

INTEGRATING INFORMATION SYSTEMS OF DISEASE-SPECIFIC
HEALTH PROGRAMMES IN LOW INCOME COUNTRIES:

THE CASE STUDY OF MOZAMBIQUE

BALTAZAR CHILUNDO

Submitted as partial fulfilment of the degree
Doctor Philosophiae

At the Faculty of Medicine
University of Oslo,
Norway

August, 2004

I dedicate this thesis to Josina (my wife) and Chilundo's family for the love, support, strength and encouragement.

ABSTRACT

This thesis presents an interpretive study to examine the challenges posed by the integration of disparate health information systems in highly aid-dependent and low income countries, within the context of health sector reforms. Specifically, the thesis analyses the potential and challenges of integrating the information systems of the Malaria, Tuberculosis and HIV/AIDS programmes with the overall routine systems, and also integration of the multiple reporting channels within each individual programme.

Multiple comparative case studies (in two of the eleven provinces of Mozambique) were performed aiming to: (i) Analyse the reporting system(s) of each specific programme, from the point of services delivery to the national level of the health administration; (ii) Analyse the work practices of the health staff based on how these practices shape data quality; (iii) Examine the tensions, conflicts, commonalities and interests amongst actors at district, provincial, national and international levels; and (iv) Identify mechanisms by which the information systems of the individual programmes could be integrated.

The multifaceted and multilevel complexities of the integration efforts involve not only political, cultural and technical aspects but also a range of problems such as pressure to harmonise vertical and horizontal modes of service delivery, lack of adequate and skilled human resources, inadequate and multiple reporting systems, extreme donor aid-dependence and the pressure of life threatening diseases.

This thesis develops a socio-technical perspective drawing upon theories of organisational change, multiple and territorial rationalities, and representations to build an understanding of the phenomena of information systems integration in these contexts.

Integration involves a heterogeneous network comprised of people (e.g. health workers, managers, planners, donors, etc.), artefacts (e.g. forms, software, etc.), socio-political structures and representations of diseases (e.g. health indicators), which are socially constructed involving the use of

information systems. Aligning this heterogeneous network entails a process of negotiating multiple rationalities (i.e. formal, techno-economic, situated, substantive and contingent) to achieve the rationality of the health information systems integration – a consistent, coherent and non-redundant reporting system for the entire National Health System. To develop this rationality, political negotiations among all stakeholders are crucial, including expanding the perspective from the rationality of individual programmes to include the overall health organisation.

This thesis makes contributions to both Information Systems and Public Health domains. Theoretical and practical models are developed to plan, design and implement the integration of disease-specific information systems in deprived settings. The models emphasise that integration is not just an issue to be discussed at the national level but that it also requires an equal consideration of the reality on the ground, and the informational and material inter-linkages. A cultivation approach is proposed to highlight the need of thorough integration (respecting the multiple rationalities), taking incremental steps and building upon what is working rather than trying to design new systems from scratch. This thesis also presents specific recommendations to strengthen the individual information systems of the Malaria and HIV/AIDS programmes within the current situation and proposes how donors can contribute to the building of integrated information systems, within the context of Sector Wide Approaches.

ACKNOWLEDGEMENTS

I would like to thank all those who made this thesis possible. First of all I want to express my sincere gratitude to my advisor at the Department of Informatics, Professor Sundeep Sahay, for his inspiration and unceasing moral and technical support. In many ways he provided clear comments on my thesis' drafts and the various research papers. My sincere thanks go to my principal supervisor, Professor Johanne Sundby, for her thoughtful and valuable advice which made this work possible.

I am deeply indebted to Professor Jørn Braa whose reliance allowed me to be a PhD candidate and a key member of the HISP network.

Through the years of my research I have discussed and learned how to address information systems theories with a number of fellow researchers and professors. I would like to especially thank Professor Margunn Aanestad. Our many conversations have helped me to understand the complex issues that surround information systems integration. I am extremely grateful to Professor Judith Gregory, Professor Geoff Walsham, Professor Jens Kaasbøl, Professor Gunnar Bjune and Dr Satish Puri (former research fellow).

I enjoyed my time at both the Department of Informatics and Section for International Health (UiO), and for this I must thank my fellow PhD students and others, especially to the Mozambican HISP folks and friends namely Humberto Muquingue, José Nhamossa, Emílio Mosse and João Mavimbe. My gratitude extends to Petter Nielsen, Marisa d' Mello, Jennifer Blechar and Jyostna Sahay for commenting in my writing as well as to Jagrati Jani, Patrick Burasa, and Honest Kimaro.

The research which forms the basis of this thesis was carried out in the National Health System of Mozambique. This was possible as the national health authorities allowed me to do so. I especially thank Dr Martinho Dgedge for providing valuable comments on my thesis draft and papers, Dr Francisco Saúte for providing valuable information and Dr Paula Perdigão for commenting in my draft paper. My thanks extend to Mr António Sitoi and Dr

Bruno Piotti for providing their empirical experience in the matters of health information systems. A great thank you to you.

Thanks are due to many members of the HISP network, especially those from Mozambique, Norway, South Africa, India and Tanzania. In particular I would like to express my appreciation to Dr Esselina Macome, the HISP coordinator in Mozambique.

I also thank all my colleagues at the Faculty of Medicine, University Eduardo Mondlane.

Last but not least, I would like to thank the financial supporters of this research, namely HISP (field work), QUOTA Programme (scholarship) and GLOBINF Network (HIV/AIDS research) which I deeply appreciate.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCING THE TOPIC OF THE THESIS	1
1.1. Scope of the thesis, problem domain and research questions	3
1.2. Expected contributions of the thesis	7
1.3. Structure of the thesis	8
CHAPTER TWO: EMPIRICAL SETTING - The Case of Mozambique	10
2.1. The profile of Mozambique	12
2.1.1. <i>Geographic and Population profile</i>	12
2.1.2. <i>Political profile</i>	14
2.1.3. <i>Socio-economic and education profile</i>	17
2.1.4. <i>Health profile</i>	20
2.2. Empirical setting: Health Programmes in Mozambique.....	22
2.2.1. <i>The organisational structure of the National Health System</i>	23
2.2.2. <i>Current Government Strategies on Health Sector: Sector Wide Approach and National Integrated Plan</i>	27
2.2.3. <i>Influence of aid dependence and donor practices on the current health policies</i>	31
2.2.4. <i>Empirical strategy</i>	35
CHAPTER THREE: CONCEPTUAL FRAMEWORK	37
3.1. Literature review on integration	39
3.1.1. <i>Approaches to the delivery of community health care services</i> ...	39
3.1.3. <i>Challenges of information systems integration in organisations</i> ..	46
3.2. Theoretical framework	49
3.2.1. <i>Integration and Organisational Change</i>	50
3.2.2. <i>Integration and Multiple Rationalities</i>	55
3.2.3. <i>Integration and representations</i>	60

