incorporate them so that they will be an important part of district decision circle.

During this period, there was also a change in the overall project implementation plan. The contract between HISP and DANIDA expired in January 2008, and continuation of the HISP staff was mandated to direct contracts of the individuals from DANIDA. The HMIS unit exercised much power in defining the new contracts as well as evaluating the project progress. As a result, the new contracts put an emphasis to empower HIS staff noting the shortfall from the outcome based approach that dominated the first phase contracts. Later in April 2009, the Italian Cooperation sponsored training programme to the DSOs and other HIS staff from hospitals and Zonal offices with the same aim of empowering the staff.

Both DANIDA and Italian Cooperation agreed to the hands on practice approach proposed by the action team. Thus, from the first quarter of 2008, quarterly data use workshops were conducted where DSOs were gathered to present their data in relation to the various reports they are supposed to prepare for their district needs. Apart from these quarterly meetings the DSOs participate in the annual data cleaning workshops, a precursor to the preparation of the annual health information bulletin. The DSOs also accompanied their district superiors in workshops to prepare comprehensive annual district plans, and are fully responsible for preparing all reports, though under close supervision of HISP and HMIS unit staff. This is in contrast to the previous group where the reports were produced by HISP staff.

The Italian Cooperation sponsored training programme stretched the focus to epidemiology, sharpening the trainees' capability in data interpretation. In these trainings, trainees organised into groups were required to prepare short reports presenting district health profiles, based on the data they have collected through DHIS. These reports were supposed to be improved when the trainees return to their offices with the aim of making a regular process of making such kind of reports.

6.3.4   Evaluating

In comparison with the first cycle, the project can be considered a success in that the district team (DSOs) both survived keeping the team and improved their work capabilities. The

capacity of the DSOs in preparing and presenting their district reports in an independent way demonstrates this. In an interview with the DSOs the participants hailed the approach acknowledging their capability to learn:

> *In my district I did not have this kind of problem where data had such rapid rise just in one month. But I have learned from others that this is a concern on data quality, and I will try my best to make sure I correct any such problems before reporting any data.* (DSO, March 2009)

> *I learn faster here than just sitting alone in the office, or calling you [HISP] to help me, because when sitting in my office I only seek solution to problems I encounter... not always I will come across every problem, here problems are shared.* (DSO, April 2009)

During the Italian sponsored training, trainees appreciated the mode of the training.

> *If this is my job I need to understand every thing. It is fine for the DHIS to give the indicator values, but knowing its meanings is also important.* (DSO, May 2009)

Also worth noticing, the DSOs had developed strong sense of ownership to DHIS. This indicates that there is a prospect of making a reliable network that will take charge of the DHIS to support healthcare service planning, monitoring and evaluation within their respective areas and to the nation at large. During the routine follow-up, the DSOs often expressed desire to do more from the DHIS:

> *The exercise is good, but is also important that we can create the pivot tables by ourselves. We also need to know how to install the DHIS. What if all of you are not available and the computer crashes?* (DSO June 2009)

6.3.5   Specifying Learning

The proposed approach in the second cycle planning is somehow a success. Until the May 2009 it appeared to have a stable district team of DSOs that have been capable of doing much of their responsibilities. This is reflected in both the strategies proposed. First, enforcing users to directly reflect acquired knowledge to their day to day activities cemented the knowledge into practice. Second, bringing the group together formed a meeting stage where every body learns from each other. A common sense of responsibility between them was created implying a shared identity which is a starting point for preparing and making the team alive. Thus, both learning and practice is seen as a shared responsibility. Subsequently, this will lead to a stable and robust network that can benefit from the higher level networks from other HISP sites.

7.   DISCUSSION
In this section, the approaches to mobilising the local networks of human resource to address the problem of HIS sustainability are discussed. The discussion focuses on mobilising the healthcare staff to form a robust network within the healthcare bureaucracy that facilitates working and learning. The conceptual framework is drawn from networks of action and CoP concepts to synthesise the argumentation. Throughout the discussion the need for the change agent to engage in the political establishments to influence the process is also acknowledged.

7.1   Mobilising the Networks
As argued by Braa et al. (2004) and earlier by Elden and Chisholm (1993), sustainability of action research project should be viewed in the necessity to forge networks of action between people working in similar projects. This will enable knowledge and resource sharing between the networks. The case in Zanzibar HIS project demonstrates the link between the working local team and the international community of similar works from other HISP sites. The relationship between the local network and the broader HISP network is facilitated by a team of staff who constitute a mix of local and international consultants. This represents physical movement and coordination of knowledge and resources where the international team members bring along with them abundant experiences from other sites. The software resource sharing of the DHIS releases. (i.e. from the South African team), and the email and discussion groups strengthens the network. The linkage between the local and international HISP staff serve the task of flow of resources and knowledge to the HIS implementation team in Zanzibar.

This downward flow of knowledge and resources is dependent on the presence of sustainable network of implementers at the lower levels (district and facility) as well as the higher national level of MoH. The case demonstrates efforts to create such network. While there has been a stable network of data collection team at health facility level since the project inception, this was not the case for the district level. The difference between the health facility staff and the first batch district staff (DHOs and DHAs) is a result of self adjustment and perception of the staff to the new HIS. For the health facility staff, there was no alternative to what they have been doing. In fact, the new tools liberated their lives in terms of data collection conveniences. Analytically, we can view a deep seated identity of the health facility staff as primary data collection staff. The task is their routine duty, and they found the new tools to be more user-friendly, fewer, and easy to use. This helped to boost their identity as data collection staff.

Building identity is an important step towards creating a CoP, because CoPs are characterised by common practices (Wenger, 1998). For the health facility staff, the new HIS tools boosted their identity through improved work conditions. Identity is something that needs to be cultivated. One way to cultivate identity is by providing incentives to the community. The improved working conditions resulting from the new systems served as an incentive to the health facility staff, building their identity towards the new system. Comparing the two groups of district team, the first group of DHOs and DHAs failed to forge an identity towards the new HIS as opposed to the second group of DSOs.

The differences between the first and second district team clarify the point that allocating permanent staff, does not necessarily help to solve the problem of manpower in

addressing HIS sustainability. The process needs to be viewed in the capacity to forge teams that identify themselves as a community organised to perform that task. Analytically, we see the difference between identity change and identity building. For the first district team (DHOs and DHAs), the difficulty in creating the identity towards the new HIS resulted from the fact that there is already pre defined identity of their routine works –programme activities, which they consider as channels to personal gains. The story of the DSOs is different, for them, the new HIS is an identity builder and it serves as a source of opportunities such as attending meetings and seminars as well as gateways to knowledge and new technologies. These might be valuable incentives in making their identity towards the new HIS. Thus, changing identity is a more difficult process compared to creating one.

7.2   Communities of Practice as a Tool to Improve Network Robustness

One of the primary motives for the networks of action perspective is the limitation of the stand alone projects to knowledge exchange for similar projects (Elden and Chisholm, 1993, Braa et al., 2004), a concern over sustainability. Learning and knowledge sharing between the networks are important aspects of the concept. While learning is seen as the product of the networked interventions, sustainability and durability of the network also depends on the level to which the teams are engaged in the learning process.

CoP can be seen as a means to boost the network robustness due to the ability of team members to participate in the learning process. The local HISP community comprise of people of different backgrounds (IT and public health) working with the local MoH staff, mainly people of health education background outlines the process under which people of different backgrounds can work to accomplish their goals. What is common in this team is the practice of developing and putting into use the IS for the Zanzibar healthcare system. On top of that is the HISP global agenda of mobilising resources to ensure working and sustainable HIS in several developing countries.

Knowledge exchange within the HISP project in Zanzibar shows how CoP are useful in strengthening the network. People sharing almost similar problems in their day to day HIS activities meet and discuss their success and challenges in meetings and workshops, as well as through email communications. While these meetings are considered formal stages for data presentation, for example, deep into the ground there is a built sense of shared repertoire where the stage is not only used to present the formal routine, but is a rich source of learning and maintaining the network of the grass root implementers of the new HIS. Making an important hub to the international community are the HISP local staff, who in practice, work as the bridge between the international HISP team in other HISP implementation sites and the grass root workers who are involved in data collection, analysis and use at the health facilities and district offices. This situation of co-participation (Lave and Wenger, 1991) in the whole HIS activities, make the team experience learning and resource sharing (for example, software) that both empowers the locals as well as making the whole network active thereby fostering its robustness.

7.3   Political Establishment and Network Sustainability

Braa et al. (2004) considers the political establishment in IS development as key in network building. The need for political manoeuvring comes from the fact that there are conflicting

interests between different actors involved in the HIS development. The actors include programmes, district health management teams, HMIS Unit, HISP and DANIDA. These differences may be intended or unintended, both visible and invisible. In our case, the conflicting interests are noticed from the effect of the programme activities to the district health management team members notably DHOs and DHAs, whom, together with the health facility staff are the primary players of the new HIS. As the case presents, the DHOs and DHAs were deeply engaged in the programmes activities, compromising the new HIS which HISP, HMIS Unit and DANIDA invested much on their trainings in order to create sustainable network capable of implementing and sustaining the new HIS. To save the situation, HISP intervened through political persuasion where HISP staff were involved in direct interventions doing the work of DHOs and DHAs, at least to make things visible in front of others.

Although this direct involvement of HISP members escalated the irresponsible actions of the DHOs and DHAs staff , on the other hand, it led to a firm political support of both the HMIS Unit and DANIDA –the primary HIS supporter. To them, HISP has been more than consulting body –it is a partner in development, and the work (HIS) is visible. This resulted into HISP incorporation of insiders' decisions. HISP inputs have always been considered useful during planning and evaluations done by HMIS Unit and DANIDA. An example is the recommendation for recruitment of the DSOs, who to a large extent strengthened the network with the local HISP. This bond between HISP, HMIS Unit, DANIDA and other HIS stakeholders is a result of political engagements of the HISP team in alignment with the institutional and political situation of the time. For example, the result-based approach of the first phase where HISP successfully managed to demonstrate the HIS outcomes to both DANIDA and HMIS Unit was very helpful in cultivating a mutual understanding between the two parties.

8.   CONCLUSION

In this paper, we have discussed the practical approaches to building sustainable HIS. The conceptual framework is built from the concept of network of action, which is the underlying philosophy of HISP. Through empirical material from the Zanzibar HIS, we have underscored the importance of establishing robust local networks of implementers for sustainable HIS.

The analysis of the earlier projects that inspired the need for conceptualising network of action is viewed from the bottom up approach that outlines the needs to forge networks, if action research projects are to sustain. The HISP approach (Braa et al., 2004) to establish sustainable HIS in Zanzibar delineates on the top down approach where the global network is viewed from its capability to grow across countries and extending them to the lowest level of data collection. However, the problem of HIS sustainability in developing countries is also often associated with foreign initiatives, of which HISP is not exceptional. To this matter, we argue in the virtue of sustainable HIS development, a scrutinised analysis of the composition and operationalisation of the local network of implementers, drawing its roots from the lowest level of HIS bureaucracy –the districts and health facilities.

To address the creation of local networks of implementers in the settings of the shortage of human and capital resources, the concept of community of practice is applied to

discuss a practical approach to establishing the networks. As the case has demonstrated, building an identity was an important step in establishing the community. Knowledge sharing is then facilitated through organised practical works where individuals meet to demonstrate their work. In this context, learning seems to take place in a faster pace, yet not exploiting many resources. Thus, with this respect CoP are very useful in building the networks at the lower levels. Incorporating CoP in such HISP top down mode to network building provide a sound approach to extending such networks to the desired levels –lowest level in the MoH bureaucracy, thus adding value to our understanding of the networks of action. We also argue that there is no universal way of mobilising these networks. As the case demonstrates, the first hypothesis of developing the existing staff (DHOs and DHAs) failed due to difficulty in changing their identities.

To address the sustainability of the networks themselves, HISP project and in particular the Zanzibar case presents a rich network of knowledge and resource sharing. The network of action perspective implemented within the HISP project, outlines the way teams within particular countries coordinated with other countries not only to facilitate knowledge sharing but also mobilisation of resources such as software and direct involvement of human and financial resources. To address the problem of sustainability of the local networks themselves, the network of action concept elaborates the way CoP can be used to extend learning horizons. As the case dictates, the formation of the local networks is largely influenced by the presence of the local HISP team that has direct involvement with the global team. This intermingling between the local and global HISP teams as well as the local network of implementers within the MoH is different from the networks of practice (NoP) (Brown and Duguid, 2000) –an extension of the CoP. While NoP extends CoP into cyber forms of networks, the networks of action perspective is more than virtual networks. It also involves direct involvement of the people from around different networks. In the developing countries context this is necessary, because the context requires direct involvement in order to build political ally with different actors involved, engaging with the necessary negotiations within the decision making circle. HISP has been part of the circle. Thus, the study suggests that the sustainability of the local network themselves shall not be viewed in the lens of acquiring networks of CoP solely, rather be part of the larger network of action. Thus, in this context CoP should be seen as means but not end to themselves.

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Sheikh, Y. H. On Being Specific about Power: Institutional Dualism in Information Systems Integration. Submitted to *Journal of Health Informatics in Developing Countries.*

On Being Specific about Power: Institutional Dualism in Information Systems Integration

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Abstract. Why is information systems integration in the public healthcare sector complicated? This paper unpacks the causes of such intricacy using the concept of institutional dualism. The empirical materials are derived from the Zanzibar healthcare sector, where data were collected using qualitative methods such as interviews, focus group discussions, document analysis, and participant observation. Cases from selected health programmes are examined in essence in order to shed light to which we can understand the HIS integration process as a straddling task of institutional matching or mixing where multiple institutions meet. Findings suggest that the resulting trajectories are the results of power interplay between actors involved, where power highly shapes reality and consequently affecting the prospects of the HIS integration.

Keywords: Health information systems, integration, institutional dualism, institutional logics, power, developing countries

1. Introduction

Organizations have been using the opportunities offered by the potential of information and communication technologies (ICT) in improving organizationsø performance, productivity and competitive advantages (Qureshi 2009). In the public sector, the aim has been to improve government efficiency and responsiveness to its citizens, commonly known as e-governance (Heeks and Santos 2009). With adoption of ICTs developing countries are expected to advance their chances to compete in a more equal basis in development (United UnitedNations 2000). In recent years, the trend has been to use ICTs to monitor countriesø performance in response to the millennium development goals (MDGs) (United UN 2008). This study focuses on the domain of healthcare sector in developing countries context. The healthcare sector has been one of the ill-performing sectors despite its importance to the public. As evidence, three out of eight goals are directly related to the healthcare sector (UN 2008). One reason associated with this underperformance is low budget allocations from the governments.