3.3. Summary.....	62
CHAPTER FOUR: RESEARCH METHODOLOGY	64
4.1. Origin of the research	66
4.2. Qualitative research in information systems.....	67
4.3. Research setting and case study strategy.....	69
4.4. Selection of research sites.....	72
4.5. Data collection techniques.....	76
4.5.1. <i>Semi-structured interviews</i>	76
4.5.2. <i>Observation of work practices</i>	77
4.5.3. <i>Review of secondary data</i>	79
4.6. Modes of analysis	79
CHAPTER FIVE: Summary of Research Findings and Analysis	81
5.1. Papers included in the thesis and linkages between them.....	82
5.1.1. <i>Paper one</i>	84
5.1.2. <i>Paper two</i>	85
5.1.3. <i>Paper three</i>	86
5.1.4. <i>Paper four</i>	87
5.1.5. <i>Paper five</i>	88
5.2. Understanding the challenges of information systems integration of disease-specific health programmes – current work practices and contingencies, data quality and representations of the disease- phenomenon	89
5.3. Integrating the information systems of disease-specific health programmes: Negotiating multiple rationalities	91
CHAPTER SIX: CONTRIBUTIONS AND FINAL REMARKS	94

6.1.	Theoretical contributions.....	95
6.1.1.	<i>Development of a theoretical perspective to analyse the challenges of the integration of information systems of disease-specific health programmes</i>	96
6.1.2.	Articulation of a theoretical model to support the integration of disease-specific health information systems	100
6.1.3.	<i>Emphasising the role of work practices in shaping data quality reported for surveillance purposes</i>	101
6.2.	Practical contributions.....	103
6.2.1.	<i>Developing a model to guide practical efforts to integrate disease-specific information systems in low income countries ...</i>	103
6.2.2.	<i>Developing guidelines on how information systems associated with the Malaria, Tuberculosis and HIV/AIDS programmes can be integrated with the routine reporting systems.....</i>	109
6.2.3.	<i>Proposing recommendations to strengthen the individual monitoring and reporting systems of the disease related programmes concerning HIV/AIDS and Malaria.....</i>	110
6.2.4.	<i>Proposing mechanisms by which donor agencies can provide more effective support to strengthen health information systems</i>	112
6.3.	Final Remarks	113
	REFERENCE LIST	115
	PAPERS ONE to FIVE	

LIST OF PAPERS

- (i) Chilundo, B. and Aanestad, M. (2003) *Vertical or Integrated Health Programmes? The consequences for the laboratory information systems in Mozambique*, In *Proceedings of the IFIP TC8 & TC9/WG 8.2+9.4 Working Conference on Information Systems Perspectives and Challenges in the Context of Globalization. Electronic version* (Eds Korpela, M.; Montealegre, R. & Poulymenakou, A.) Athens, Greece.
- (ii) Chilundo, B.; Sundby, J. and Aanestad, M. (2004) *Analysing the quality of routine malaria data in Mozambique*. *Malaria Journal – BioMed Central*, 3(1)3.
- (iii) Chilundo, B.; Sahay, S. and Sundby, J. (2004) *Analysing the quality of the HIV/AIDS case-detection and case-reporting systems in Mozambique*. Accepted for publication in the *African Journal of AIDS Research*.
- (iv) Chilundo, B. and Sahay, S. (2004) *Representing the phenomenon of HIV/AIDS in developing countries: a case study from Mozambique*. Accepted for publication in the *Journal of Information Technology for Development*.
- (v) Chilundo, B. and Aanestad, M. (2004) *Negotiating multiple rationalities in the process of integrating the information systems of disease-specific health programmes*. Accepted for publication in the *Electronic Journal of Information Systems in Developing Countries*.

CHAPTER ONE

INTRODUCING THE TOPIC OF THE THESIS

"Any change, even a change from the better, is always accompanied by drawbacks and discomforts".
Bennett Arnold (1867 - 1931)

I. CHAPTER ONE

This chapter sets down the purpose of the research, the rationale for choosing it and orients the reader to the overall issues addressed. The thesis is broadly concerned with understanding the challenges of integrating information systems of diverse disease-specific health programmes in a high aid-dependent country (Mozambique). The research is situated within the context of organisational change, characterised by sector reforms, decentralisation and consequent re-organisation of the health systems and programmes, which inevitably also calls for information systems redesign and integration. It is argued that integration of these health information systems is not a purely technical or practical issue, but entails a political negotiation of interests that are historically and socially situated. Through the course of this chapter, the scope of the research is elaborated upon together with a description of the problem domain and research questions. The chapter closes by providing the expected contributions of this work and the outline of the entire thesis.

1.1. Scope of the thesis, problem domain and research questions

This thesis represents a multidisciplinary approach to examine the problems of integrating diverse disease-specific information systems in a complex health organisation. Perspectives from disciplines such as health systems policy and management, community health, information systems and epidemiology in the context of low income and high aid-dependent countries are explored. These perspectives seek to emphasise that public health issues fundamentally involve information systems, and that challenges of information systems in the health sector need to be grounded within an understanding of public health issues. The challenge of this multidisciplinary nature is the need to satisfy two audiences that have historically and epistemologically been distinct: the Public Health domain - more oriented to community health problems and health programmes; and the Information Systems domain – more concerned with information processing for decision-making in organisations.

Healthcare services in low income countries are usually provided in collaboration between national authorities, foreign aid agencies and non-government organisations. Foreign aid is often given towards particular projects or specific programmes rather than towards the general budget administered by the government (Brown, 2001). This funding focus has led to an unmanageable proliferation of projects, programmes and policies and ‘an unruly melange’ of demands on health ministries (Walt et al., 1999, p.207). Managing this multiplicity of projects is made further complex by the institutional conditions of the health ministry, which are often characterised by poor capacity to provide strategic and cohesive leadership to the health sector (Collins, Green and Newel, 2002). Mandatory requirements to demonstrate funding accountability and short-term results have often led to donors promoting vertical (donor-driven) programmes operating “outside” a cohesive sectoral framework, such as those centred on specific diseases (e.g. tuberculosis) or health problems (e.g. reproductive health) (Oliveira-Cruz, Kurowski and Mills, 2003). Such vertical programmes, which tend to oppose an integrated approach to health care delivery, contribute to a state of

fragmentation and redundancy, and associated problems (Hutton, 2002; Cassels and Janovsky, 1998).

The recognition of such problems has in recent years contributed to national governments and some aid organisations to try to promote broader health system development initiatives. These include finding ways to integrate specific vertical programmes into routine health care delivery. However, achieving this integration in practice is a complex undertaking (Oliveira-Cruz, Kurowski and Mills, 2003), characterised by tensions between the 'system designers' (management and planning specialists), who promote the overall operation of the health sector, and the specific programme managers, who are concerned with particular disease control strategies. The following quote illustrates some of these tensions:

"Management and planning specialists have often adopted a narrow formulation of health care reforms which, in some cases, pretend to an almost universal legitimacy, proclaimed as beneficial, irrespective of the context in which they are designed. Ideological, economic and political pressures, often emanating from outside the health sector, have shaped health reforms while concern for epidemiological, [informational] and demographic issues and technical approaches to health care interventions have tended to be secondary considerations. Health reforms have been developed which pay little attention to the particular features of specific disease control policies. At same time, [specific] programme managers have not engaged actively with reformers in such a way as to influence the appropriate design for a reformed health sector..." (Collins, Green and Newel, 2002, p.141).

One key aspect, though often ignored, of 'unifying' specific health programmes includes the consequent need to also integrate the respective information systems. In this study, integration of health information systems¹ is seen as a process of bringing health data from various information systems to be available at one level of decision-making (functional integration) or of building a common shared database (data integration). The goal is to construct a consistent, coherent and non-redundant information system for the entire National Health System.

¹ Health information systems are defined as assemblage of human and technical components that gather, process, store, use and transmit information. In developing countries these systems are usually based on a combination of both paper and computer technologies.