To tackle the problem of poor healthcare services in the developing world, donor agencies, both bilateral and multilateral, have been providing tremendous financial and technical assistance. This assistance is given in the form of health programmes. The programmes include specialized services such as immunization and mother and child care or focusing on particular diseases such as malaria, HIV/AIDS and TB and are

vertically managed (Chilundo and Aanestad 2005). Each programme tends to have its own information systems to support its services and monitor the resources being used. Reports for each programme are sent to the donor agencies to ensure accountability. The vertical programmes have resulted into a situation where there are multiple information systems serving the healthcare sector. The challenge is, often, there is overlapping occurs during data collection. Vertical programmes end up sharing the data collection staff whilst the data collected is not shared (Sheikh and Titlestad 2008).

Health Metrics Network (HMN) underlines information systems integration and the use of ICTs as an important step towards strengthening health information systems (HIS) of a particular country. Integration will provide a shared and comprehensive HIS. In turn, integrated and shared HIS will help to reduce data collection burden to health workers, and consequently will improve data quality and reduce data administration costs (HMN 2008).

This paper addresses the problem of integrating HIS in such context. Empirically, the research is based on the project to integrate HIS for Zanzibar healthcare sector. The analysis is based on the broader perspective of IS integration óthat of organizational routines and institutions on top of the technical aspects of integration (Alexander 2004, Sahay, Monteiro et al. 2009). The integration project case is built from case units from selected health programmes (HIV/AIDS, reproductive and child health, malaria, immunization and nutrition) that operate in the Zanzibar healthcare sector. These are examined to identify challenges associated with the process of integrating the individual programme information systems, both during the integration of the artefact as well as post-artefact integration.

We base our discussion on the concept of institutional dualism, referring to a situation where two different institutional contexts or institutional systems come together as a result of innovations in public sector (Brinkerhoff and Goldsmith 2005, Heeks and Santos 2009). We examine the two institutional contexts: the historically established multiple HIS that serve the different programme, and the new integrated HIS. The two institutional contexts are built from different logics. In one hand, programme based HIS are aimed to help the specific programmes on monitoring and evaluation of the individual services they provide on top of reporting to their respective donors to secure trust. On the other hand, the integrated HIS is aimed at providing quality data to all stakeholders (including the programmes), promoting data sharing and the use of ICTs to facilitate easy data access and presentation of information.

We view the emerging trajectories in the HIS integration as the impact of manipulating financial, material as well as the administrative resources, thus analysing the results through the lens of power (Lukes, 1974; Bachrach and Baratz, 1962; Clegg, 1975; Pettigrew, 1979; Foucault, 1979). The paper discusses the emergent trajectory on the integration process and how the outcomes are influenced by the stakeholders involved. Thus, the objective of the paper is to unpack the tensions that arise on course the HIS integration project in Zanzibar and how they affect the integration process. This is addressed through the following research question:

> *How does power tensions around the actors involved in HIS affect the integration process?*

Next section presents a conceptual framework that will be used to analyse the institutional dualism in HIS integration project in Zanzibar. The discussion starts with presenting the status quo of HIS in developing countries and the need for integration

followed by highlighting the complexity involved and how institutional dualism concept can be used to unpack that complexity. We supplement our conceptual framework with the notion of power and how it plays roles in this duality.

2. Institutional Dualism in Information Systems Integration

Information Systems integration has been a topic of discussion amongst researchers in the various fields of IS. For some time, a dominant group conception has been on viewing IS integration from pure technical angle. To these researchers and practitioners alike, the main concern has been on how we can offer technical solutions to integrate systems of different background in order to cater for the evolving business and technological needs, while reasonably retaining legacy systems and legacy technologies. A major issue has been keeping the right balance between distribution, autonomy, and heterogeneity (Hasselbring 2000). Thus, researchers focus on how to develop right standards, techniques, and approaches for attaining integration.

This conception is however criticised by the other school which believe the social and organisational aspects play equal role on IS development. This group conceptualise IS development as rather socio-technical process, highlighting the needs on working around the organisational and social issues during development and post development of technical solutions. In this paper we contribute to the later conception, and particularly within healthcare sector in developing countries. Our analysis of IS integration, is motivated by the observed alarming level of healthcare information systems failure, one reason being a design-reality gap (Heeks, Mundy et al. 1999, Heeks 2003), which spells out the inattentiveness to the social and organisation realities.

The socio-technical conception of IS design and development originates from early works by Robert P. Bostrom and J. Stephen Heinen who explicitly identified cause of IS failure being the design strategies that explicitly view information technology (IT) as just artefacts, disregarding the dynamics of the changing organisational and social environment in which information systems are built. The authors draw from socio-technical systems theory, and they conceptualised IS systems as socio-technical systems with IT artefacts and organisation procedures and routines highly intertwined (Bostrom and Heinen 1977, Bostrom and Heinen 1977).

In the healthcare sector, the concept was pioneered by Berg et al. (1998) and Berg (1999) in their studies of electronic patient record, and patient care information systems, respectively. In these studies, and subsequent studies, the agenda has been to unpack the socio-technical configurations in which the design process is politically textured towards organizational changes, involving the way people work and behave as influenced by organisation policies, procedures, and norms, all of which are also subject to interference following the introduction of the new information systems. Despite considerable number of research on this strand in healthcare sector, little has been done on IS integration, and in particular in within healthcare sector in developing countries.

We thus, contribute to analysing healthcare information systems integration from this perspective. Drawing on the nature of healthcare sector, and particularly in developing countries, we offer an ideal stage to discuss issues associated with IS integration from the socio-technical perspective. Healthcare sector possesses special character: the nature of the systems to be supported, stakeholders involved and sensitiveness of data and work practices. In developing countries, another level of

complexity prevails. Due to resource scarcity experienced by almost all developing countries, fragmented information systems evolved out of necessity. Multiple donor agencies operating in these countries have formed strong specialised programme in order to assist in offering the badly required services.

In no doubt, the only way to monitor progress and resources they offer is through setting up information systems to cater for the data needs of particular programmes. In doing so the sponsors can guarantee themselves of accountability and impact of the assistance they offer (Chilundo and Aanestad 2005). As a result, this has led into serious challenges. Redundant data collection overburdens the health facility staff resulting into problem in both quality of care, and quality of data, redundant data collection leads to data inconsistency especially for the shared data, and lack of complete picture for the overall healthcare monitoring. It is indeed these problems associated with fragmented HIS which led to the continuous call on integration. In its latest publication, Health Metrics Network advocates for integrated HIS as the key to health information systems strengthening (HMN 2008), repeating the call indicated by various studies, with the aim to providing comprehensive, quality and timely data for healthcare planning, monitoring and evaluation.

Having presented the history and the cause of fragmentation, the justification for the need of integration, and in consideration of the complex array of actors in the healthcare sector, we find it very helpful to discuss HIS integration from this perspective. In order to better understand this complexity, we draw on the concept of institutional dualism. Institutional dualism refers to a situation where two different institutional contexts or institutional systems come together as a result of innovations in public sector (Heeks and Santos 2009). It refers to the resulting tension between the intended new institutions and the old [often] unwanted institutions (Brinkerhoff and Goldsmith 2005). By institutions we refer to those routines comprising regulative processes, normative systems and cultural frameworks that shape information systems development and use (Scott 2008, Orlikowski and Barley 2001).

The concept of institutional dualism was initially used by Brinkerhoff and Goldsmith (2005) to discuss challenges associated with innovation in international development projects. In that article, they examine trade-offs and complementarities between what the rational agents like the World Bank which explicitly attempt to identify what is good and what is bad practice when it comes to governance. The argument, they try to build is that an explicit differentiation between the two and drawing a line to which organisations shall follow are not necessarily leading to success of any development or innovation effort. They analogise good practices to formal guidelines which the agents impose for the organisations to follow, and bad practices with informal institutions, that is, what people do informally, often mixed with rules and regulations that govern particular organisation or society. According to them however, the real power of doing things rely on the informal arrangements and networks, and how this is embodied into the formal structures (ibid). It is this power which needs to be cultivated in for successful and sustainable integration of HIS.

Extending this debate on institutional dualism in information systems development and particularly within e-government initiatives, Heeks and Santos (2009) outline a broader challenge of institutional context on implementing Information System on Public Health Budgets (SIOPS) in Brazil. In that study, they underscore the institutional dualism resulting from mismatches between what the designers perceived as rational decision to introduce the system with its power enshrined in the constitutional reforms, referred as Principal-Designers Institutional System. This is

against what they considered the system potential adopters infused with rules, norms, and values of historical traditions such as politicisation, unaccountability and centralization, referred as the Agent-Adopters Institutional System. They consider the later as informal against the formal institutions of the former. The result, as they present, is an unpredictable trajectory with various means to find solution on table. As it was the case of international development by Brinkerhoff and Goldsmith (2005), they also posit their discussion around the formal-informal dichotomy trying to draw a boundary between the two and see how this boundary can be infused as a means towards an institutionalised IS innovations. This formal-informal dichotomy is also emphasised by Sautet (2005) who provided a simple model of the relationship between the domains of formal and informal institutions portraying an overlap between the two to be ideal for the successful organizational changes and innovations, õthe greater the overlap between formal and informal institutions, organizational change will be enabled more easilyö (Piotti, Chilundo et al. 2006 p.94) pointing up to the role of existing informal constraints to successful and sustainable IS development.

The healthcare sector in developing countries overwhelmingly suffers from the multitude of stakeholdersø interests inscribed in both technology and routines, often hampering any innovation initiatives towards integrated HIS. Thus, analysing the situation from the formal-informal dichotomy might not provide broader picture of the context, and hence, we would argue for analysing the context from the third angle where we view the existing system as a proper overlay of formal-informal and how the new formal will come to find its place in the existing normalcy. The history portrays the reasons of the existence of these multiple, parallel and fragmented information systems and outlines how institutionalised those systems are, and thus the inclusion of the third level of analysis will help in unpacking the complexity underlying the integration. The actual boundary between the formal procedures and informal activities associated with these systems are difficult to draw indicating how institutionalised they are.

These systems have been used by those programmes for a long time and are part and parcel of daily life, enjoying the strength of the broader institutional context encompassing resources, politics, and power. Most healthcare staff take the systems for granted; health facility workers collect data, district managers collate the data and send to higher levels, none of them, or staff at the national level questions the usefulness of the data they collect, even for their respective level of administration. These systems entail established ranks, and ways of life, and thus enjoy legitimacy to both the designers and operators. For example, Mosse and Sahay (2003) reporting a case study from Mozambican healthcare system, identified staff actions of manual data reporting to higher levels as showing sense of responsibility because the bosses see them doing the work. In this case rationality on whether this is really needed, or at least this way is not an agenda.

In order to build a deeper understanding of the case, we extend the discussion using concepts from the theory of power, and in particular we look on how actors who control key resources and how administrative authority affect the integration process, drawing from Lukes (1974) and Foucault (1979) respectively.

3. Research Settings and Methodology

The study is based on the HIS integration project in Zanzibar, a country archipelago that is part of the United Republic of Tanzania. The nature of the united republic, gives autonomy to Zanzibar on several affairs including healthcare service provision where the Zanzibar Government is the sole authority. Zanzibar comprises two major Islands (Unguja and Pemba) along with several islets covering a total of 2,600 sq km with a population of 1,303,569[1].

Administratively, Zanzibar is divided into five regions and ten districts. Each region comprises two districts. Three regions are located in Unguja, which is bigger island and two in Pemba. Healthcare administration follows the same administrative structure at the district level, where District Health Management Team (DHMT) is responsible for all healthcare administration issues over all health facilities located in a particular district, from medical supplies to data collection. DHMTs report to Zonal Offices, where a Zonal Health Management Team (ZHMT) is responsible. Each Island, Unguja and Pemba form a zone and they both report to the National level.

Healthcare service provision is organised into three levels: primary level mainly concentrating on preventive services and basic curative services, secondary level that comprises the district hospitals, and tertiary level comprising Mnazi Mmoja Hospital, which is the main referral hospital in Zanzibar. Different programmes operating at all three levels are engaged in the provision of specialised services such as maternal and child health and some are responsible for particular diseases such as malaria, HIV/AIDS, TB and Leprosy, and have support from different donor agencies.

3.1. Research design and methods

Epistemologically, the study is drawn from interpretative strand (Walsham 1993, Walsham 2006), in order to understand the HIS integration challenges from the experience of those who are directly involved (Cavaye 1996). Interpretive research in information systems development is very useful in helping researchers understand the problem in the contextual nature (Klein and Myers 1999).

To unpack the complexity around the HIS integration project in Zanzibar, we adopted a case study, where four case units were studied and a comparison in relation to their involvement in the HIS integration is made. Case study is powerful approach in studying complex phenomena like the one presented in this study (Cavaye 1996, Baxter and Jack 2008) because it enables capturing the ‒realityø of the work in its natural context.

Data were collected using qualitative methods. This includes interviews, focus group discussions, document analysis, and participant observation counting to my role in the project implementation for the period covered in the study. My own experience of the project also contributes to the data.

A total of 21 interviews were conducted to district and programme staff. Document analysed include quarterly health reports, annual reports and data collection forms from the mainstream HIS and programme HIS. Focus group discussion was between the district, HMIS unit and programme staff who met in several HIS activities such as data collection form reviews, data use workshops, health information bulletin preparation workshop. The author has worked as a participant observer working in the daily

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[1] Tanzania Population and Household Census, 2012

assignments including software configuration, training and support and participation on the various workshops and meetings. Field notes were taken in a diary and were later typed into a computer.

Data interpretation has been driven by interpretive process. In particular, a principle of hermeneutics as outlined by Klein and Myers (1999) were followed. Throughout data collection process, initial analysis was conducted to identify areas which needed more clarification and to see if there were interesting themes rising (Pope, van-Royen et al. 2002). The process of identifying themes and relating them to the theoretical concepts of institutional dualism and power governed the whole analysis process.

4.   Zanzibar Healthcare Landscape and HIS Integration Arena

To present the HIS integration case in Zanzibar, we present four case units, each presenting one programme highlighting the programmesø roles and their involvement in the HIS integration process. The selected programmes are: Reproductive and Child Health (RCH), Zanzibar AIDS Control Programme (ZACP), Zanzibar Malaria Control Programme (ZMCP) and Expanded Programme for Immunization (EPI) and Nutrition Programme discussed in one case. Before the case presentation, a historical background of HIS is presented. Along with this, the Health Management Information Systems (HMIS) Unit is also discussed óits roles, capacity and the outcome of the process. Finally, the empirical analysis of the case is analysed with a focus on power tensions featuring the institutional dualism.

4.1. An overview of HIS development in Zanzibar

A joint survey conducted in 2004 by the World Health Organization (WHO), Danish International Development Agency (DANIDA), University of Oslo (UiO) and the Ministry of Health (MoH) revealed a highly fragmented information system largely programme-based, in the Zanzibar healthcare sector. This triggered major reforms aiming at developing integrated health information system. Health Information Systems Programme (HISP) was contracted to undertake the assignment, which was funded by DANIDA. The project scope included developing new shared data collection tools integrating the previous tools used by different programmes HIS, and installing a computer based system to facilitate effective and efficient data storage, processing and presentation. HISP introduced its globally researched and implemented software data warehouse solution called District Health Information Software (DHIS).

The development process was inclusive, where programme data managers, the HMIS Unit officials and officials from the district and zonal health management teams, hospital data managers, and doctors were involved. The design rationality was based on the concept of minimum data and indicator sets that are useful for healthcare management. Thus, rather than designing data collection tools that are programme-specific, the tools were designed in service categories (e.g. reproductive health, child health, etc.) and it was agreed that programmes should share the data collected through one integrated system that is supported by a data warehouse. The HMIS Unit was assigned the responsibility to oversee the new HIS. HISP as the consulting agency was responsible for technical facilitation for designing the data collection tools and

configuration of the data warehouse, trainings and other technical support to the HMIS unit.

The following subsections empirically describe the roles of the major actors in the in the integration process, their involvement and how power issues, largely based on resource ownership and authority contribute to the duality of institutions.

4.2. Reproductive and Child Health (RCH) Programme

RCH programme is involved in broad service provision from antenatal care, delivery and postnatal care for mothers to child health monitoring, with data and service provision interests spanning to other programmes including ZACP, ZMCP, and Nutrition. For example, the new integrated HIS has a form called ‒RCH monthly reportø whose data are supposed to be shared with ZACP and Nutrition programmes. Another shared form is ‒Maternity Ward Reportø, shared with ZACP and respective hospital administration. In both forms that seem to collect shared data, and a number of other forms which do not have apparent sharing of data, there is a number of registers used to collate data to feed to these monthly summaries.

RCH took active role in the new HIS participating in the first revision of the data collection tools that led to the integrated and shared tools. The programme also has experienced most frequent needs for form revision. The programme has experienced a change in financial support, initially being supported by the United Nations Population Fund (UNFPA), and later USAID. When USAID came onboard they brought their demands for data, hampering the whole process, which requires the tools to be revised on annual basis and be agreed by all parties. For example, new age categories for family planning clients were introduced, without taking into consideration that these data are being shared with other programmes. No justification was given by the programme, except that the new donor wanted data that way. In addition to these demand, in 2009 the programme hired a consultant to develop new registers to cater for the new data requirements, totally bypassing HMIS. As a result, data needed by different other programmes including Nutrition, ZMCP, and ZACP had to be collected from different format. This sparked lot of criticisms from those programmes and the HMIS Unit which completely rejected the idea. The RCH programme could never justify the exercise to other programmes or to HISP and HMIS Unit, but decided to bow down to the donorøs demand without even explaining to them about the existing system.

4.3. Zanzibar AIDS Control Programme (ZACP)

The effect of AIDS pandemic has drawn attention to international community. This effect is also observed in the Zanzibar HIV/AIDS control programme, from service provision to the type of data collected. This scenario is observed through the management of the disease, resources used as well as the politics behind. Number of donors providing financial and technical support to the programme at different times including Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), World Health Organization (WHO), Medicos Del Mundo.

Like RCH, ZMCP was among the early adopters of the integrated HIS, participating in the initial data collection tools design. The initial data collection tools design for ZMCP was the smoothest, where two forms were designed based on the existing two registers for recording data for Sexually Transmitted Infections (STI) and

Voluntary Counselling and Testing (VCT) were adopted. These registers were designed and supported by Medicos Del Mundo. The programme also formed the consortia to use DHIS for data capturing, processing and reporting.

Despite being part of the initial design team that also agreed on the use of DHIS, the programme diverted from the system during implementation. Health facilities submitted the monthly summaries to the districts as agreed, but in parallel, the programme maintained that data from the registers be reported and were entered their old Epi Info database, which has been used before DHIS came to place. This database was rarely updated leaving the programme with absolutely no data, since they did not trust the DHIS and at the same time failed to maintain their system. In March 2009 – three years after the integrated HIS was in place, the programme realised the danger of totally missing the data and they decided to consult HMIS Unit to find a solution for the data problems which they were facing.

In order to address the situation, the programme conducted a series of consultative meetings with stakeholders sharing data with them. In these meetings, a number of forms, some never presented before, were brought for discussion. The programme eyed to incorporate all these forms to the general HIS and without causing chaos. The exercise ended with nine forms agreed, including two forms shared with RCH. RCH cleared all issues with ZMCP, for example, forms were synchronised to have similar age groups and also the amount of data to be captured was reduced to include mainly those related to the programme's list of indicators. An interesting debate was on the redesign of HIV Counselling and Testing Monthly Report where the programme introduced new age categories (0-9 yrs, 10-14yrs, 15-24 yrs, 25-34 yrs, 35-44 yrs, 45-54 yrs, 55 yrs+) different from other forms (0-14 yrs, 14-24yrs, 25yrs+). Although all stakeholders from all other programmes agreed on the rationality of having synchronised age categories for related data, the programme managers insisted that the categories should not be changed because they are the ones required by the donors even when they cannot rationally justify. "This form is the backbone of the programme. Just leave it as it is" (ZACP officer, May 2009).

4.4. Zanzibar Malaria Control Programme (ZMCP)

For a long period malaria has been a major health problem for the Zanzibar population. Until mid 2000s malaria prevalence was recorded at 40%. The disease was the major cause of death in both adults and children. At the beginning of the millennium, efforts to contain the disease were increased. Several donors are involved in the programme support. These include President's Malaria Initiative (PMI), GFATM, WHO, Italian Cooperation and African Development Bank (ADB). These efforts have resulted into diseases downgrade to a prevalence of less than 1% in 2010 (HMIS Unit, 2010).

This success has changed the way the programme operates, from focusing on curing the disease to preventing the disease come-back, and hence changing the data needs. Thus, after 2006 when the integrated data collection and reporting system was agreed and the programme fully complied, the programme had to introduce a number of additional data collection tools, both routines and survey based tools in order to cater for the rising data needs. As part of the commitment towards the integrated HIS, the programme agreed to receive data that are only related to malaria tests, incidence and prevalence of the disease for adults, children under five years and pregnant women. Three forms are primary sources of the data: Hospital Admission Form, General Outpatient Report, and RCH Form.

However, to cater for the programmes needs, basically arising from the different donors supporting them, the programme prepared a standard report format in Microsoft Excel featuring all the routine data they needed, and were open to receive data from the integrated HIS that will be populated to their standard format. In return to this commitment, the HISP/HMIS Unit developed a gateway to transfer data from DHIS to the programme's standard format. The DHIS data source was based on the Microsoft Excel Pivot Table developed automatically by DHIS. At the time of this study, ZMCP had no alternative way of getting data from HMIS Unit except by emailing or physically sending a flash disc containing exported data from DHIS, since the DHIS version on place was desktop based. This led to unguaranteed data update to the programme, since HMIS Unit would not routinely send the data, and the Programme could only make a follow up when they are in urgent needs.

4.5. Nutrition Programme and the Expanded Programme for Immunization (EPI)

Expanded Programme for Immunization (EPI) and Nutrition are relatively smaller programmes compared to other programmes discussed earlier, though covering the same population. The Nutrition Programme is a relatively less resourced, mainly relying on the Government budget. Thus, the new integrated HIS was a fortunate to the programme, since it would get up to date data with no costs.

The EPI programme is small but well organised programme, funded only by the WHO. The absence of multiple donors makes the programme less resources but at the same time more focused especially on data requirements, contrary to the bigger programmes presented earlier. Throughout, EPI has explicitly demanded data necessary for monitoring and evaluation of their interventions as well as reporting to WHO regional office in Nairobi. This made the data collection tools for EPI the most stable since the integrated HIS was introduced. Not only was the EPI among the early adopters of the integrated HIS, but also a frontier in promoting the system and data use. Prior to the integrated HIS, the programme had a good history in proper data management, instilling this in the new HIS where the programme has always been pushing for timely data. EPI was the first programme to request the DHIS web version when it piloted in 2010.

4.6. The HMIS Unit and the upshot of HIS integration

The new HIS structure gives the HMIS Unit a leading role with responsibilities to prepare and distribute data collection tools to districts which then distribute to health facilities, ensuring proper functioning and use of DHIS at all districts, hospitals, and programmes, as well as ensuring timely data flow to the programmes. The ideal process stages for data reporting include district officers sending DHIS data exports to the HMIS Unit, the HMIS Unit updating the central data warehouse, and after doing necessary quality check, export data and distribute to individual programmes which are supposed to import into their databases. The unit is also responsible for facilitating review of the whole HIS in order to keep pace with the evolving data needs, as well as technical support to all DHIS implementing nodes, including districts, zones and programmes.

In order to perform these assignments a well-experienced and well-resourced unit is needed, contrary to the actual situation as discussed. Consequently this led

difficulties in undertaking its responsibilities and hence affecting the whole implementation process.

4.6.1. *Institutional Capacity of the HMIS Unit*

Despite the critical responsibility assigned to the HMIS Unit the unit is far outweighed by the programmes it is supposed to serve, both in terms of human and financial capacity. Almost a decade after HMIS unit was established in 2001, the unit had four skilled staff filling the positions of the head, assistant head and two information technology (IT) specialists. The rest of the staff were adopted from the then statistics unit and are only capable of performing clerical works. The two IT specialists are responsible for managing the IT infrastructure of the whole Ministry of Health. Consequently, the unit has not been in position to do the stated responsibilities, and instead had to highly rely on HISP consultants, who also have their contractual obligations which are not always aligned with what the HMIS Unit wants at that particular time. This rose the fear over reliability of getting timely data, and causing a loophole for some programmesø non-compliance.

The HMIS Unit has experienced limited financing. Since project inception, the unit has been financially supported by DANIDA only, with MoH taking care of salaries only. However, apart from data collection forms printing and workshop financing DANIDA was not covering extensively the work of the HMIS Unit, the same way it covered the districts budgets. DANIDA maintained a policy of not giving fund to purchase motor vehicles, and being the sole financier this constraining the HMIS Unit capacity on making follow-up to districts and health facilities. In 2009 the Italian Cooperation joined effort, though funding only small portion and focusing on training only. There was also budget limitation on the areas which can be funded. While the HMIS Unit experienced limited financing, the programmes, as mentioned earlier have been enjoying a substantial support from the different donors. Combining to the manpower problem this has escalated the problem of HMIS Unit on its ability to reach both the lower levels for support as well as data supply to the programmes. As a result reluctant programmes such as HIV/AIDS and RCH found reasons to justify their deviance.

4.6.2. *MoH Bureaucracy and the Position of the HMIS Unit*

Another challenge relates to the formal organisation procedures. While the unit is mandated to oversee the all HIS activities, the unit does not have any managerial authority to the zonal, district and health facility staff, who according to the HIS hierarchy are key personnel on data collection. Data are collected by health facility staff and district staff are responsible for picking up the filled in summary forms which they enter into a computer system (DHIS) at their respective districts. If any of these staff fail to do the work, the HMIS Unit does not have a mandate to take any disciplinary action against them. This power is given to Zonal offices, which are formally responsible for all districts and health facility staff. However during the HIS implementation, accidentally zones were bypassed, overemphasising the activities at the district level, partly due to pressure to deliver. When the district staff failed to work, the zonal office especially Unguja blamed the HMIS Unit for bypassing them. This is when district health officers and administrators who were trained to work for DHIS

refused to work in many districts. In those districts the staff were occupied with other programmes related activities which are financially attractive to them.

The third challenge is the centralisation-decentralisation dilemma in the HIS setup. The philosophy behind the new integrated HIS is based on integration in the sense that all stakeholders are meant to get data from a unified system, enabling data sharing among programmes and reduce work redundancy, and consequently minimise cost and improve data quality. It also advocate for decentralisation, meaning a freedom is given for all the levels to analyse and use data within their respective offices. In principle, this is well facilitated by DHIS. This decentralisation is intended to enable managers at all levels of healthcare management to use the data for the management at their respective levels.

In practice however, the envisioned data decentralisation did not take place, at least in the first years. The HMIS Unit found itself with the sole authority of distributing data to programmes, making it data ‒vertical programme'. From 2006 to 2008 all data from all districts were channelled through the HMIS Unit as the de facto standard procedure, and programmes would receive the data from them. This caused unnecessary bureaucracy delaying the data to programmes, who are the primary data users, which in turn increased their scepticism towards the new HIS.

To address the issue of data delay an alternative solution was introduced by HISP in 2009 where districts could send data to zone, HMIS unit and all programmes as an email copy to each, where the programmes will download the data export and update their databases. However, this did not work out the way it was expected. Until the end of 2009, only EPI fully supported the new data reporting standard procedure. EPI routinely updated their database analysing the data for the programme use and subsequently sending data to WHO regional office in Nairobi, which is the programme's sponsor. Second, some officers in the HMIS Unit felt the new system will undermine the unit since it will pull out its authority as the main data stakeholder. For example, in one case a senior officer at the unit dismissed data that were distributed to RCH directly by HISP consultant under the reason that the data had to go through ‒formal' channel. To them, the formal channel is to go through the HMIS Unit and shall only be distributed to programmes after the unit's approval.

5. Analysis and Discussion

The empirical case shows the institutional contexts of HIS living together. The first institutional context is the promoted integrated HIS under philosophical rationality of shared, effective and cost effective HIS. The second context is the long established vertically managed HIS reflecting the service provision system. With the rationality of shared, effective and cost effective HIS, the later is considered inept in an environment where the ministry of health struggles to improve the health and well being of the people. This scenario dubbed institutional dualism (Heeks and Santos, 2009; Brinkerhoff and Goldsmith, 2005) is the result of tensions between different actors; programmes in one side, and the HMIS Unit (accompanied with HISP) on the other side. Tensions also arise between programmes themselves. These tensions are the result of power asymmetry in resource viewpoint (Nyela and Mndeme 2010) that feature the HIS integration process.

Moreover, the logics behind the old, fragmented HIS are different from those of the newly introduced integrated HIS. In institutional terms, this is referred as institutional logics (Friedland and Alford 1991, Thornton and Ocasio 1999, Scott, Ruef et al. 2000). This is far different from integrated approach built on the logics of sector wide performance, efficiency in data collection, improved data quality, and sharing of information. Both the programme based HIS and integrated approaches are supported by both internal and external players. Thus, moving to the integrated HIS approach is the process of intermingling of these conflicting logics, and the dominant logic rise among them or as a hybrid of the conflicting logics. This process, among other factors, is highly affected and determined by power structures that feature the healthcare sector.

This emanates from power vested to the various stakeholders. This power is exercised in the day to day routines that also involve and affect the overall IS process. In attempt to contain these power tensions, system designers always need to make right choices on the decisions over õwhat to integrate, when, where and with whomö (Sahay, Monteiro et al. 2009).

While relying on one donor was effective for EPI, which escaped multiple donor requirements, this has positive and negative impacts for HMIS Unit. The negative impact comes from the inscribed donor procedures to the programme implementation. Due to the prolonged fragmented system of both service provision and data collection, staff were more obedient to programmes which provided lucrative assignments rather than ill financed HIS activities.