This research is concerned with this crucial, but hitherto overlooked issue of integrating the diverse reporting and monitoring systems within the disease-specific programmes. Specific health programmes often have an independent decision-making structure, an internal reporting system, resource and information sharing, and a liability-sharing system. The result is several parallel and overlapping information flows, a lack of integrated analysis, and a high burden of registration on health workers in the primary health care facility.

The disease-specific programmes being analysed in this thesis are Malaria, Tuberculosis (TB) and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS). These three diseases constitute the major health problems in many low income settings and tend to share the same point of delivery in the health facilities at the district and sub-district levels (e.g. clinical laboratories and infirmaries). The rapid growth in the spread of diseases globally, is creating complex challenges for the management of these health programmes, forcing managers to re-strategise their approaches, including those relating to information systems (Collins, Green and Newel, 2002).

The issue of integration is not only relevant to health care, but also to wider information systems research and practice. Many private and public organisations usually face multiple challenges as they seek to progress through stand-alone systems to an 'organisation-wide' integration. These challenges include changing organisational environments, existing policies, data forms and applications, data channels, technology and human skills. For these reasons, it has been argued that information systems integration is not merely a simple technical process of "solving problems", but goes beyond that to also include political, cultural and socio-economic processes in building alliances, sharing commonalities and making coalitions (Webster, 1995; Lee and Madnick, 1992; Davenport, 1998; Mabert, Soni and Venkataramanan, 2003; Hanseth, Ciborra and Braa, 2001).

It is argued in this thesis that in order to integrate disparate information systems, it is of crucial importance to understand the different rationales behind these systems, the actors and their interests responsible for them, how

these rationalities have historically been formed, how they are shaped by the characteristics of the diseases addressed, and how they are embedded into different institutional settings, both at local, national and international levels. To understand these multiple and inter-connected aspects of health information systems integration, the analysis of the following research questions is fundamental:

- i. What are the challenges related to the integration of information systems of disease-specific programmes within the context of health sector reform in low income countries?
- ii. What are the implications of health programmes integration efforts into the existing information systems?
- iii. What theoretical concepts help to better conceptualise the tensions of integrating information systems in these settings?
- iv. What practical implications can be drawn to support efforts of integrating health information systems in high aid-dependent countries?

The empirical setting to analyse these questions is the health sector of Mozambique, a low income and high aid-dependent country, where issues of health system development including reforms, decentralisation and reorganisation of several health programmes are currently ongoing. An explicit focus on one country allows for the in-depth examination of these experiences necessary for exploring implications of information systems integration. Mozambique was the country targeted because the author of this thesis is a Mozambican citizen, a medical doctor and a faculty member of the main higher education institution (Universidade Eduardo Mondlane). This research is situated within the umbrella of the Health Information Systems Programme (called HISP) which is based in this institution. The HISP initiative seeks to develop health information systems to support the emerging decentralised health administrative structures in various developing countries including Mozambique (Braa and Hedberg, 2002). Specifically, HISP is involved in the processes of improving the quality of information reported to health managers in order to enhance the information basis of decisions, for

example related to disease surveillance and allocation of resources. HISP was first initiated in South Africa in 1995, and now represents a collaborative research and development programme between Eduardo Mondlane University (Mozambique), University of Western Cape and University of Cape Town (South Africa), University of Oslo (Norway), and the Ministries of Health of South Africa and Mozambique.

1.2. Expected contributions of the thesis

This research expects to contribute to the domain of both public health and information systems research. The following contributions to both theory and practice are identified.

Theory

- (i) Development of a theoretical perspective to analyse the challenges of integrating health information systems in low income countries;
- (ii) Articulation of a theoretical model to support the integration of information systems of diverse disease-specific health programmes in low income countries; and,
- (iii) Emphasising the role of work practices in shaping data quality reported for surveillance purposes.

Practical

- (i) Developing a model to guide practical efforts to integrate disease-specific information systems in low income countries;
- (ii) Developing guidelines on how information systems associated with the Malaria, Tuberculosis and HIV/AIDS programmes can be integrated with the routine reporting systems;
- (iii) Proposing recommendations to strengthen of the individual monitoring and reporting systems of disease related programmes concerning Malaria and HIV/AIDS;

- (iv) Proposing mechanisms by which donor agencies can provide more effective support to strengthen health information systems.

1.3. Structure of the thesis

This thesis is divided into six interconnected chapters (Figure 1.1).

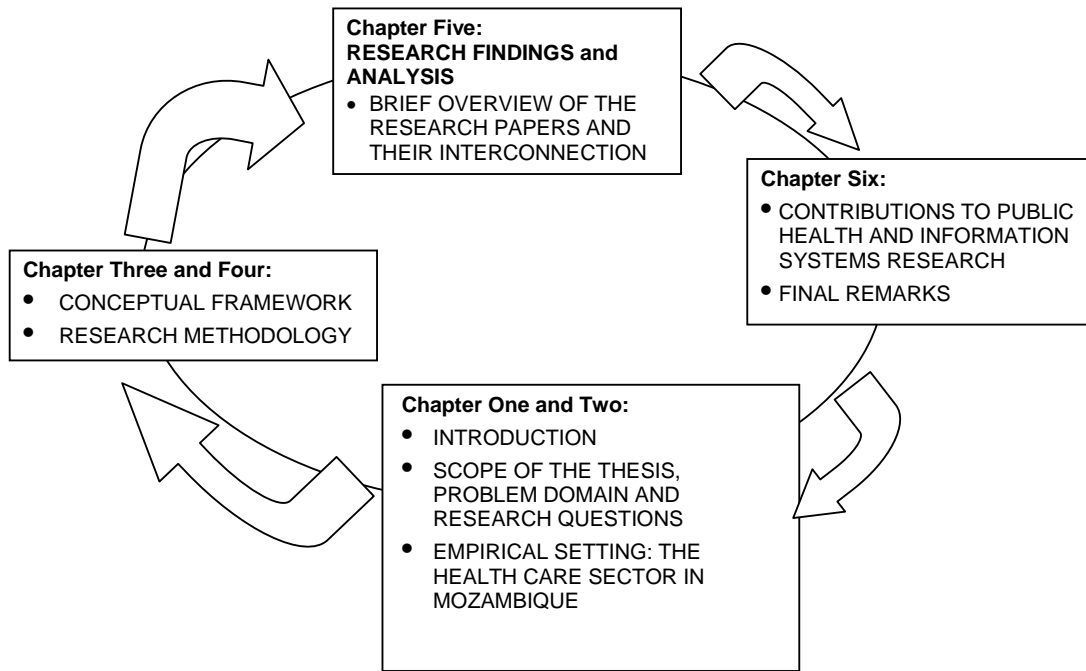


Figure 1.1 – An overview of the thesis

This chapter presented the research topic, the rationale for choosing it, the research questions and expected contributions.

Chapter two provides the empirical setting of the study through the case of Mozambique. The broader country context and more specific empirical setting are described followed by the empirical strategy.

Chapter three presents the conceptual framework within the scope of integration of diverse information systems in the process of public organisational change in constrained settings. First the current debates around vertical versus integrated health programmes is described, followed by a review of experiences with integration of disparate information systems in organisations. Integration will be analysed from three angles described by these pairs of concepts:

- Integration and organisational change;
- Integration and multiple rationalities; and,
- Integration and representations.

Chapter four discusses the main methodological approaches adopted for the research. Here, interpretive case study research is described as the baseline for this study, drawing upon qualitative methods.