5.1. The logics of institutions and institutional dualism

In discussing the institutional dualism of HIS integration, it is important to identify the three groups of actors involved ódonors, programmes and the HMIS Unit. Out of the three groups, the donor and programme in one side, form an alliance in which the creation of the new institutional context óthe integration seems to interfere with what the alliance is used to. The discussion here does not aim at questioning whether the institutional arrangement of the new HIS is valid, rather to examine the duality that arise as a result of introducing the new system. With no doubt, the integrated HIS is the better way of achieving effective HIS for the sake of sector planning, monitoring and evaluation. However the achievability of the integration phenomena is an interesting discussion. Programmes are the key service providers. In a long period they also used to collect the data independently from each other, and in both cases óservice provision and data collection, they seek to legitimise the accumulation of resources. Donors, in their side use the data collected by the programmes to justify their presence and seek more support from their financiers.

5.2. Talking about power

As it was observed in other studies (Flyvbjerg, 1998), health programmes in Zanzibar also do not consider the =data for actionørationality, rather reporting and collecting data as per donorsø demand is the major driving factor, depicting how power play overpowers rationality. Two examples justifying this point were given in the case description; first, the HIV/AIDS programmeøs resistance to change age structure of the Counselling and Testing monthly report form. Here the programme officers opted to

accommodate age structures that are different from all other forms and that are not linked to any of the agreed indicators, simply because the donor wanted the forms that way and they are the principal financier of the programme. The second example is the RCH decision to accept consultation for data collection tools review which simply was done after changing the sponsor. This not only disturbed other programmes which also want to be clean to their sponsors, but also downplayed the whole HIS integration efforts. Thus, power exercised by the donor as a result of their financial contribution was a source of tension in the HIS integration efforts.

The HIS integration project depicts power interplay between the actors, in two dimensions. The dimension of resources, where the alliance of programme-donor imposes difficulty in the enactment of the new institutional context óthe integration. This dimension is more visible when different donors cause tension in the HIS design process. The case of normalising age categories for HIV/AIDS programme demonstrates this situation. Ultimately, this has an impact on the design and hence efficiency of the HIS itself. For example, the compromise made resulted into having more data element categories. Another tension is when actions by one programme interfere with other programmes. This is demonstrated by the RCH consultancy that required other programme interference on the data type categories. The second explicit power play is seen from authority dimension. Furthermore it can be seen from our case that, power derived from the resource side surpass authority.

Despite the agreement on integration and the design of the integrated data collection system, the programmesø institutional arrangements are however still in fragmented settings. This adds another level of complexity to realigning the two institutional contexts. A solution proposed to speed the data reporting and to virtually reduce bureaucracy was however technically met with resistance from the HMIS unit itself. Though, it was agreed in principle, however to some of them this was seen as threat as they would curb the power (even if little) already attained by the unit.

6. Implications

This paper empirically contributes to the discussion established by Brinkerhoff and Goldsmith (2005) and extended by Heeks and Santos (2009) on institutional dualism and particularly in HIS integration in the context of developing countries. The paper provided empirical evidences demonstrating how what is widely considered as rational can be overpowered by agendas imposed by powerful players in the contested fields, a common scenario in developing countries, where donors dictate what should be done. While the previous studies considered the institutional dualism in the form of formal-informal dichotomy, this study extended this discussion by bringing a scenario where two rationalities (both formal) compete and how power play determines which rationality prevails.

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Revisiting Participatory Design: A Critical Examination of User Participation in Participatory Information Systems Development

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Revisiting Participatory Design: A Critical Examination of User Participation in Participatory Information Systems Development

This article addresses the issue of user participation in the design of information systems. Two case studies from a project to design and develop health information system (HIS) in Zanzibar are used. The article contributes to the ongoing debate that challenges the facts and merits of user participation in   participatory design approach to systems development. The article unveils power and dominance structures as key in determining the extent of participation. The two cases are – i) designing data collection tools and ii) designing HIS guideline. The article compares and contrasts the level of participation within a hierarchical setting that comprises ordinary health workers in health facilities (data collectors), managers and donors. The cases provide three scenarios for analysis: where there is high participation, constrained and limited participation, and symbolic participation.

Keywords: user participation, health information system, developing countries, power, dominance patterns.

1. Introduction

User participation in systems design is credited by its prospect to developing quality systems as well as creating better environment that minimises user resistance to the designed system (Bjørn-Andersen and Hedberg, 1977; Bødker et al., 2000). User participation has been at the centre stage in systems design literature drawing attention to several user-centric methodologies. Participatory design (PD) is one among the methodologies that consider user participation critical throughout the whole design process. PD has one important qualification that makes it unique from other methodologies: to increase working life democracy through empowering users to participate in the design and implementation of their own technological solutions (Bjerknes and Bratteteig, 1995). In PD users and practitioners collaborate in developing future technology (Suchman, 1988; Bjerknes and Bratteteig, 1995).

In the West and especially Scandinavia where PD originates, the issue of work life democracy has been pivotal from the outset of the PD as witnessed in the Norwegian Iron and Metal Workers project (Bjerknes et al., 1987) UTOPIA and Florence projects (Bjerknes and Bratteteig, 1995). PD is a bottom-up approach where the future users of the system have always played part in the design process. It aims at increasing participation of those who are marginalised in decisions concerning themselves, addressing shortcomings of traditionally top-down approaches. PD is 'people' oriented approach, and empowers people who had limited control or influence in traditional design methodologies (Cooke and Kothari, 2001). In this context, PD challenges the existing power structures.

With growing interest to adopt PD in developing countries, the challenge remains on how it can be adapted considering the socio, economic and political context. Studies have pointed to the contextual nature of developing countries and the need for contextualizing PD to fit the environment (Puri et al., 2004; Byrne and Sahay, 2007). The Scandinavian PD is built in a strong democratic society established under the state as well as the strong trade unions backed by federal laws (Bjerknes et al., 1987; Bjerknes and Bratteteig, 1995). The challenge is how this can be replicated to an environment where democracy is still at its infancy stage and power is highly contested between internal players as well as the donor agency.

Previous debates have pointed out to participation in a context where power and dominance structures persist. Cooke and Kothari (2001) argue that proponents of PD have become naive in the complexities of power and power relations and call for the need to study power relations between facilitators and participants, and between donors and beneficiaries

(Cooke and Kothari, 2001). PD shall consider an understanding of the role of power in the design context. Focusing on developing countries, this research article contributes to this discourse and discusses two cases from a project to develop integrated health information system in Zanzibar, Tanzania. The objective of this research is to study power relations between actors involved and how PD has been exercised in the project, pointing to the contextual challenges of PD. The article extends the debate over merits of PD adoption in developing countries context with a focus on power and dominance patterns.

The article is organised as follows: in the next section, literature review on PD in IS development and its practical challenges on addressing issues of power and dominance is presented. Section 3 presents research approach and methods used. Section 4 presents the case, where individual cases are presented followed by a comparative analysis of the two cases, pointing out issues related to power and participation. In the last two sections the case is discussed in relation to the literature reviewed, followed by a concluding remark.

2. Participatory Design in IS development

PD was born in Scandinavia or the Nordic region, the first project being Norwegian Iron and Metal Workers Union in 1960s. The motive behind this project was the concern over imbalance of computing access between managers and workers (Beck, 2002). In this project and the subsequent projects the aim was to involve future users of technology in designing their own solutions (Bjerknes et al., 1987; Bjerknes and Bratteteig, 1995; Bødker et al., 2000). From the early projects till now, PD has revolutionised the way information systems are developed. Three reasons are given in support of this argument. First, it is believed that involving users in the design of their technology improves the knowledge upon which systems are built. Secondly, involving users from early stages of development enable them to develop realistic expectations as well as reducing resistance to change. Thirdly, it enhances workplace democracy by giving members of an organisation a right to participate in decisions that are likely to affect their work (Bjerknes and Bratteteig, 1995; Bødker et al., 2000).

The first two reasons mentioned above are also common in other human-centred systems development methodologies and approaches. However, the third, with particular political interest of increasing workplace democracy is specific to PD. Democracy is usually concerned in giving equal rights for people with little or no power. Workplace democracy means the right for all employees to have influence on their work situation through work

arrangements and participation in decision-making (Bjerknes and Bratteteig, 1995). It is this political agenda which makes PD unique among other systems development approaches.

Outside Scandinavia, PD was adopted in Britain, and later in the United States. In Britain the focus was on autonomy in work group organisations through power sharing, joint responsibility, and multiple leadership (Asaro, 2000). Since PD tends to challenge existing power relations, socio, economic and political situation of the context matters. In Europe (Scandinavia and Britain) the socio-political conditions were in favour of PD. In Scandinavia for example, right to decision by employees is established through trade unions, backed by federal laws (Bjerknes et al., 1987; Suchman, 1988; Bjerknes and Bratteteig, 1995). The socio political situation of work places in the United States is different from that of Europe, hence did not favour the European style PD. Instead, companies in USA used PD to improve systems development techniques through prototyping and business process reengineering in order to provide better products as well as enhancing domain knowledge for the newly developed products (Asaro, 2000; Puri, 2003).

As PD widens its domain the challenge is how to practice it in Africa and the developing world at large. Researchers have pointed out on the need to contextualise PD to suit the developing countries context (Puri et al., 2004; Byrne and Sahay, 2007). Technology design usually involves a highly political process where technical artefacts inscribe and mediates social relations, between designers and users (Winner, 1980; Latour, 1986). In developing countries, the socio, economic and political conditions make this process even more difficult due to multitude of stakeholders involved in different development projects and the interests they represent. Health information systems, for example, often tend to collect data for specific programmes that are sponsored by external donors. In turn, the data collected, the design and layout always have to reflect the interest of the supporting agency. Power between these actors is highly contested. Thus, participation by end users implies challenging power structures and dominance patterns to the people the users rely on.

2.1 Power, dominance patterns and user participation

PD addresses the shortcomings of traditionally top-down, externally-driven and expert-oriented development approaches to incorporate end users in the design process. Being 'people' oriented approach, PD insists on empowering those who otherwise would have limited control or influence. However, PD faces challenges of the participation it tends to

promote (Cooke and Kothari, 2001). At the core of PD is democratisation of design process and empowerment of users, not only to be able to effectively use the final product, but also to enhance participation amongst them (Bjerknes et al., 1987; Bjerknes and Bratteteig, 1995; Bødker et al., 2000). However, the political challenge of the actual mode and motive behind participation is debated. In the book co-edited by Bill Cooke and Uma Kothari, authors have criticised the PD on a number of issues including decision-making and control, beneficiary of decision-making outcomes, and methods of participation (Cooke and Kothari, 2001).

Looking back to the prime motive of PD –increasing work place democracy, the issue of challenging the existing power structures and dominance patterns is inevitable. Design is about politics; systems designed may result into actions that are politically determined or solved, for example, cutting jobs of certain staff. The design and implementation will often encounter political pressures that may be opposing to the system's goals (Beck, 2002). Politics deal with dominance patterns. This can be for example, making visible the marginality related to computing. The dominance patterns occur in IT and general IS design process. This is experienced between users and designers, beneficiaries and donors and between the government and development programmes (Beck, 2002). The concern, however, is on whether PD itself results into positive effect to users as it promises.

Although empowerment has been the major concern in PD, contrary to the rhetoric of empowerment, PD may be counter-intuitive to empowerment and hence acts as 'tyranny' to the people who are to be empowered (Cooke and Kothari, 2001). This is through the potential consequences of PD itself where the powerful may use participation agenda to grip their power (Asaro, 2000; Cooke and Kothari, 2001). "Tyranny is the illegitimate and/or unjust exercise of power" (Cooke and Kothari, 2001:4). Recalling the contextuality of PD Puri et al., (2004), arguments can be made on how institutional context may constrain participation process. This is because within a particular community, often bureaucracies play an important role, forcing formal and informal bureaucratic goals to be met (Mosse, 2000). Power structures and dominance patterns between facilitators and participants, and between donors and beneficiaries are complex, prompting closer scrutiny. However, proponents of participation have become naive in discussing these complexities (Cooke and Kothari, 2001).

Social structures and individual agencies also play a role in shaping the participation process. Cleaver (2000) argues that it is important to understand individuals' motivations to participation rather than basing it on rational assumptions about motives towards participation. These assumptions are usually drawn by those who introduce participation. In some cases, participation agenda based on participants' motivations can highly be different.

There is also a question of and a relationship between inclusion and subordination (Cleaver, 2000). By not understanding the intention and low capacity to participate, participatory project may in some cases result into negative effects for those who participated with the hope of getting better solutions catering for their interests as was the case in the participatory joint forest management in India (Hildyard et al., 2000).

Responding to the challenges of participation, some PD researchers argue for contextualisation of PD in developing countries, incorporating issues of culture, bureaucratic nature of the context and the use of intermediary to close the participation knowledge gap (Madon and Sahay, 2002; Puri et al., 2004; Byrne and Sahay, 2007). Responding to the well established bureaucracy of Indian system, for example, Puri et al. (2004) describes how the traditionally bottom-up PD was introduced as top down process where the process was sponsored by the government officials. They argue that this was necessary to avoid challenging the existing power structures not in favour of bottom-up initiatives, giving time for the process to be nurtured gradually. They further argue that there is no single best practice for PD. Although this may be a good strategy to reach the PD goal in such context, there is also a danger of widening the power gap between participants coming from different levels of hierarchy and reinforce interests of the already powerful (Cooke and Kothari, 2001). Participation involves wider range of issues including responsibilities, knowledge and access to resources (Jonsson, 2003), and indeed, these are the issues where power and dominance build a base.

3. Research Approach and Methods

In order to build understanding of the extent and mode of user participation, an interpretive qualitative case study was conducted. Qualitative case study can be used to explore relationships between individuals or organisations and facilitates interventions (Yin, 2003). Qualitative case study is very useful for a research that intends to answer the questions of how and why as well as exploring the contextual conditions that are important for the study (Yin, 2003). Qualitative research helps to develop deep understanding of the situation (Cavaye, 1996) that is very useful in understanding the power relations and dominance patterns that are the subject of this study. Two cases have been studied from a large project for design and development of integrated HIS in Zanzibar. According to (Stake, 1995), a case can be built based on time and activity. The two cases selected are drawn from two main activities which we find rich in studying user participation because power and dominance

patterns prevail. The two cases have been studied over time.

The first case involves design of data collection tools and is discussed as a comparison between the process to develop hospital data collection tools (forms) and the primary healthcare data collection tools. The case is presented since project inception in 2005 where major changes were made, and the annual tools revision exercise from 2006 to 2010. The author was involved in the initial design in August 2005 and the revision exercise in November 2006 and December 2009, and made close follow-ups for the exercise in December 2010. The second case presents a project component to develop HIS guidelines and is presented as two major events and a follow-up covering the same period of 2006 to 2010. The author actively participated in the first exercise to prepare the guidelines in November 2006, and had close follow-up in the second phase which was between May and August 2007.