Chapter five presents a summary overview of the findings related to the five papers included in this thesis.

In Chapter six, the theoretical and practical contributions of the thesis are presented, and how these help to answer the research questions provided in the thesis. Some brief final remarks are provided.

CHAPTER TWO

EMPIRICAL SETTING

2. CHAPTER TWO

EMPIRICAL SETTING

The case of Mozambique

This chapter outlines the framework for answering the research questions mentioned in Chapter one, through the case analysis of Mozambique. The aim is to examine the integration effects of the disease-specific programmes at the health facility level, from the perspective of information systems for activities and diseases' reporting. Information systems integration is seen as a challenge because this problem has largely been dealt at the senior levels (involving donors, health authorities and key national managers) mainly concerning funding mechanisms and some technical details (for example, the creation of national 'integrated' plans), which often do not take into account the historical context, and the particularities of the programmes, the illnesses being addressed and community problems. The challenges thus created is that while implementing integration efforts fundamentally require local practices and systems to be unified, in practice the local level is totally excluded from this process, most noticeably in the design stage.

Understanding integration is not just as a technical issue but requires an analysis of the socio-economical-political contexts of the health sector of Mozambique. Following the presentation of the Mozambican profile, the empirical setting is described including the organisational structure of the health systems so as to orient the reader to the context of the research. In addition, the current national strategies focused on the health sector including health policies, integration plans and the influence of donors and partners in shaping the policies is described.

2.1. The profile of Mozambique

The Mozambican profile is presented around four aspects: (1) Geographic and population profile; (2) Political structure; (3) Socio-economic and Education status and (4) Health status.

2.1.1. Geographic and Population profile

Mozambique, located in the east coast of the Sub-Saharan Africa (Figure 2.1), is situated between the parallels 10°27' and 26°56', latitude South and the Meridians 30°12' and 40°51' to the East. Mozambique has approximately a land size of 799,380 square kilometres and water size of 17,500 square kilometres. It is bordered by Tanzania to the north, Malawi, Zambia, and Zimbabwe to the west, and South Africa and Swaziland to the south.



Figure 2.1 – Map of Mozambique, zoomed in from African Continent

The climate in the country is typically tropical to subtropical. The northern part of the country is made up of a large mountain range whereby the highest elevations are situated alongside the eastern edge of east Africa's rift valley. The central region is mostly lowland due to the strong influence of

the lower Zambezi valley. The lowest point is the Indian Ocean (0 metres) and the highest point is the Monte Binga (2,436 metres). Scattered throughout the country of almost 2,500 kilometres of coastline, are numerous islands.

The country is administratively divided into ten provinces plus the capital of the country, Maputo City. There are three provinces in the north (Niassa, Cabo Delgado and Nampula), four provinces in the centre (Zambézia, Tete, Manica and Sofala) and also four provinces in the south (Inhambane, Gaza, Maputo and “Maputo City”) (see Figure 2.1). Each province in turn is divided into a capital, districts and these into administrative posts. In total, the country has 144 districts, 33 municipalities, 68 towns and 387 administrative posts (INE-Mozambique, 2000).

Population projections from the 1997 census indicate that the total population in 2004 should be 19.1 million people, of whom 52% are women. There is a high proportion of younger people: in 2002 it was estimated that 44.3% of the population was younger than 15 years, 53% were adults aged 15 to 65 years and only 2.7% were over 65 years (INE, 2003). 32.6% of the population lives in the northern region, 41.9% in the central region and 25.5% in the southern region. The most populated provinces are Zambézia and Nampula with 19.2% and 19.0% respectively of the overall population. With an estimated population growth rate of 2.5% for 2000-2010, the country's population is expected to reach 21.1 million by the year 2010 (19.7 million including the adjustment for the impact of HIV/AIDS) (UN Population Division, 2002).

The Mozambican population is predominantly rural (77%). Amongst the people that are living in urban areas; almost half reside in the country's capital (Maputo city). The average density in the country as a whole is 20 inhabitants per square kilometre, but it varies greatly from Nampula with 35 inhabitants per square kilometre to Niassa where there are only six inhabitants per square kilometre. The population is mainly concentrated along the country's coastal strip.

Despite Portuguese being the only official language in the country, it is only spoken by 40% of the population (50% of men and 30% of women) and

very few people use it at home (9%). Nevertheless the country is rich in terms of national languages (seventeen), for example *Chopi, Makhua, Gitonga, Makonde, Sena, Tsonga*, etc. that dominate everyday communication. The country is extremely heterogeneous and rich in terms of religion and ethnicity. The major religious groupings include indigenous traditional beliefs (42%), Christians (23.8%), Muslims (17.8% practised mostly in the northern part of the country), and “Zionist” (17.5% practised mostly in the southern part of the country). The ethnic groups include Makua 47%; Tsonga 23%; Malawi 12%; Shona 11%; Yao 4%; Swahili 1%; Makonde 0.5% and European 0.2%.

The diversity of the population and their cultural beliefs and attitudes play an important role in how diseases spread in the community and people’s attitudes towards treatment. For example, the lower education levels in certain parts of the country and the practice of polygamy and multiple sex partner arrangements amongst certain segments make them particularly vulnerable to infectious diseases like HIV/AIDS.

2.1.2. Political profile

Formerly a Portuguese colony, Mozambique became an overseas province of Portugal in 1951 and achieved full independence in 1975 after a 10-year guerrilla war by *Frente de Libertação de Moçambique (Frelimo)*². During the colonisation period, the health status of the majority of the population was very poor. The Portuguese state put very little effort into social development, and with the exception of some vertical health programmes, very few or no health services were provided by the state outside the major towns. To the extent that health services were available, they were primarily provided by church groups or traditional practitioners with limited involvement of the state (Walt, 1983).

After independence, even though the country witnessed a large-scale exodus of people with qualified skills, for example doctors and lawyers, the government adopted an ambitious approach based on socialist principles towards sustainable development. This entailed a broad policy of

² Mozambique Liberation Front

nationalisation, beginning with the health and education sectors, but later extending also to land, agriculture, banking and commerce. The government also sought to overcome imbalances in the health sector created by the colonial rule by initiating a 'dramatic' expansion of the rural health network. The number of first-level health facilities increased from 326 at the time of independence to 1,195 in 1985 (van Diesen, 1999). This also led to an expansion of the physical infrastructure, which demanded intensive recruitment of staff and their training. Some visible positive results were the provision of health care free of charge, the strengthening of the referral system, establishment of health posts as the first point of contact, with the health centres and hospitals expected to deal with more complex cases (Pavignani, 1999) .

However, in the early 1980s, Frelimo's (health) policies suffered from a prolonged civil war moved by *Resistência Nacional de Moçambique* (Renamo)³ that was supported by the former Rhodesian and South African Apartheid regimes. Due to the growing tensions between Mozambique, Rhodesia and South Africa (van Diesen, 1999), Mozambique became the target of intense destabilisation campaigns, which consistently targeted the destruction of health facilities and schools. Between 1982 and 1988, 292 health facilities were destroyed and a further 687 looted and temporarily closed. It is estimated that by the end of the war, almost half of the 1,195 health facilities that existed in 1985 were closed or were not functional (Pavignani, 1999; van Diesen, 1999).

Over 50% of school and health networks were also destroyed during the 15-year civil war. There was a massive challenge to relocate approximately 1.5 million people displaced by the war and to resettle them. Poverty levels were very high. There were widespread minefields (with an estimated 10 million unexploded mines), many not properly identified, which forced resettlement, especially to the rural areas. As a result, access to health care services became very skewed and also limited.