Various data collection methods were deployed. Open interviews, observations and document analysis were employed. Discussions and meetings also contributed to the data. Having actively participated in the project, personal experience and reflection was also very useful. Total of 21 interviews were conducted to staff at health facility/hospital level, district, zone, programme and the central HMIS unit, nine were related to the first case and 12 to the second case. The interviews were conducted during the period of February – March 2011. The selection of the interviewees was based on their participation in the two project components that form our cases. The use of triangulated data collection methods helps to collect as much data as possible, compare between data collected by different methods, e.g. compare what people say and what is observed, and thus it helps to increase the validity of the results (Mathison, 1988). Data were interpreted using interpretive approaches. In particular, principles of hermeneutics (Klein and Myers, 1999) were followed. The process was governed by identifying themes related to participation in relation to power and dominance structures, and relating these to the theoretical concept (Pope et al., 2002).

4. Case Studies and Analysis

As part of health sector reform, the Zanzibar Ministry of Health through the Health Management Information System (HMIS) unit decided in November 2004 to establish an integrated health information system for the whole sector to replace the existing multiple and fragmented systems that were operated by individual health programmes. In August 2005, the Health Information System Programme (HISP) was assigned a task to undertake the design

and development of the new HIS under the contract sponsored by the Danish International Development Agency (DANIDA). HISP is a global network of research and development headed and initiated at the Department of Informatics, University of Oslo, working to develop HIS in 16 African countries and India, Bangladesh and Vietnam. HISP adopted PD in the Zanzibar project. HISP together with other stakeholders divided the task into three major areas; design the data collection tools, developing software solution for the data warehouse and training.

This study covers the first component which comprises the design process and preparation of guidelines to govern HIS activities and process. The component is presented as two distinct cases below, and later a comparative analysis of the two cases is made. The first case presents a process to design data collection tools (daily registers and tally sheets, and monthly data reporting forms) for hospitals (hereafter referred to hospital data collection tools), and lower level health facilities (hereafter referred to primary healthcare data collection tools). The second case presents a process to prepare HIS guidelines aimed to improve overall HIS operation.

4.1 The Case of Data Collection Tools Design

A major exercise to redesign data collection forms was launched in August 2005. The exercise was collaborative and inclusive, involving all stakeholders: health facility and hospital staff, district, zone and programme data managers, the central HMIS unit officers and HISP consultants (local and international). The data collection forms that were designed included registers, tally sheets and monthly summary forms for small health facilities and hospitals. Two distinct sets of tools were developed; one for hospitals and the other for small health facilities who collect data for primary healthcare only. The two sets had different hierarchical reporting channels.

Hospital data are collected at hospital wards and specialised clinics by doctors and nurses who fill in registers and tally sheets. Monthly summaries are prepared by clinic or ward in-charges and are collected by the hospital medical records/statistics unit for entry into a computer system. Later, data are electronically submitted to the central HMIS unit which distributes to programmes. Most hospital data are however used by hospitals themselves and the central HMIS unit. The hierarchy for the primary healthcare data reporting is different. Health facilities staff collects data using the registers and tally sheets and summarise them into monthly forms that are usually collected by the district officers who enter them into a

computer system. Above the district level is a long bureaucracy; zone, central HMIS unit and programmes. At different capacities, the officers and managers in the hierarchy have authority over the data, including collection, analysis and processing, and reporting. Health Programmes are the major owners of the data. This hierarchy had impact on selection of participants during the initial design process and the subsequent annual revision.

4.1.1 Designing the hospital information system

Participants in the workshops to design hospital data collection tools include hospital administrators (in-charge, hospital secretaries and matron), ward and clinic in-charges, and staff from medical records/statistics section of every hospital, HMIS officers, HISP consultants, and managers from programmes that have interest on hospital data, such as HIV/AIDS. Two issues are of particular interest for this research; the narrow gap between participants' groups, and participants' capacity to present and defend their interests through the design process.

With respect to formal organisational bureaucracy, although doctors and nurses from the hospital are direct data collection staff, they are also managers on their own and hence direct beneficiaries of the data. This small gap between the hospital staff on one side and the programme and HMIS staff on the other side facilitated inclusive discussion between all the participants. This was useful in making sure interests of every group are safe guarded.

Turning to the second point, interests of the different groups were drivers in the discussion and subsequently the overall design. Doctors' interests were on diseases. Arguments built by doctors were always to include diseases which are most important. However, this was compromised with design standards and form size which was an issue from both HMIS participants and HISP consultants. Matrons and hospital secretaries were mainly concerned with the hospital administration data like bed states, admission and discharge. Programme concern was on collecting as much data as possible for their needs. The HMIS unit, on the other hand was more interested in making sure that all the data collected meets the demographic and epidemiological standards such as gender, morbidity and mortality of the diseases.

The exercise was led by HISP and HMIS officers. After studying the existing system, draft tools were prepared and presented to stakeholders in two workshops; one organised in Unguja and one in Pemba. During discussions on the draft data collection tools, all

participant groups showed capacity to defend their interests, and the result was reflected on the final version released for use. During annual review the trend was similar.

4.1.2 Designing health facilities (primary healthcare) information system

Actors in this exercise comprised the health facility staff and district, zone, and programme managers as well as HMIS staff. The actors participated in different stages and levels. Worth noticing in this exercise is the hierarchy and difference in the level of decision making. This had an impact on the whole exercise. Like the hospital system, the exercise was facilitated by HISP and HMIS officers preparing draft set of tools after studying the existing system. The draft tools were discussed with stakeholders at two levels. First, the tools were presented for discussion to programme managers and zone and district officers. In the next level, the tools were presented to the health facility staff in meetings organised by HISP and HMIS together with district officers. In this exercise, the aim was both discussing the issue related to the tools themselves as well as training the health facility staff how to use them.

After one year of use, all stakeholders were called for discussion in the November 2006 review. In the following years however, the exercise was limited to district and zone officers together with programme managers who would discuss with HISP and HMIS officers. This was due to budget limitations. Instead, district officers were given responsibilities to train the health facility staff at their respective districts, with technical support from HISP and HMIS.

The participation gap can be clearly traced in this exercise. The decision to separate discussions during the first meetings where the health facilities staff could not directly interact with the higher managers (programmes) showed how important decisions were made in the absence of the primary users of the tools. In fact, meetings organised for the health facility staff were primarily used to for training, and concerns which they raised were answered by clarifying what the managers has stated. For example, when the health facility staff asked why some of the diseases they previously collected data for were omitted, the answer was that the diseases had low priority at the national level. This might be true, but for the health facility staff priority could be different because in some areas those diseases needed consideration due to their incidences. Exclusion of the health facility staff from later tools revision exercises also demonstrated how important stakeholders in the whole exercise were sidelined in important decision-making concerning their work. Despite the fact that data are used at different levels, the data collection tools are only used by the health facility staff;

the rest receive data in electronic form after the district officers enter them into the computer system.

4.2 The Case of HIS Guidelines

During feasibility study, it was stated that it was necessary to prepare proper guidelines in order to coordinate the whole HIS process (Cf. Sheikh, 2005). This plan was made at the outset of the project. However, a priority was to prepare data collection tools and install and configure software data warehouse for capturing and processing data. The first initiatives to develop the guidelines were implemented in November/December 2006. The World Health Organisation (WHO) sponsored the exercise. Senior consultant from WHO led the exercise. This was the first sponsorship by WHO on the new HIS. HIS was established under financial support of DANIDA, and still remains the main and only financier of the health sector which is not directly engaged in any particular health programme.

During the WHO led exercise, all important stakeholders were invited. The programme managers, doctors, hospital managers, zone and district managers, as well as HISP and HMIS officers. Before the workshop that was intended for the preparation process, a chance was given for those active stakeholders who would not be able to participate in the workshop to give their inputs. For example, one HISP senior consultant sent his inputs which served as base material for the new guidelines. These were discussed during the opening of the workshop, which lasted for one week in late November 2006.

The workshop can be considered collaborative and to a large extent inclusive since it represented all important stakeholders, except representatives of health facilities because it was not practical to bring every one, considering space and budget. The first day, workshop participants discussed structure of the guideline to be produced, chapters to be included and abstracts of the content for each chapter. Following days, participants were divided into smaller groups, each group given responsibility to prepare full content of a specific chapter. The team constitution of each group was selected based on the experiences of the participants and comprised a mix of participants from different backgrounds –doctors, public health officers, statisticians, information systems (mainly from HISP), etc. The chapters prepared by the teams were later, on the final day, discussed by the whole group and a draft guideline was produced. Due to budgetary and time concerns, the final editing was left to the HMIS officers.

These guidelines were never finalised. One reason could be the problem of time because HMIS officers are overwhelmed by several other activities and the number of skilled staff is limited. Due to the importance of the issue, this could not be let go for good. After one year of silence, DANIDA re-initiated the exercise. This time, a consultant was hired by DANIDA to undertake the exercise. Despite the fact that this consultant had been in touch with various HIS activities in Zanzibar, including the major tools design exercise and was kept informed in all developments, the consultant did not continue with the unfinished guidelines. Rather he prepared two new guidelines. The two guidelines; HMIS guidelines for health facility workers and data flow policy altogether seem to provide information that was given in the previous abandoned guideline. While content wise, the two served the purpose, the question is why were the original guidelines abandoned?

The development process of these two guidelines (sponsored by DANIDA) followed a slightly different approach compared to the first guideline sponsored by the WHO. Here, the consultant prepared full drafts which were brought for discussion. Almost the same officers who participated in the previous abandoned guidelines participated in the discussion in a workshop organised for the purpose, but this time it was a three days workshop. After the discussions, the improved draft versions were produced and the task to produce the final version was left to the consultant, who was the leader of the whole exercise. When the final version was produced it was also translated into local language, Kiswahili. During August 2007, the drafts were sent to the district offices for distribution to health facilities in order to test their use. Unfortunately, until the time of writing none of the guidelines were put into routine use.

Now, the two cases are analysed looking into similarities and differences in order to provide ground to discuss its implication to user participation.

4.3 Comparative Analysis of the Two Cases

The two cases presented have similarities and differences that are important for analysing the facts of user participation in information systems design. First, in both cases stakeholders were invited to join the discussion of the design of the tools. However the difference is the extent to the stakeholders' impact on the participation.

The data collection tools design case has clear differences between hospital and primary healthcare data collection tools. This can be explained in terms of the differences between managers and end users (data collectors). For hospitals, data collectors and managers were the same people –the doctors and nurses. In this process, there was active

participation throughout. It is reasonable to say that in this case, tool users participated in designing their tools. The story of primary healthcare data collection tools is different. Managers –district, zone and programme are not directly involved in data collection (using the tools being designed). However, when it comes to the data/information use they are the users, according to the present settings. They use the information, at least in modest sense, for health planning, monitoring and evaluation but also reporting to donor agencies. In either case, they dictate what type of data is to be collected, and hence directly affecting the design process.

There are therefore hierarchical differences between the stakeholders involved in the design of the two toolsets. This has impact on the role of participation agenda in the whole exercise. For example, despite health facility staff being involved, they were not able to argue on anything that was presented in the presence of their superiors. This is culturally deep rooted. During my previous research together with the joint HIS review team, in 2004, a senior Zone officer was the only one addressing all questions which the delegates asked the facility staff. When the delegates insisted that facility staff must answer the questions on their own, the staff echoed their boss's answers. In the follow up visit, however, the staff revealed that they were afraid to speak their mind; instead they had to speak of what their superiors want.

When asked for opinions on the whole process of data collection tools design, a health facility staff replied: *"I do not think you came to ask us to participate in the design. Nothing was considered as important input from us... [However] the training part was very good"*. Another staff went further to express their fear on suitability to discuss things openly and equally: *"Who argues with the boss, it is not our custom ... However, I appreciate that the forms are better than the previous ones"*. Most respondents had nearly similar opinions.

The HIS guidelines case adds one more level; donor influence in the design process. While the differences between the participating stakeholders are not visible in terms of how the actors actively participated, the question is the motive behind the participation especially from those who sponsored the exercise. This turns out to the money agendas. In the first phase of the exercise to prepare HIS guidelines it was very clear that the whole exercise was locally managed and coordinated. Only that WHO sponsored and a consultant from the organisation participated and led the exercise. The one day discussion prior to smaller teams works as well as and the teams works demonstrate that the guidelines were locally constructed by the people who are going to use them. This is different from the second phase,

where the consultant prepared drafts in advance and brought already prepared guidelines for discussion and subsequently passing them to be the official documents.

What went wrong with this exercise was not the approach but rather who was in-charge. The two phases of the exercise demonstrate differences in interests between the two sponsors of the exercises –WHO and DANIDA. While there is no simple answer to the question of why the first set of guidelines were abandoned for new ones, a critical analysis point to interests between donors who financed the exercises.

When approached to explain why this happened, respondents had nearly similar opinions. In an interview, one respondent replied: *"The WHO did this strategically to take advantage of the already established [HIS] work. However, the support they provided and their participation were appreciated. I wonder why those guidelines never materialised"*. Another respondent added: *"This situation is difficult to explain... It appears that DANIDA was not happy with WHO interference. You know this is very influential exercise in the whole HIS development... I remember once I was discussing with DANIDA officer who said that it appears WHO are trying to hijack the HIS"*. Responding to the question of why they participated in both exercises without any objection even to question whether they can just finalise the first version of the guidelines instead of starting a new one, the answers were: *"We did not have option... I think it is better to do what our superiors had proposed"*. *"This happens sometimes, but we only do our responsibilities"*.

5. Discussion

In this section the cases presented earlier are discussed in relation with previous works related to PD. The discussion is organised into two main themes in which contributions are made. The first theme, analyses the role of bureaucracy and social structures in shaping PD. Power and dominance patterns stemming from the existing contextual conditions are discussed. In the second theme, user diversity in HIS projects is discussed in relation to how it affects the participation process.

5.1 On power and participation

Cooke and Kothari (2001:11) assert that "participation is always constrained, and hides and at the same time perpetuates certain sets of power relations". The cases presented in this article provide a viable ground to discuss PD in this respect. The first case –the case of designing data collection tools shows how power relations stemming from the existing

bureaucracy constrained participation among lower level staff. In the first case, during data collection tools design process, separation of health facilities staff from the senior officers during the initial discussions of the draft tools sidelined the other part of tool users. Health facilities staff are the primary users of the data collection tools and the rest are secondary users since the only use associated with them is receiving data that are collected using the tools.

Although the whole process was designed to follow participatory procedures, since all important actors were involved in the exercise, though at different stages, the existing power structures and dominance patterns were very apparent early from the design process and later during tools review process. PD is based on democratic principles of design process (Bjørn-Andersen and Hedberg, 1977; Bjerknes et al., 1987; Bjerknes and Bratteteig, 1995). The separation of users groups during the design phase is against PD's democratic principles, since the process facilitated the decisions to be made by one group and the rest only symbolically participated. As the case shows, the result was a complete divergence from participation theme of design during the health facility staff sessions to that of training.

Mosse (2000) asserts that participation may be constrained by the institutional contexts expressed in bureaucratic requirements. The relationship between district managers who participated in the health facility staff training and the health facility staff shows how important the bureaucracy is in shaping PD. While the health facility staff raised concern about their exclusion, they also feel that it is not right to debate against superiors. Thus, the existing social structures that strongly draw lines between managers and subordinates inhibited participation to the extent that subordinates felt they did not have the right to equally participate and discuss the matter. The institutional contexts witnessed in the big gap within the bureaucracy constrained the participation process. It exposed the level of subordination in the participation process and consequently determined who was to be included and the extent of inclusion.