³ Mozambique National Resistance

In 1989, the ruling party Frelimo formally abandoned the Marxist principles on which the socialist policies were based, and a new constitution was formulated the following year allowing for multiparty elections and a free market economy. A United Nations negotiated peace agreement in 1992 between the rebel forces (Renamo) and Frelimo formally ended the fighting.

Mozambique today is seen as a key example of a peaceful transition. In 1994 and 1999 there were multi-party Presidential and Assembly elections (the next is scheduled for December 2004) and two elections at the civic (municipality) level have also been held. The level of mistrust within different groups in society (for example between members of Frelimo and Renamo parties), and the legacy of the colonial rule and the civil war, is gradually declining. Parliament has become a truly legislative body and oversees the executive. Public sector reform and decentralisation are under way and attempts are being made to increase public sector efficiencies, to tackle corruption, to develop greater transparency in the government and to strengthen a culture of a serving rather than a controlling state (UNA-UK, 2002). However, these efforts are often undermined by inefficiency in the overall public sector and dearth of well organised sectors to tackle Mozambique's transformation from a centrally planned to a market economy. The former Prime Minister has acknowledged these issues as reflected in the following quote:

"We want a public sector that transmits efficiency, a new culture for the public service should be developed as we advance toward a market system". Paraphrased by UTRESP (2002, p.1).

Therefore, although peace prevails in the country, the government is under pressure to consolidate its performance towards social development, especially in domains like health and education. These efforts are extremely complex to materialise in practice given the historical legacy of colonial rule, a situation further magnified by the civil war.

2.1.3. Socio-economic and education profile

Since the 1994 multi-party elections, Mozambique has made tremendous strides in consolidating its democracy and in implementing a comprehensive economic reform programme. The country's economic performance has consistently been robust, meeting and often surpassing ambitious targets (Mozambique Country Coordinating Committee, 2002). However, there are substantial concerns about the sustainability of that performance. The reasons are evident: dearth of qualified staff, public workers being amongst the most poorly educated in Africa, staff are poorly paid compared to the private sector, and the existence of a poor informational basis for monitoring and follow-up of service delivery in various sectors such as health and education (UTRESP, 2002).

Therefore, despite the significant gains that have been achieved in the aftermath of a debilitating civil war, Mozambique remains one of the poorest countries in the world. According to the United Nations Development Programme's (UNDP) 2004 Human development Report, Mozambique's human development index ranks 171 out of 177 countries and is well below the Sub-Saharan Africa and Least Developed Countries averages, in spite of a noticeable improvement in this indicator over the last half-decade (UNDP, 2004). 69.4% of the population lives well below the poverty line (0.40 USD per day), a condition more prevalent in rural areas (71.3%). There are also significant variations at the provincial level, with the incidence of poverty ranging between 47.8% in Maputo City to 87.9% in Sofala Province (Republic of Mozambique, 2002).

Widespread poverty is reflected in Mozambique's social indicators. The poor and ultra-poor tend to miss more days of work from illness than the non-poor, and are less likely to seek treatment due to lack of access to health care facilities. Lack of health care, hygiene, and access to safe water and sanitation allows preventable disease to flourish. Food insecurity, prevalent during the war, continues to contribute to malnutrition due to the vulnerability to floods and to the long dry seasons. In Table 2.1 below, a comparative summary of how Mozambique stands against other country groupings on

selected social indicators is provided. It is evident that the Mozambican social indicators are amongst the worse in the world.

Table 2.1 – Selected socio-economic indicators of Mozambique compared to the Sub-Saharan, Low Income and Developing Countries, and to the World

	Mozambique	Sub-Saharan Africa	Low Income Countries	Developing Countries	World
GDP ¹ per capita 2002 (ppp ² US\$)	1,050	1,790	2,149	4,054	7,376
Adult literacy rate 2002 (% age 15 and above)	46.5	63.2	63.6	76.7	N.A.
Population with sustainable access to an improved water source 2000 (%)	57	57	76	78	82
Undernourished people 1999/2001 (%)	53	32	27	21	N.A.
Life expectancy at birth 2001 (years)	38.5	46.3	59.1	64.6	56
Population with access to improved sanitation 2000 (%)	43	53	43	51	61
Infant mortality rate 2002 (per 1,000 live births)	125	108	80	61	56
Under-five mortality rate 2002 (per 1,000 live births)	197	178	120	89	81
Maternal mortality ratio 1985-2002 (per 100,000 live births)	1,100	1,098	671	463	411
Telephone main lines 2002 (per 100 people)	5	15	28	96	175
Internet users 2002 (per 100 people)	2.7	9.6	13	40.9	99.4
Personal computers in use 2001 (per 100 people) [#]	0.4	1.1	0.6	2.5	8.7

Source: Adapted from UNDP (2004); # - UNDP (2003); N.A. – Non Available

¹ GDP – Gross Domestic Product

² PPP – purchasing power parity – a rate of exchange that accounts for price differences across countries, allowing international comparisons of real output and incomes.

The education profile in Mozambique is characterised by a relatively low rate of school attendance, low quality of teaching, and significant disparities in access to schools amongst the different provinces. Low quality of teaching and a non-practical nature of the secondary school curricula have been described as two of the main reasons for a high school dropout rate (Pöysä, Packalén and Voipio, 2002). The primary school system, despite its expansion in terms of number of schools (nearly doubled from 1994 to 1999) is especially challenged by the need to improve the quality of teaching and learning. About 50 per cent of the students, despite obtaining passing grades, do not reach the course objectives, which are too demanding to be achieved

by the majority of the pupils, especially those in the rural areas. The problems of low quality and poor effectiveness of the school system implies that the majority of the students do not accomplish functional literacy despite them having attended schools. In addition, there are significant discrepancies of access to school between boys and girls with a poor boy having a higher probability of attending school than a non-poor girl (Pöysä, Packalén and Voipio, 2002). One of the current attempts to improve the quality of the basic education is the new curriculum which has been released early in 2004, which is expected to be more pupil orientated (using modern teaching methods and didactics) hopefully contributing to better results in learning.

The higher education system, which is symptomatic of the country's history, is also of concern. At first there was only one university, Eduardo Mondlane University, offering courses modelled on the Portuguese system, with 5-7 years of study leading to a single qualification (licenciatura) along with a limited number of shorter degree programmes. In the last 5 to 15 years, an additional nine institutions have been created, five of which are private. However, the majority of them still face similar issues of low academic quality, inadequate learning environment and materials, access inequities, low graduation rates and overall limited capacity (MESCT, 2001). The education policy has now developed a strategic framework for higher education, with the objectives of extending primary education and raising the gross enrolment ratio (MESCT, 2000). How this policy is implemented in practice has still to be seen.

In summary, the major poverty determinants are low rates of economic growth, poor education levels (especially amongst women), high domestic dependency rates, low agricultural productivity, lack of employment opportunities and infrastructural constraints, particularly in rural settings. These factors reduce the capability of the people, especially those in rural areas, to access good quality health care. For example, the high maternal mortality rate of Mozambique can largely be attributed to the reason of poor access – both in physical and economic terms.

2.1.4. Health profile

Mozambique has a large and diverse number of communicable diseases, several of which occur in endemic form. The diseases' pattern is favoured by the existing socio-economic profile of the population and the existing climatic conditions. The country is vulnerable to frequent outbreaks of water-borne diseases including cholera and dysentery. The country's Maternal Mortality Rate at approximately 600 to 1,100 per 100,000 live births is considered among the highest in world. Similarly, the Infant Mortality Rate of about 219 children deaths over thousand live births and the prevalence of chronic under-nourishment is also very high (Mozambique Country Coordinating Committee, 2002). Tables 2.1 and 2.2 summarise some of the key health indicators, and how Mozambique compares to other country groupings.

Currently the most serious diseases affecting the population are malaria, tuberculosis, acute respiratory infectious, diarrhoeas and sexually transmitted diseases including the HIV/AIDS pandemic.

Malaria is endemic and accounts for the highest incidence of disease in the country (15% of the total disease burden in Mozambique) (MISAU, 2001). Children under five years of age and pregnant women are the most vulnerable groups. Although prevalence data are not available for the whole country, it is reported that in some areas, 90% of the children under five are positive for *Plasmodium falciparum* (most common malaria parasite) infestation. The disease accounts for up to 44% of all out-patient consultations and 57.6% of all paediatric admissions at the district hospitals. In 2000, Malaria has caused death of about 40% (498/1242) of children admitted into paediatric wards in hospitals nationwide (Mozambique Country Coordinating Committee, 2002). Malaria and malaria-associated anaemia also contribute to the high rate of maternal mortality observed in the country. Through anaemia and haemorrhage-related complications, malaria is the leading cause of low birth weight in newborns. According to the official epidemiological reports by the Ministry of Health in 2001, about three million cases of malaria were reported amongst a total estimated population of 17 million (Mozambique Country Coordinating Committee, 2002).

Table 2.2 – Selected key health indicators of Mozambique, compared to Sub-Saharan, Low Income and Developing Countries, and the World

Key Indicator	Mozambique	Sub-Saharan Countries	Low Income Countries	Developing Countries	World
One-Year-old fully immunised (measles) 2001 (%)	58	58	64	72	75
HIV Prevalence 15 – 49 years old 2001 (%)*	13.0	9	2.1	1.3	1.2
Malaria-related Mortality rate 0 – 4 years old 2000 (per 100,000)#	1,159	791	N.A.	166	148
Tuberculosis-related Mortality rate 2001 (per 100,000)	33	47	45	32	26

N.A. – Non Available * - Source: UNAIDS, 2003 # - Source: WHO, 2002
Source: UNDP, 2004

Mozambique was added to the list of high-burden countries following a revision of TB incidence estimates for 1999. A report from the Department of Epidemiology describes TB as the third leading cause of hospitalisation in the country, after acute respiratory infections and malaria. There are 21,000 new TB cases per year, 30-32% of which are co-infected with HIV. The estimated annual risk of TB infection is 1.7%, empirically corresponding to about 94 new smear positive cases per hundred thousand inhabitants per year. In 2000, 13,257 smear positive TB patients were registered. The estimated incidence was around 254 per hundred thousands inhabitants.

Mozambique is significantly affected by HIV/AIDS with a prevalence rate of about 13.6% among people between 15 to 49 years of age, ranging from 7.5% in Cabo Delgado to 26.5% in Sofala Provinces (MISAU PNC DTS/HIV-SIDA, 2003). An increase of HIV patients is placing increased demands on all levels of the health sector, including for improved information systems for the continuous monitoring and evaluation of HIV programmes (MISAU DPC, 2003). By 2010, without lifesaving treatment and aggressive prevention measures, an estimated 1.9 million people will be infected and 167,000 people are expected to die, 19,000 of which are children under the age of 15. It is projected that by the end of the current decade, the epidemic could lower the expected life expectancy from the anticipated 50.3 years to 36.5 (INE et al., 2002).

The principal mode of transmission of HIV infection among adults is unprotected sexual relations where women are the most vulnerable. Nearly 57% of the Mozambican adults (15-49 years) living with HIV/AIDS are women. The gender disparity is even more striking within the age group of 20-24 years where women living with HIV outnumber men by four to one (Country Coordinating Committee Mozambique, 2002).

It has been estimated that in a population with 10% HIV prevalence, approximately 40% of TB cases can be attributed to HIV infection. In addition it has been reported that 50% of HIV persons will have developed TB in their lifetime in Sub-Saharan Africa.

From the health profile presented above it is clear that the health of the population of the country is heavily undermined by a range of infectious diseases contributing for a very poor health status, especially amongst the young, women and children.

After providing a broad overview of the study context, the next section turns to a description more specifically relating to the empirical setting in which the research was carried out.

2.2. Empirical setting: Health Programmes in Mozambique

In the previous section, the Mozambican demographic-social-economic-political and health profiles were briefly presented. This section provides the empirical setting of the research in three main parts. One, describes the organisational structure of the health care sector in Mozambique in which the specific-disease health programmes and their information systems are embedded. Two, the Sector Wide Approach and National Integrated Plan as two key government strategies to reorganise the health sector is described. Finally, the influence of donors in shaping the national health policies is presented.

2.2.1. The organisational structure of the National Health System

The National Health System can be seen as a complex organisational structure involving many actors, from the international agencies to the Ministry at the central level to the district and sub-districts at community level. In Mozambique, the National Health System is responsible for providing a minimum set of health care and for managing the health system network. It is therefore managed at three key levels, namely the National (Central), Provincial and District Directorates of Health.

The organisational structure of the National Health System headquarters (Mozambican Ministry of Health) and its relation with the lower administrative levels is schematically presented in Figure 2.2. The Ministry of Health is administratively divided into four major national directorates: the Directorate of Planning and Cooperation, the Directorate of Health, the Directorate of Human Resources and the Directorate of Administration and Management.