Bureaucracy was not very evident amongst participants from hospitals, neither was there a gap between data collection tools users and managers. In the absence of subordination, participation was all inclusive. The difference between the two scenarios affirms the fact that power relations vested in bureaucratic system together with culture and social structures largely determine the practice of PD and consequently determines it merits. These findings coincide with that of Cleaver (2000).

The second case reporting on activities to prepare HIS guidelines takes the issue further. While in the first case, participation was constrained by the administrative

bureaucracy that shapes the existing social structure, and hence excluding some from participation, this case unpacks the power tensions between the donors who have sponsored the project under PD cover. The case shows that participants were used to legitimise decisions made by donors who are trying to advance their own interests. In simple language, participation was used as a tool to legitimize power struggle of the two bodies. In the first instance, the WHO did a brilliant job, and participation was evident. All important actors were involved and participation was on equal basis –no subordination no exclusion. Had this exercise been successfully finalised, there would be no ground to argue about its validity.

However, the unsuccessful termination of the exercise and the launch of a new one raise concerns about the motives of participation. While participation was seen as a good strategy to developing the HIS guidelines, DANIDA followed the same participatory approach to drive the situation in their favour. The question remains as to why the previous efforts were abandoned. What is interesting is the lack of courage from the participants to question the whole process of reviving the exercise, although some of them understood that it was not the right thing.

Participation in this context seems to be questionable as in what Cooke and Kothari (2000) describes as the tyranny of decision-making and control and the tyranny of groups, where facilitators may use PD in order to override existing legitimate decision-making process, and whether group dynamics lead to participatory decisions that reinforce the interests of the already powerful (Kothari, 2000:7-8). Critically analysing, it is worth stating that the decision by DANIDA to reinvent the wheel through participatory process was aimed at overriding the collective efforts simply because if things would be allowed to continue as it started all credits would have gone to the WHO, which at some point both DANIDA and the locals believe they wanted to take advantage of what DANIDA had been invested for a long period. Looking at the history of new HIS in Zanzibar, there is no doubt that DANIDA is more powerful due to its role as the only HIS financier until when the WHO sponsored the HIS guideline project. Thus, the second phase of the HIS guidelines outlines how DANIDA as the participatory organiser used the participants to both override the previous decisions and to grip the power they have on the whole HIS exercise through PD.

5.2 Redefining user in the contexts of participation

The analysis of the two cases presented shows the differences in level of participation between the two cases and within the individual cases. The data collection tools design case

reveals the differences between the process of designing hospital tools and primary healthcare tools. This difference is apparent in the groups and level of participation based on the existing hierarchy. Participants from hospitals comprise the core data collectors as well as users. Users here are both the users of the data collection tools as well as the end users of the collected data. Although considered as one of the HIS problem in developing countries (Lippeveld, 2001), collecting data for health management is usually characterised by a separation of data collectors and users. While, it is not the intention of this article to argue whether this process is bad, the purpose is to highlight how much effect it has on the HIS design even when promising approaches like PD are applied.

The effect of separation of data collectors and data users was apparent in the process to design data collection tools for the primary healthcare data. In the beginning, the meetings to discuss the draft tools were separated between the top managers (district, zone, programmes and national) and those for health facility workers that were attended by district officers and HISP and HMIS organisers. The nature of the discussions was also different. While debates at the top managers meetings were focused on how to improve the draft tools, the meetings with the health facility staff were more like training rather than discussing the tools. Thus, this situation requires a closer look and rethinking on what we mean by user when it comes to PD.

The definition of the user in this case requires clear description of what the user is entitled to with regard to the tool that is designed. In this case, the user can be defined as those who directly interact with the new tools and those who benefit from the use of those tools. If the beneficiaries overpower the direct users, the risk is that only some aspects may be considered important. To the health managers who participated in the design exercise the main concern was the content rather than the layout. With layout playing important part in tools usability those who are directly interacting with them must fully participate. Even when looking at the content, health facility staff are the first contact to the patients and health clients. This implies they are the immediate health managers when the healthcare beneficiaries (the community) are concerned. Thus, what matters to them may be of great importance to managing and hence improving the health and well being of the community. The case of primary healthcare data collection tools design did not reflect the importance of health facility staff.

This again necessitates the need to contextualise PD. The arguments to contextualise PD are not new. Earlier, Puri et al. (2004) argued on the contextual nature of PD indicating that their is not singular algorithmic approach to PD. The contextuality, in this perspective, is

on the definition of the user as we see in PD. In Scandinavia the user was defined as the one

who is directly going to use the tool and who will be directly affected by that tool. For

example, this was the case in the Norwegian Iron and Metal Workers project (Bjerknes et al.,

1987), UTOPIA and Florence projects (Bjerknes and Bratteteig, 1995). However, the

situation in HIS development in developing countries is different. This means the user

depends on the type and nature of tools to be developed and the complexity of PD process is

determined by that nature.

   The argument for extending the definition of users was also made by Byrne and

Sahay (2007) when presenting case for developing community HIS in South Africa. In this

case, they outline the importance of incorporating those who are going to be affected by the

data collected, that is, the community members. In this research, however, the attention is to

highlight the possible negligence to bypass those who are directly interacting with the tools in

favour of those who dictate the use of the tools. This brings back power arguments discussed

above.

6. Conclusion

This article is not a mere critique of PD rather it continues a debate on the facts and merits of

PD especially in the developing countries context. Using two case studies in the project to

develop integrated HIS in Zanzibar, Tanzania, the article highlights some of the PD

challenges in developing countries especially in the context where power and dominance

patterns resulting from the existing socio, economic and political establishments, exists.

   In the two cases –case of designing data collection tools and case for designing HIS

guidelines, this article has compared and contrasted the level of participation within a

hierarchical setting that comprises ordinary health workers in health facilities (data

collectors), managers and donors. The two cases provided three scenarios for analysis: First,

in the design of hospital data collection tools, where data collectors are also data users,

participation was at high level. Second, in the design of primary healthcare data collection

tools, where data collectors and data users (managers) are different, participation was

constrained and limited only to data users and left the actual users of the data collection tools.

Third, in the case for preparation of HIS guideline, interests between donors made

participation largely symbolic.

   Two lessons are revealed. First, the role of hierarchy and dominance patterns in

determining and shaping the participatory process. As the cases demonstrate, PD can be

constrained by the existing social structures that host the power imbalances between the actors to the extent the powerful speaks and acts on behalf of the less powerful. This has been observed in both cases. In the data collection tools design case PD followed the existing dominant patterns. The HIS guidelines case, power struggle between the donors turned the well organised PD into symbolic exercise. Second, the study points out to the need to reconceptualise user when referred to PD. The first case demonstrates that for the design and development of management HIS, especially in the developing countries context, users of the tools and users of the tool's product may be different. PD facilitators need to consider this situation without overlooking the constraints that may rise when attempting to incorporating the real end users of the design product.

This study focused on the developing countries context, pointing to the unique context of multitude of stakeholders. However, its lessons are applicable to all IS development contexts, since power resides in any societal constitution, which all typical organisations are.

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Exploring the Power of Technology in the Institutionalization of Health Information Systems: An Actor-Network Analysis of Information Systems Integration

Yahya Hamad Sheikh and Edwin Nyella

Abstract:

Information systems (IS) integration is a complicated exercise. This comes from the fact that IS integration is not a mere technical exercise rather is a complex socio-technical process of aligning not only the technologies but also routines associated with those technologies. Through three case studies drawn from healthcare sector in developing countries settings, this article compares and contrasts the process of integration where the importance of deploying proper technology in line with right regulations is highlighted. The concepts of inscription and alignment from actor-network theory are utilized to discuss the HIS implementation process, whereby the article describes HIS integration as a *combinatory* actor network building process that need to consider the nature of the technological artifact, and the manner in which it is implemented, coupled with the policy and guidelines which inscribe and prescribe the use of the system.

Keywords: integration, power, health information systems, actor-network-theory, inscriptions, alignment.

1. Introduction

As part of development efforts, developing countries are engaged in the process to alleviate healthcare status of their populations. Development partners, both bilateral and multilateral are highly involved, considering the economic status of the countries which prove difficult for them to catch up with the existing and emerging healthcare needs primarily caused by high disease burdens but also the capacity to provide basic primary healthcare aimed for disease prevention and improving the well being of the people. Donors usually organise their support in the mode of 'vertical' health programmes specialising in a particular disease or service. Ultimately, the programmes devised the way to ensure proper accountability of the resources they provide. In this way, information systems (IS) were designed to provide tools for monitoring and evaluation of resources and impacts of the programme initiatives on particular diseases or health services. In turn this resulted into fragmented IS serving the healthcare sector, and its impact is viewed in both the quality of data collected as well as staff overloading (Mosse and Sahay, 2003, Sheikh, 2005). By focusing on specific programmes, the fragmented IS failed to address the sector-wide information requirements.

To address this condition of ineffective IS, countries have invested in projects to develop integrated health information systems (HIS) aimed at providing comprehensive and shared data that serve the whole sector. The initiatives are sponsored by individual countries supported by donor agencies, often the one involved in healthcare provision. The health metrics network (HMN) outlines the

integrated approach to data warehousing as an alternative to providing comprehensive sector-wide data (HMN 2008). Despite these initiatives, integration has proved to be a challenging process, and hence receiving attention to IS research community. While some research has focused on the technological issues such as challenges of legacy systems, others are more concerned on organisational aspects of integration. This is mainly based on what rise as the enduring challenge in the concerned projects.

In this article, we formulate a discussion on the organisational aspects of IS integration. The context of the study is Tanzania, a developing country in which donors play a major role supporting healthcare service provision and hence have had myriad influence on the HIS integration exercise. Empirically, our discussion is based on three case studies drawn from two healthcare organisations (Tanzania Ministry of Health and Zanzibar Ministry of Health[1]). The two healthcare organisations has taken measures to integrated various HIS supporting individual programmes and have used district health information software (DHIS) to capture and process data for the sector wide information system. The discussion is centred on the challenges of coordination between stakeholders involved in HIS integration project.

Theoretically the discussion is based on actor-network theory (ANT) which is used to describe the socio-technical configuration of the HIS /integration exercise. In particular, the concepts of inscription and alignment are used. The empirical material is construed towards understanding power relations between actors involved and how this affects the coordination of integration routines between the actors in order to achieve the goals of HIS integration. The pivotal point of the discussion is the role of artefacts (software and regulations) in facilitating this coordination.

The article is organised as follows. Following this introduction, a theoretical foundation is build based on actor network theory concepts of inscription and alignment and the role of power. A section on research methods follows, followed by the presentation of the cases. The case description is followed by the discussion linking the cases with the theoretical arguments presented earlier. The last section presents the concluding remarks.

2. Actor Network Theory – The Dynamics of Power

Actor network theory (ANT) originated from the field of science and technology studies (STS). Rooted on the study of micro-processes of the way science is actually done and the way technological artefacts are actually designed, ANT is generally concerned to research how actors do what they actually do (Callon 1987). It does this by studying the mechanics of power as actors develop them as they construct and maintain actor network (Tatnall and Gilding 1999). The network is constituted by both human and non-human actors forming a heterogeneous actor-network. Thus, ANT focuses on tracing transformations of heterogeneous networks which includes how they are constituted, how they emerge and come to being, how they are maintained, how they compete with other networks, and how they are extended in space and time.

ANT rejects the control of social actors' mastery of technology. Instead of intentionality and consciousness perceived as source of power, the focus in ANT is on the organizing powers of combinations or on the effects of an association (Latour 1986). The focus is on what is being generated by virtue of an arrangement, rather than speculation on the intrinsic qualities of different

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[1] Organisational setup of healthcare system is outlined in section 3 – research context

constituent actors. Thus power is not something exercised between two or more combatants or adversaries divided over some issue, one to the other. Rather, power is more a question of ongoing and active structuring of the possible field of action of others, and is always open to resistance, transformation and renegotiation. Those who are powerful are not those who '*hold*' power but those who are able to enrol, convince and align others into associations allowing these initial actors to '*represent*' all the others.

Thus to understand power one need to examine how collective actions come about or how actors come to be associated, and how they work in unison (Murdoch and Marsden 1995). This is captured very well using the concept of inscription and materials/resources for inscriptions. Inscription refers to the way material resources embody interests meant for structuring possible actions of others. It can also be defined as a process of creating technical artifacts such as software artifacts (for example DHIS in our case), policy and guideline documents etc, that would ensure the protection and achievement of an actor's interests (Latour 1992). According to Murdoch and Marsden (1995), resources play an important role for accumulating power, as they put on:

> If power 'lies' anywhere it is in the resources used to strengthen the bonds … and we need to analyse how these resources are defined and linked and how actors impose definitions and linkages upon others. To be successful, an actor must 'colonise' the worlds of others. (Murdoch and Marsden 1995, p372)

In terms of technological artefacts, Akrich argues:

> Designers (…) define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object. I will call the end product of this work a "script" or a "scenario." (Akrich 1992, p208).

The inscribed scenarios of action define roles to be played by users and the system. Thus, by inscribing a scenario of actions into a piece of technology, the technology becomes an actor imposing its inscribed program of action on its users (Akrich 1992). However, inscriptions vary; some structure the pattern of uses strongly, others weakly. The strength of inscriptions, whether they must be followed or can be avoided, depends on the irreversibility of the actor-network they are inscribed into (Monteiro, 2000).

Chawani et al. (2014) used the concept of inscription to analyze the challenges of inscribing standardized protocols in an Electronic Medical Record (EMR), whilst taking into account local work practices. The authors argued for the need to implement weak inscriptions of the protocols in some cases and strong inscriptions in other cases as a strategy to address the challenges.

Conversely, Sigurdardottir (2009) used the notion of inscription device to discuss how use cases in a requirements specification for a digital health care information system are used as a frame of reference for how specific clinical work processes are carried out in 14 Danish hospitals. The author argued that use cases share common characteristics with inscription devices, because they translate complex organizational situations - the clinical work processes, rules on reimbursement, professional boundaries, clinical standards, accreditation standard etc. - into agreed representations.

Furthermore, in the study of Electronic Patient Record (EPR) implementation in Norway, Erna and Line (2010) looked at how elements of discipline and control are inscribed in the EPR technologies, as

it is experienced by health personnel. As the EPR technologies are perceived and used by health personnel, prescribe discipline and control regarding documentation of patient information, use of time, access to information, and the relations between different professions.

3. Research Context

The research setting is the United Republic of Tanzania, a low income country. It is the largest country in East Africa, occupying an area of about 945,087 sq. km, and has common border with 8 neighbouring countries. Tanzania is formed by the union of Tanganyika (now referred as Tanzania Mainland) and Zanzibar. The union government is composed by two organs vested with administrative authority, the government of the United Republic of Tanzania and the Revolutionary Government of Zanzibar. Thus, matters that fall under the union are clearly defined and handled by both parties under the Union Government. Other matters such as healthcare are not part of the union. In addition to the union matters, the union government deals with Mainland part for non union matters, since the Mainland does not have her own government, and the Zanzibar government deals with issues related to Zanzibar. Thus, in this article, unless stated otherwise, the Ministry of Health Tanzania means the one responsible for Mainland Tanzania, and the Ministry of Health Zanzibar means the one that is responsible for Zanzibar. Although created as independent bodies, there are extensive collaborations between the two healthcare ministries. Specifically, the empirical basis for this research is based on efforts to integrate routine HIS in the two healthcare ministries, Mainland and Zanzibar.

4. Research Methodology

The study draws on an interpretive epistemology. Interpretive researchers attempt to understand phenomena through assessing meanings that people ascribe to them (Klein and Myers 1999; Walsham 1993). As interpretive researchers, our study relies on participant observation and interviews with healthcare organizational members, and uses qualitative analysis to interpret the HIS integration process. Walsham (1993) argues that interpretive researchers often use an underlying theory as sensitizing device for collecting and analyzing research data.

The study employed ANT concepts to guide the data collection, analysis and reporting. Both formal and informal interviews were carried out to different actors ranging from the Ministry of Health and implementing partners' officials, regional and district HIS staff, to DHIS technical staff. The interview questions at the national and regional levels focused on the need to understand the availability and use of HIS policy and guidelines, data flows from the sites and whether its accessibility, and coordination of the partners engaging in the implementation process. At the district level, the focus was on the need to know the data capture and submission status, challenges faced in using the new system, and the kind of technical support provided to them etc. Conversely, the focus for the implementing partners' interviews for the was on understanding the scope of their implementation in terms of the data sets, number of districts/regions covered and whether there was a plan to scale up the implementation to other districts/regions. Table 1, shown the number of interviews, formal and informal, conducted.

Authors of this paper have worked with HISP in Tanzania (both Mainland and Zanzibar) since 2005. As participatory observers we have worked with different implementing partners in Tanzania Mainland such as the Clinton Foundation in Mtwara and Lindi, Ifakara Health Institute in 27 districts scattered in all the regions in Tanzania, Japan International Cooperation Agency (JICA) working in Coast region,

and Elizabeth Glaser Paediatric AIDS Foundation (EGPAF) working in Arusha region. In Zanzibar, we have worked at the Health Management Information System Unit (HMIS Unit), and hence working with all major players including healthcare programmes and the direct HIS sponsors such as Danish International Development Agency (DANIDA), World Health Organisation (WHO) and Italian Foundation. The activities embarked on included installation of DHIS in the sites, training, and supporting use of the system for a period of time, as well as the development of data collection tools and HIS guidelines (in Zanzibar). This gave the authors, opportunity to get firsthand experience and learn the challenges in dealing with multiple implementing partners. Moreover, a number of documents were reviewed ranging from DHIS implementers' progress reports, Health sector strategic plan III, to summarized meetings and workshops reports. Furthermore, authors attended a number of workshops, meetings and training programs organized by the Ministry of Health (both in Mainland and in Zanzibar) and sometimes by the implementing partners.

Table 1: Interviews conducted

Informants	Number Interviews
National level staff	9
Regional/Zonal staff	5
District staff	7
DHIS technical staff	5
Implementing partners	6
Total Number of Informants	**32**

5. Case Description and Analysis

Three cases are presented and are compared to how technology and institutional procedures around the technology affect the coordination of the integrated HIS. In the first case, we present Zanzibar project from the period 2006 – 2009 where DHIS 1.4 has been used. In the second phase, we present the same project through the process of technology migration from DHIS 1.4 to DHIS 2. In the third case we present project implementation in Tanzania Mainland where DHIS 2 is also used. A comparative analysis of the three cases is later presented.

DHIS 1.4 is freely distributed software with open access to the code. The software is built on Microsoft Access for both front-end and back end. It enjoys a modular architecture and the separation of back end and front end makes it possible for one site to deploy different data files by switching between databases. DHIS 1.4 is a desktop application and its deployment is based on installations at implementation sites. Reporting from one level to another is based on file export (xml or coma delimited txt files) that will be imported into DHIS installed at that site. Data are transferred by emails or physically by exchanging flash disks storing the exported file.

DHIS 2 is platform independent, java based application. It can be installed in a web server or local machine. It can be configured to run in a standalone or online mode, by making use of supporting infrastructures such as local area network or the Internet. DHIS 2 is built in the same logics as DHIS 1.4 but is built in more sophisticated technologies. At the back end it uses PostgreSQL or MySQL, both free database management systems. It also deploys built in geographical information system (GIS) component based on the open source technologies and has a mobile component.

Both DHIS1.4 and DHIS 2 are products of global network of research and development based at the University of Oslo called Health Information System Programme (HISP). HISP aims to develop proper health information system that support data needs for healthcare departments in the developing countries. HISP initiatives in Tanzania Mainland dates back to 2003 while in Zanzibar started in 2005. The project implementation presented in this paper falls under HISP initiatives.

5.1 DHIS 1.4 implementation in Zanzibar

DHIS 1.4 was adopted as the National standard from January 2006 and data from hospitals and primary healthcare units/centres were reported trough two databases, with the master databases located at the HMIS unit. Despite some improvements in data collection as compared to the period prior to the integrated HIS, there were noticed some problems that could jeopardise the future of HIS. These include, delay in reporting and hence reducing trust from the programmes, data inconsistency caused by parallel reporting of some data that had to be reported in both systems, and more general the imbalance in the structure of HIS reporting among the stakeholders. Details are presented in Sheikh (2010). As solution to minimise delays and also improve programmes' accountability on data, which could improve quality, an alternative reporting scheme was suggested. In this scheme, the plan was to utilise the existing resources to improve efficiency in the reporting scheme. Since districts usually use email to transmit data to HMIS unit, it was proposed that the districts shall also copy programmes and zones while emailing the HMIS unit. Virtually, this would reduce the reporting hierarchy.

This solution however, met some difficulties. First, reliance of people to export and import data did not necessarily cut the bureaucracy. While the districts would often send the data directly to the programmes as an email copy of the HMIS unit, most programmes did not show good response to effectively benefit from the new procedure. With the exception of Expanded Programme for Immunization (EPI), Zanzibar Malaria Control Programme (ZMCP) tried the first few months and later the programme turned back to HMIS unit asking for data. The Zanzibar AIDS Control Programme (ZACP) and Reproductive and Child Health (RCH) programmes never bought the idea. Despite the fact that they usually received the emails they never updated their databases. RCH continued to request data from HMIS unit, though on irregular basis. Surprisingly ZACP designed new tools apart from the mainstream HIS tools and distributed to the health facilities. The health facilities never used the tools designed by the programme, and hence the programme missed data for the whole 2009 and 2010.

While the programmes did not fully buy the idea, on the other hand not everyone in the HMIS unit were also happy with idea of parallel reporting. Some, especially non technical personnel still believed that the right reporting mechanism is through the HMIS unit, and the programmes must get data from the unit. For example, in one occasion, RCH programme requested data from HMIS unit and HISP staff supplied the data to the programme, when these data were presented in a meeting, a senior officer from HMIS unit claimed that the data were not official insisting that they must be approved before being distributed to programmes.

Following these constraints, HIS implementation team comprising both HISP and HMIS staff discussed the potentials for using DHIS 2 which was well tested in other HISP implementation countries. The need to upgrade to DHIS 2 was highlighted in technical limitations of DHIS 1.4, the problem of version management, and the bureaucratic reporting procedures that caused data delay. This delay had impact on data quality as the programmes could not give timely feedback, and also on the programmes reporting requirements to donors.

5.2 DHIS 2 implementation in Zanzibar

DHIS 2 implementation started in April 2010, first aimed to be pilot project for the whole 2010 and subsequently implemented as the national standard upon successful test. During this transition period DHIS 2 ran in parallel with DHIS 1.4, and the data entry clerks were entering data twice. First, they had to enter data into DHIS 1.4, which was the official data reporting system and later enter the same data into DHIS 2. The purpose of the double data entry was to expose users to the software in order to give them enough experience, at the same time the technical team (local HISP) used feedback as the way to enhance the software as well as learning user perceptions towards the new system. The data entry clerks were paid for the extra work in order to motivate them towards the new software. In January 2011, DHIS 1.4 was phased out and DHIS 2 took over as the national standard.

Contrary to setup in DHIS 1.4 where there were two separate databases, one for hospital and one for primary healthcare data, in DHIS 2 only one database was configured containing datasets for both hospital and primary healthcare data. The database is installed at the central web server located at the HMIS office. Districts and hospitals access the data warehouse to directly enter data from their locations. Zone and programmes can easily access the data once entered. All districts, hospitals, zone and programmes are connected to the internet.

The process of software development and implementation can be described in terms of both technical and political processes that were aimed at addressing the problems that HIS faced during the DHIS 1.4 period. Technically the software was aimed at improving data access through the use of web technologies, seamless integration between hospital data and primary healthcare data, improved version management, and improved feedback mechanism.

On the political and administrative aspects, the software was implemented to solve the problem of reporting where despite the change in reporting procedures that were proposed after the originally planned and implemented reporting scheme failed to improve the HIS especially on timely reporting. With timely reporting and direct access of the data DHIS 2 was aimed to facilitate immediate data analysis by programmes and hence speed up feedback, and subsequently improve data quality. The programmes will also be able to report to their donors in timely manner. Below, we present response of some selected programmes on the implementation of DHIS 2.

Immunization: DHIS 2 has been used as official data reporting system replacing DHIS 1.4 for just a half a year, from January 2011. However, the Expanded Programme for Immunization (EPI) decided to use DHIS 2 for the year 2010 instead of DHIS 1.4, though it was in the piloting stage.

Responding to the question of how they compare DHIS 2 with DHIS 1.4 in relation to improving their activities, managers from EPI were optimistic:

> *"We are supposed to report to Nairobi regional office not later than 10th of each month. Usually we report any amount of data we have and later update them. The regional office evaluation is based on the day we made our first reporting and then how quick we update the data. The availability of data online really helps to this. For example, last year (2010) we effectively used the system and we have reasonably improved timeliness. We have realised that most districts start data entry earlier than we thought, and thus, we can report earlier too"*

ZMCP: With special interests covering wider range of activities, Malaria programme has diversity in type of data collected, from disease surveillance and monitoring mortality, to recording number of households covered in indoor residual spraying and recording number of treated bed nets. With this respect, the programme agreed from the beginning that they will collect data from HMIS unit for disease surveillance, monitoring pregnant mothers against the disease, and hospital admissions and deaths. The rest of the data shall be collected by the programme itself through different tools. This means much of the data are collected by the programme itself.

Moreover, the programme does not usually use the data from the mainstream HIS on monthly basis. In the past, the programme seemed to request data on ad hoc manner and thus when the parallel reporting of data using DHIS 1.4 was introduced it did not help them much since the programme officers would usually neglect the emails that consist of the export files and hence often ended with asking back to HMIS unit when they needed data. Often, this caused pressure to HMIS unit and also led to a situation when they could not be guaranteed the data as the HMIS unit officers might be busy with other activities. Thus with DHIS 2, the data is always in the server and the programme can access them anytime they want. A manager from Malaria programme added:

> "*Having the data online makes things easier. You know we have a plenty of data from different systems covering different and we do not always rely on the data from HMIS only. However, when we need data it is usually urgent, sometimes we may be asked for reports by donors and we must call you. This does not guarantee fast response. Now we do not need to worry, as long the server is up we get data without contacting you*".

ZACP: Since the new HIS was put into use in late 2005, the programme was in a continuous swing between using the mainstream HIS and using their own system which have been in continuous changes. There are many reasons, which are beyond the discussion on this article, but what is interesting for this paper is how the agreed reporting procedures along with the installed software (DHIS 1.4) could not be institutionalised into the programme's reporting scheme and how DHIS 2 could find its way in the programme's sphere.

In 2009, for almost two years, HMIS unit officers and HISP staff were in negotiation to re-harmonise the data collection tools for the programme after the programme stopped using the mainstream HIS tools. After the new tools were designed (with inputs from both the old tools and the tools introduced by the programme), the development team managed to convince the programme to use the mainstream HIS (as redesigned) with a promise of implementing an online database solution. This, the arguments were made, will help to minimise the programme's reliance on HMIS unit for data reporting. Despite the fact that the programme did not have firm reasons to switch to their own data collection tools, DHIS 2 was used as a tool to clear any doubt they had on the possibility of data delays.

Three months after DHIS 2 was used as national standard, officers in charge of data at ZACP expressed their hope in the new system.

> "*This is promising, when you have all the data available online there are reasons to believe that we are guaranteed with our data. Previously this was not the case*"

> "*I like the fact that all data are stored in the same database. Our data are collected from a range of sources from antenatal clinic, VCT [voluntary counselling and testing], STI [sexually transmitted infections] clinics, maternity ward and CTC [care and treatment centre]. When*

you have different sources captured in different databases makes it difficult for us. But now everything is in one database, including home based care"

"I like the comprehensiveness of collecting PMTCT data, the forms collect almost every data we need and we easily access all the data"

Health Management Information System (HMIS) Unit: With its role as in charge of coordinating and facilitating availability of data to all stakeholders, HMIS unit maintains the data warehouse located at its office. Interesting in DHIS 2 is the balance between maintaining and coordinating the data warehouse. In DHIS 2 era, the unit is mainly responsible for ensuring the central server is up and running, the database is in good condition and the districts and hospitals enter data regularly and are provided with technical support.

Although a consensus was reached on the decision to use DHIS 2, some reservations are still there and doubts are still to be cleared among non technical officers of HMIS unit. While the technical team (from HMIS and HISP) use the agenda to solve both the technical problems and implementation hurdles, the non technical seem to be sceptical about the solution, apparently due to technological fear, but also a fear that the new procedure would reduce the authority of HMIS unit. An administrator at HMIS Unit added:

> *"The good thing with the new system [DHIS 2] is that I can access data any time and I do not need the technical people to load my laptop with data when updates are made. However, I am really concerned with security. I do not believe hackers will not intrude into our data... Another question is who is in-charge? If everybody will access data before we conduct quality check, how can they use the data?"*

While the argument of quality checks makes sense, this has not been the case. The HMIS unit have always been busy with a lot of activities and the quality check is usually done once a year during data cleaning workshop, prior to preparation for annual health bulletin. Moreover, the HMIS capacity is limited as compared to that of programmes. Thus, ensuring programmes get data on the right may be a catalyst for quality check and feedback to districts and hospitals, and hence improving the quality of data.

5.3 DHIS 2 Implementation in Tanzania Mainland

The current routine HIS in Tanzania Mainland was conceptualized in the 1990s through external consultants with support from DANIDA. The system consisted of paper based data collection tools at health facility and district level and computer based system at the regional and national level. However, a number of studies described the system as dysfunctional and inflexible (Mwangu 2003). Such inflexibilities led to difficulties in absorbing changes and new requirements from different health programs and healthcare services.