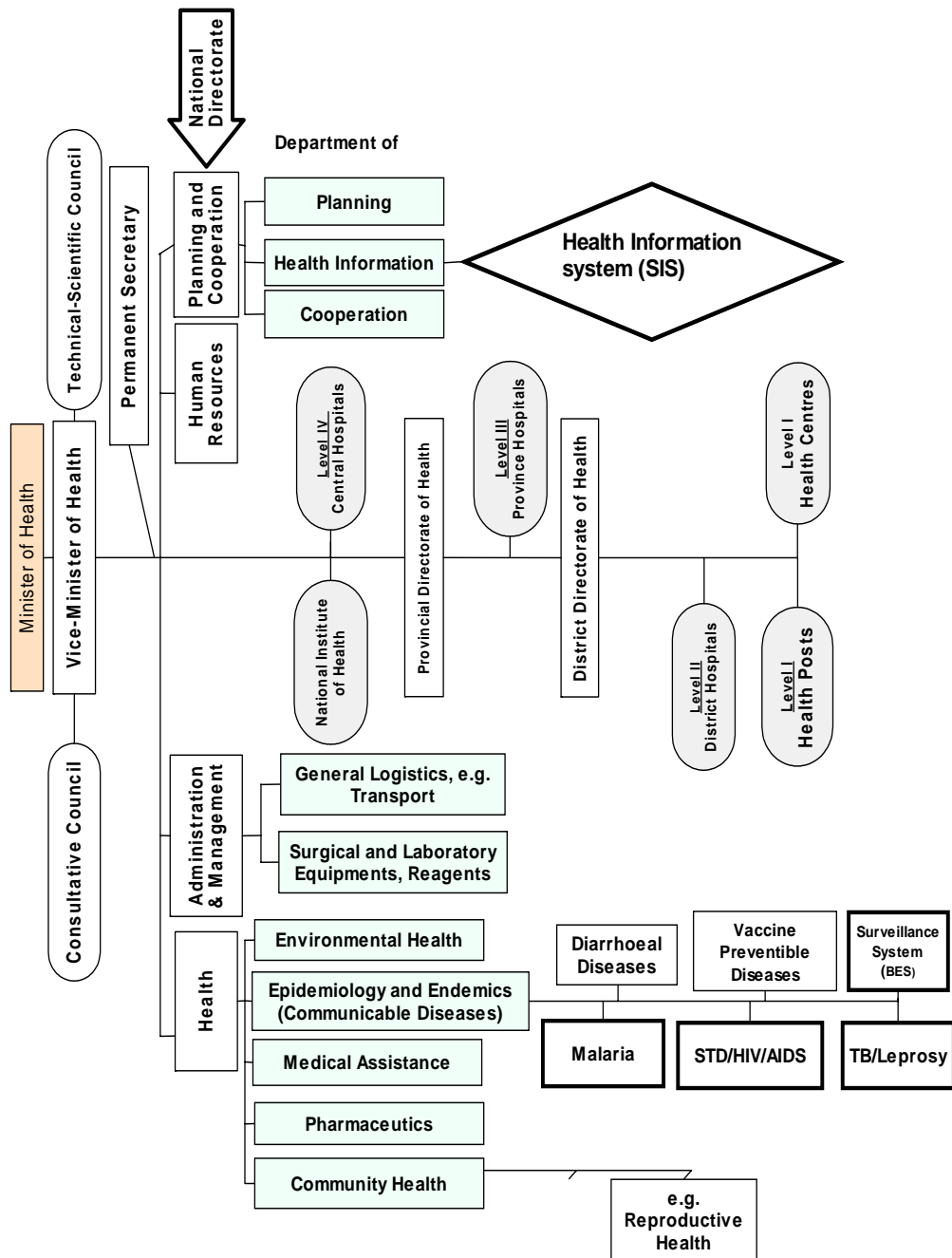


Figure 2.2 - Complex organisational structure of the Ministry of Health, Mozambique

The Directorate of Planning and Cooperation is the national directorate responsible for planning, cooperation and health information. It includes the main health information system (SIS) that collects monthly routine health related data from district health facilities and stores “semi-permanent” data including infrastructure such as health services, beds, vehicles, vaccines stocks, and so on. The Directorate of Administration and Management, is

responsible for all logistics including transport management, equipment, reagents and other supplies for surgical and laboratory purposes.

The National Directorate of Health covers most of the important Departments responsible for providing public health delivery, including managing health programmes, community health, medical care and epidemiology surveillance. It is constituted of five Departments, namely: the Department of Epidemiology and Endemics, the Department of Medical Assistance, the Department of Environmental Health, the Department of Community Health and the Pharmaceutical Department (see Figure 2.2).

The Department of Epidemiology and Endemics encompasses the management of all communicable diseases in the country, the most important being: STD/HIV/AIDS, TB/Leprosy and Malaria, which are organised as specific-disease programmes in addition to Acute Respiratory Infections, Diarrhoeal Diseases (including dysentery and cholera) and Vaccine Preventable Diseases (e.g. Measles, Diphtheria, Tetanus, Poliomyelitis, Rabies, etc). Each of these specific programmes, usually has its own budget (mainly supported by international agencies), individual information systems in which data may flow in various channels (e.g. malaria and HIV/AIDS), and departmental focused management procedures. Within the Department of Epidemiology and Endemics, there is a surveillance system (BES⁴) which collects weekly epidemiological data on communicable diseases from all health facilities in the country excluding data from the STD/HIV/AIDS and TB/Leprosy programmes. These data are collected weekly, and are generally out of synch with other routine reports that are processed on a monthly basis.

The Community Health Department includes activities related to health prevention, treatment and promotion to the community such as Reproductive Health (Mother and Child Health Care Programme and Extended Programme for Immunisation), Mental Health, School and Adolescent Health, Oral Health, Nutrition, and Information, Education and Communication. The Department of

⁴ BES - is a portuguese acronym "Boletim Epidemiológico Semanal" meaning Weekly Epidemiological Bulletin.

Medical Assistance gives support to the clinical related activities such as medical needs, laboratory services, blood banks and radiology.

While the Department of Pharmaceuticals includes amongst others the drug control laboratory, drug procurement, logistics and distribution, the Department of Environmental Health is responsible for environmental health, hygiene, inspections in public facilities including restaurants, hotels and commercial facilities.

Delivery of care is organised around four levels of health facilities (Figure 2.2): (I) health posts and health centres; (II) district (rural or general) hospitals, both in scope of the District Directorate of Health; (III) provincial hospitals within Provincial Directorate of Health; and (IV) central (specialised) hospitals in some Provinces (Sofala and Nampula) and the National Reference Hospital in Maputo. In theory, patients are referred through this system in accordance to their needs. Health posts and centres basically provide preventive and curative services respectively, and health posts typically have only rudimentary facilities and limited staffing, while health centres have a number of auxiliary staff and relatively more sophisticated equipment and facilities.

District hospitals (nationally known as rural or general hospitals) constitute the first level of referral and are expected to have emergency care facilities and the capability to perform simple surgeries as well as non-complicated obstetric and trauma interventions. Patients in need of more specialised care are sometimes referred to provincial or central hospitals. Maputo Central Hospital is the only university hospital that is considered also as the national reference and advanced hospital.

The management system of the health care structure is typically structured top-down: resources (personnel, drugs, equipment, reagents and funds) are allocated from the national level to the lower levels of the hierarchy. However, each level enjoys considerable autonomy in using its own resources, e.g. in the provincial level the distribution of new staff is decided by the provincial management team (not the national), according to perception of their needs, although the contract procedures are fulfilled at national level.

The managerial culture within the National Health System is mainly perceived by external partners as being 'reactive to events' rather than being forward looking in anticipating needs. Decades of crisis have deeply shaped the prevalent management style, which is short-term, focusing on keeping the operations going, and dealing with everyday events. This short term approach is reflected in the following quote:

"...Given their previous experience, managers approach problems one by one, as they come, and do not spend much energy in formulating long-term visions. Further, the memory of the central planning failures is still fresh, making managers sceptical of plans. The perennial scarcity of accurate information has made them reliant on their direct experience, on common sense and intuition, rather than on hard data (Pavignani and Durão, 1997, p.11).

Given the multiplicity of information systems in different directorates and departments at the national level and the prevalent managerial shortcomings, it can be argued that the ongoing efforts towards integration both of the health services and their information systems integration is a complex challenge.

The next section describes some of these reforms initiatives towards overcoming or at least minimising the effects of poverty on the population, with a focus on health care.

2.2.2. Current Government Strategies on Health Sector: Sector Wide Approach and National Integrated Plan

Despite rapid economic growth in recent years, Mozambique remains a very poor country. Expenditure-based poverty measures are reflected in widespread food insecurity and poor health status. In recognition of these problems, the Government of Mozambique is promoting a policy of expanded and improved quality and equity in access to health care as an important component of its broad strategy to fight poverty. Given the years of colonial neglect and systematic destruction of health facilities during the civil war, the recent government policy has focused on expanding the rural health network.