In an attempt to resolve the HIS challenges, a pilot action research study was conducted in 2002 by HISP team in two districts (Kibaha and Bagamoyo) located in Pwani Region (Lungo 2003). Implementation of DHIS 1.3, which was later upgraded to DHIS 1.4 in the year 2005, was done as part of the pilot study. The software was installed at district level, where paper reports from all health facilities were captured in a monthly and quarterly basis, depending on the reporting frequency of a particular data set. As a result, the software was demonstrated as flexible and capable to handle multiple programs and data sets in an integrated manner. However, it took almost five years period of intensive translation processes involving negotiations and discussions with the Ministry of Health

officials, before the software could be endorsed as a standard for countrywide implementation in 2007 (Nguyen and Nyella 2010).

However, a number actors working with various healthcare programs used their resources to review and standardize their paper based data collection tools, and were in search for an electronic artefact for data processing and management. For instance, National AIDS Control Programme (NACP) supported by the Japanese International Cooperation Agency (JICA) revised paper-based recording and reporting tools for Sexually Transmitted Infections (STI) and Voluntary Counselling and Testing (VCT) services. The actors then approached the Ministry of Health and the HISP team, requesting implementation of DHIS in one region –Pwani. Following the approval, HISP team advised the Ministry and NACP/JICA to use current version of the software - DHIS 2. With the capacity to be used as web solution or standalone, an agreement was made to implement DHIS2 as standalone. Customization of the software was effected where STI and VCT paper-based tools were implemented in the database and rolled out into all six districts in Pwani Region, including regional offices. Data entry is done at the district level and an export file is transmitted to the region where it is imported into the regional DHIS2.

Results from STI and VCT implementations spurred other actors working with different initiatives in the same region to support implementation of other data sets. Supported by the WHO, the national PMTCT program revised their paper tools including registers and monthly summary tools in 2008. In need of an electronic tool for computerizing the summary reports, the national PMTCT officers attended a stakeholders meeting where DHIS2 with the results from the Pwani Region were presented. Among other things the partners learned the capacity of DHIS2 and that it had been endorsed as a national standard. Promptly, a decision was made to implement PMTCT summary tools using DHIS2 within the Pwani Region. By July 2009, all the new PMTCT data sets were codified in DHIS2 and rolled out into all the six districts in the Pwani region. The Norwegian Agency for Development (NORAD) supporting child and maternal health program, provided funds to implement the rest of the data sets using DHIS2 within the Pwani Region.

5.3.1 DHIS2 Enrols other Actors to the Network

Other actors working with different initiatives in various sites using their resources negotiated their way into DHIS2 implementation. For instance Clinton Health Access Initiative (CHAI) has been collaborating with the MoHSW since 2005, to expand access to HIV/AIDS care and treatment in Mtwara and Lindi. In need of a monitoring and evaluation tool CHAI approached the Ministry of Health and the HISP team requesting to implement DHIS2 in the two regions. An agreement was reached to implement DHIS2 in two regions including all data sets implemented in the Pwani Region. By October 2009 DHIS2 training was conducted by the HISP team, followed by installation of the software into all districts and the regional level, both in Mtwara and Lindi. CHAI hired one personnel who was trained on DHIS2 as a super user to provide technical support to the districts and the regional levels.

> *"CHAI provides regular supportive supervision to the districts and the regions. This involves solving problems encountered during use of DHIS"* (Technical personnel, June 2011).

However, due to ICT related problems CHAI contracted a company to provide regular ICT support to both Mtwara and Lindi regions in terms of computer repair and maintenance (hardware and software).

Another actor which drew on their resources and implemented DHIS2 to provide informational support to their programmatic decisions is Elizabeth Glaser Paediatric AIDS Foundation (EGPAF). Among other things EGPAF focuses on expanding the provision of comprehensive PMTCT services and improving access to HIV care and treatment. Arusha is one of the regions where the PMTCT services are supported by the foundation. In January 2010, EGPAF through the HISP team implemented DHIS2 in all districts in Arusha including the regional level. However, the NGO was ready to support only PMTCT data sets. The implementation process included training and installation of the software in all the districts and including the regional level. EGPAF hired one ICT officer who also received DHIS training in order to provide support to the districts and the regional level.

However, some other actors run DHIS2 implementation not just as way to get information support for programmatic decision making but as a separate project with earmarked resources such as funds, and human resources. Ifakara Health Institute (IHI) is a research and training non-governmental institution. In 2010 IHI launched a health research project called Sentinel Panel of Districts (SPD) in 27 districts of Tanzania Mainland, aiming at improving availability of data. According to the IHI official, the project dwell on facility based information and population based demographic and mortality data in all the districts. The project has received support for five years and will provide annual, age, sex and cause-specific mortality estimates from a population of about 25,000 to 30,000 in a sample of 27 districts.

IHI approached the HISP team upon being sanctioned by the Ministry of Health, to implement DHIS2 in 27 districts. The implementation included training of data clerks and CHMT members, and installation of DHIS2 in all 27 districts. IHI recruited one information officer in each district, to do data entry, to follow up reports from the health facilities which have not yet reported and to perform data analysis and transmission to the central IHI offices. IHI maintains a DHIS2 server, where export files from the districts are imported. Moreover, IHI recruited one ICT personnel who was later trained as a super user on DHIS2 to provide recurrent support and maintenance of the district DHIS2 installations.

5.3.2 DHIS 2 Coordination challenges

To ensure a functioning DHIS 2 in every district the DHIS 2 implementing actors maintain ICT support personnel who provide regular support to the districts. However, user support was reported by some of the district data clerks to be poor. Once DHIS 2 problems were reported to the central support staff, support was not provided on time and sometimes it could be left pending without any response. Other districts reported that sometimes they were given solutions which could not solve their problems. As one of the actors noted, the big problem in the districts with computer systems is viruses causing most of computer crash problems.

> *Our computer running DHIS 2 software crashed several times and we could not enter data for more than three months (District data clerk, March 2011).*

Another challenge experienced in DHIS 2 implementation is the need to ensure uniform versions of the standards across sites. This is important in order to ensure integration and central data analysis. For instance, in most districts visited it was noted that data entry clerk's accounts in DHIS 2 were given full administrative privileges, giving them room to change anything in the system. As a result, one technical personnel reported that some actors introduced changes in the system causing difficulties in integrating data across sites.

Some users had added new health facilities in DHIS 2 without consulting the central support team. This made their database different from the central database which presented difficulties in importing data sent from the districts (Technical personnel, March 2011).

Moreover, the problem of ensuring uniform standards across sites is compounded with the need to upgrade from one version DHIS2 to another which requires all sites to be visited and updated. This happens as a result of a new added feature in DHIS2 artefact or introduction of new data sets or data elements which need to be collected and captured across sites. However, the challenge comes when not all implementing actors are ready to incur costs for updating the system at the same time.

Other routines necessary to ensure the decentralized DHIS2 implementation serves the needs of multiple actors, is the need to ensure data transmission to the central data warehouse. Until the time of writing only one actor was transmitting data to the national database – the Pwani region. Explaining the difficulties in coordinating the multiple actors with multiple DHIS2 implementation, one national HIS officer argued,

"The implementing partners have resources and multiplicity of interests. That's why after getting what they want, they don't bother about other things like data transmission to the central level".

Though data flow guidelines were developed during the Pwani DHIS2 implementation, enforcing the routines stipulated in the guidelines proved rather difficult.

"Yes, we developed a guideline document for the districts to use. And the districts officers were involved in the process, giving their comments until it was complete. But they don't seem to use it. That's why we are experiencing similar problems addressed in the guidelines"

6. Analysis and Discussion

The three cases presented have similarities and differences. A common feature for the three cases is the multitude of stakeholders that are involved in the HIS integration projects in both Tanzania Mainland and Zanzibar. However, the differences are on the extent to which donors are directly involved in the project, and on how the ministry of health managed to lobby its role as the coordinator of the HIS integration exercises. Another difference between the cases is the type of technology used and the mode of implementation and how this had great impact on the process to create a common, integrated data repository.

The three cases presented provide a ground to discuss the challenge of coordination as part of HIS integration process. The cases outline the power struggle between actors as they draw on different resources available to them as material for inscribing their interests.

The Role of Artefacts to Facilitate Coordination: A Comparative Analysis

In our analysis of the three case studies we conceptualize the integration process as an actor networking building process where a number of actants such as the ministries of health, donors, vertical programmes (RHC, HIV, Malaria, EPI, etc), implementing partners, software artifacts' (DHIS), policy and guideline documents, to mention just a few, are engaging in the processes.

The actor network building process using DHIS1.4 artifact in the Zanzibar case was initiated by the Ministry of Health under the HMIS unit supported by DANIDA. By drawing on the financial resources

from the donor, the HMIS unit as a focal actor aligned the interests of all other actors forming one actor network. The activities of aligning all the actors' interests went hand in hand with revision of data collection tools, codifying the tools into the software artifact (DHIS1.4), and rolling out the software and the revised tools to all the districts in Zanzibar.

However, the actor network built using DHIS1.4 was aligned using guidelines which inscribed the manner in which the technology should be utilized by the multiple actors involved. Some of the inscriptions in the guidelines were related to the manner in which data should flow from the districts to the national level and then from the national level to the vertical programs and to other actors.

Nonetheless, the fact that DHIS1.4 was decentralized in terms of having it installed on every district including the national HMIS unit and at the programme level, various challenges related to availability of timely data and in maintaining all the instances of the system led to the weakening of the bonds of the actor network. Though the HMIS Unit politically had the mandate to prescribe the use of the DHIS1.4 and maintain its position as a focal actor in the network, weakening of the bonds forced it to succumb that position. This is in-line with the argument that those who are powerful are not those who *'hold'* power but those who are able to enrol, convince and align others into associations. As the case suggests, though the actors strived to strengthen the network by prescribing that data from the districts could be sent to the programmes via email directly, but this was not bought by all the actors, hence it did not work as envisaged.

Conversely, the decision of the actors to move to DHIS2, and having it centralized with actors such as vertical programmes having direct access to their data immediately after the districts have captured them in the system, transformed the configuration of the actor network. This time the role of the ministry as a focal actor coordinating the process was taken by another actor – DHIS2 software artefact. This affirms power according to ANT being a question of ongoing and active structuring of the possible field of action of others, and always being open to resistance, transformation and renegotiation. DHIS2 artefact as a focal actor altered completely the role not only of the HMIS unit which was hitherto the main actor, but also the role of other actors such as the vertical programmes.

Hence, DHIS2 artifact as an important actor in the Zanzibar case is used to institutionalize the data reporting by virtually eliminating bureaucracy while ensuring that no actor is sidelined whether purposely or accidentally as it was in DHIS 1.4. Under this setup as the case suggests, almost all the actors are happy, however the important question still remains, "*what would be the role of the HMIS unit?*" And as one of the HMIS unit informant asked, ''*.....who is in-charge?*''.

As the case further suggests, this actor would like to maintain its role as a network builder and a coordinator. However the fate of that actor is determined not by its political and bureaucratic mandate to prescribe anything to other actors but by the actor network dynamics which asserts that power lies in the ability to translate the interests of others, making them yours. Precisely, the nature of the technological artifact (stand alone or web based) and the manner in which it is implemented (decentralized or centralized), coupled with the policy and guidelines which inscribe and prescribe the use of the system, are the important factors that determine success or failure of the network building process – the HIS integration process.

The implementation of the DHIS2 in the mainland started by the Ministry as a focal actor endorsing the software as a standard to be used countrywide. However while the ministry was in the process of mobilizing funds to start implementation, other actors with their interests started implementation

project in their respective sites. Starting from one region (Pwani) with only two data sets (VCT & STI), the enrolment of other actors supporting inclusion of the other data sets, changed the role of the DHIS2 just as software being implemented to an actor mobilizing other actors and aligning and enrolling them to the actor network. As a result this saw many other actors join the network supporting implementation of DHIS2 in other regions such as Arusha, Iringa, Mtwara and Lindi.

As was the case for DHIS1.4 implementation in the Zanzibar case, DHIS2 implementation in the mainland was decentralized in the sense that the application was installed at every district, expected to submit data monthly to the regional level and from there to the national level. However as the case suggests not much of the data from the regions was submitted to the national level. As long as the implementing actors in their respective regions fulfilled their interests of data, they did not bother to submit the same to the national level. Though there was a guideline developed to inscribe and prescribe the performance of the actors in terms of data submission routines, the ministry of as focal actor actor seems to have lost control in terms of coordination and enforcing the use of the guidelines.

Succinctly, the actor network bonds in this case was weakened by the fact that the national HIS authority that was to coordinate the process did not succeed to inscribe implementation and use of the system using resources such as HIS policy documents, and other guideline documents. For according to Murdoch and Marsden (1995) power lies in the resources used to strengthen the bonds of the actor network and to be successful, an actor must 'colonise' the worlds of others. However the poor state of the national HIS authority makes use of managerial control over the actors futile, hence the need to rely on other pragmatic ways to coordinate the HIS implementation and use.

And from the DHIS2 implementation in Zanzibar it is clear that, though the technology used is the same as that in the Mainland, the mode of implementation used led to the success in the Zanzibar case. Explicitly, the mode of implementation led to the development of an actor network with strong bonds making DHIS2 an actor aligning all other actors and inscribing their use. The table below compares and contrasts the two cases where DHIS2 was used:

Table 2: Summary of the DHIS2 Comparative Case Analysis

DHIS2 Implementation in Mainland	DHIS2 Implementation in Zanzibar
Multiple actors engaging in the implementation process in multiple sites	Single actor engaging in the implementation process by aligning other actors
Decentralized mode of implementation	Centralized mode of implementation
Guidelines are in place but not in use. No policy documents in place as materials for inscriptions	Guidelines and policy documents exists and in use
Limited data submitted to the higher levels	All data submitted and accessible to higher levels and other stakeholders
DHIS2 as an actor failed to coordinate and align other actors due to the mode of implementation used.	DHIS2 as actor succeeded to coordinate and align other actors into a strong actor network due to the mode of implementation used.
Expensive and difficult to maintain multiple software instances at various sites	Only single instance exists, hence cheaper and easier to maintain for the common good

7. Conclusion

Information systems integration is a very challenging undertaking, more so in the healthcare context of developing countries, characterised by multiplicity of actors and initiatives to address diseases burden. This comes from the fact that IS integration is not a mere technical exercise rather is a complex socio-technical process of aligning not only the technologies but also routines associated with those technologies. Through three case studies, this article has compared and contrasted the process of integration where the importance of deploying proper technology in line with inscribing right regulations has been highlighted.

By drawing on ANT concepts of inscription and alignment, precisely, the article described HIS integration as a *combinatory* actor network building process that need to consider the nature of the technological artifact (stand alone or web based) and the manner in which it is implemented (decentralized or centralized), coupled with the policy and guidelines which inscribe and prescribe the use of the system. The article reveals this combination as an important factor that determines success or failure of the network building process (the HIS integration process) in the backdrop of myriads of heterogeneous actors with multiplicity of interests.

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