Based on poverty assessment, the Government developed an Action Plan for Reduction of Absolute Poverty or PARPA (2001-2005), including the

following key components: (i) generating rapid and sustainable growth; (ii) investing in human capital through improved delivery and quality of social services and (iii) developing a programme including creating safety nets that fosters the social and economic integration of the most vulnerable groups. Health has been identified as one of the six fundamental areas for action because of its key role in directly influencing the well-being of the poor, and with it contributing to economic growth (Chao and Kostermans, 2002).

In search of more accountable and efficient health systems, the Ministry of Health is in the process of long-term reform, with a focus on decentralisation and local governance characterised by the gradual empowerment of the provincial authorities and municipalities. More specifically, in response to the national development strategy (PARPA), the Ministry of Health designed the Health Sector Strategic Plan (PESS) for the years 2001-2010. The PESS is seen as a process by which the Ministry of Health defines and disseminates, in a transparent manner, its sectoral policies and main health objectives (MISAU, 2001). Through PESS, the Ministry of Health is adopting the Sector-wide Approach to Policymaking and Programming (SWAp), which illustrates its desire to assume leadership of the health sector in the country as a whole, including both the public and private domains.

The SWAp defines a method of working between government and development partners, a mechanism for coordinating support to public expenditure programmes, and for improving the efficiency and effectiveness by which resources are used in the sector (I.H.S.D, 2001). It aims at rationalising and improving the coordination of external assistance (i.e. donor support) (Cassels and Janovsky, 1998) and supporting the national government in reaching their development goals, defined by an appropriate institutional structure and national financing programme (Schreuder, 2002).

In May 2000, the Ministry of Health and its external partners (United Nations Population Fund, United Nations Children's Fund, United Nations Development Programme, Cuba, Denmark, Finland, Norway, European Union, Finland, Germany, Ireland, Netherlands, Switzerland, United Kingdom, United States of America and World Bank) signed a Code of Conduct as a

first step towards introducing SWAp to help provide direction in its implementation (MISAU, 2001).

Mozambique is seen as moving towards the model of multiple mini-SWAp with different “mini-SWAp” (for drugs, provincial health services and central support services), and these initiatives are in different stages of involvement (MISAU, 2002). An example of a mini-SWAp is the case of the “Drug Pool” (I.H.S.D, 2001) to create a pooling arrangement for the purchase of medicines, common auditing, administration, management and monitoring procedures. The constructive dialogue between the Ministry of Health’s Pharmaceutical Department and the donors established through this mechanism, is expected to build wider donor confidence in the Ministry of Health ability to lead a SWAp (I.H.S.D, 2001). However, recent evaluations have shown that the coordination of the donors by the Ministry of Health has rather been irregular and ad hoc (Chabot, Heldal and Zorzi, 2002; Dgedge et al., 2003). Furthermore, the effects of such approaches are seen as being negligible when analysed in the context of peripheral health facilities, mainly because the existing information systems are unable to provide the picture in a comprehensive and integrated manner.

The current strategic framework recognises that the health sector has been performing inefficiently over the past decades due to various managerial constraints, such as availability of people with qualified skills, drugs, poor infrastructures and the high burden of diseases. To try to bridge these resource and managerial gaps, various donors have enrolled themselves with national partners. However, their programmes focused on disease-specific efforts have contributed to a fragmentation of the sector, with performance inequalities in different health programmes and little or no collaboration or cooperation between them (MISAU, 2001). SWAp, while theoretically being seen as the most appropriate mechanism for better collaboration with external and internal partners, in practice its benefits are yet to be fully realised.

In addition, and as part of the PESS, the Ministry of Health has developed an “updated” Human Resource Development Plan (HRDP+) and an Institutional Development Plan (PDI 2001-2003). Institutional development is considered to be crucial for the success and sustainability of national health

development. The Medium Term Expenditure Framework has also been prepared and linked to the PESS. Nevertheless, it is said that the PESS/PDI at the national level, remains quite general in defining the responsibilities linking the various departments in the overall institutional set-up, leaving room for the various actors within the Ministry of Health to continue operating as independent islands (Chabot, Heldal and Zorzi, 2002).

Under these health reforms, integration of various health programmes is seen as a key component of the government's health strategy. This strategy is reflected in the National Integrated Plan for Community Health and for Communicable Diseases. Theoretically, the integration approach comprises not only the Community Health and Communicable Diseases Programmes but also the various support systems like laboratories, information systems, drugs supply and distribution, training activities and financing mechanisms.

The National Integrated Plan for Community Health represents a complex process of change aimed at integrating the management of its diverse sub-components described above. On the other hand, the National Integrated Plan for Communicable Diseases has started recently in 1998, and includes some major disease programmes like STD/HIV/AIDS, TB/Leprosy, Malaria, Acute Respiratory Infectious, Vaccine Preventable Diseases (Measles, Diphtheria and Tetanus) and Diarrhoeal Diseases. However, this integration is not yet so evident on the ground, as the majority of the disease-specific programmes are still operating independently as before.

Additional forces being mobilised to combat the major communicable diseases are the Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria from Gates Foundation, the Clinton Foundation and the Roll Back Malaria (which is a global partnership between World Health Organisation (WHO), United Nations Children's Fund, the World Bank and United Nations Development Programme). The purpose of the Gates Fund is to attract, manage and disburse additional resources through a new public-private partnership that will make a sustainable and significant contribution to the reduction of infections, illness and death. The aim is to mitigate the impact caused by HIV/AIDS, tuberculosis and malaria in countries in need, and with it to contribute to poverty reduction as part of the Millennium Development goals

(The Global Fund to Fight AIDS Tuberculosis and Malaria, 2003). The Clinton Foundation's aim is to substantially expand the access of care and treatment to the people infected by HIV/AIDS. The foundation seeks \$330 million USD within five years from its partners (World Bank, PSM and NGOs) in order to cover 351,000 infected people of which 132,000 will receive the Highly Active Antiretroviral Therapy (HAART) (Republic of Mozambique and Clinton Foundation, 2003). The Mozambique Roll Back Malaria programme, launched in 1999, aims at reducing mortality and morbidity attributed to malaria, specifically amongst children under five years of age and pregnant women (MISAU, 1999).

As mentioned in the following sub-section, the performance of these programmes is also being shaped and influenced by external aid agencies, specifically in the design of the health policy and its implementation.

2.2.3. Influence of aid dependence and donor practices on the current health policies

Mozambique has been experiencing a significant degree of aid dependence from external donors to finance the external trade deficit, as well as the state budget. This subsection describes some of the implications of the chronic dependence on donors in the health sector, particularly in creating a government vulnerability to donor pressures (Batley, 2002; Pavignani and Hauck, 2001; Pavignani and Durão, 1997).

Aid dependence at the height of the civil war and economic crisis in the early nineties accounted for more than 100% of the GDP. Despite this having fallen to 30% of the GDP by the late nineties, Mozambique has still remained the largest single recipient of foreign assistance in Africa (Batley, 2002; Technical Advisory Group, 1998), accounting for more than half of the total public spending and currently about two-thirds of public investment. Within the health sector, the extreme external dependence is a historical legacy since the war period in the 1980s, where emergency interventions were performed by external agencies and NGOs. The health sector was fragmented along vertical lines as projects and programmes proliferated, becoming largely

dependent on external aid for its basic functioning (Frieden, 1991). The Ministry of Health's capacity to directly access external resources decreased as many players such as the UN agencies and NGOs, mediated between the recipients and donors. The whole procurement cycle for most equipment and drugs, and the contracting of technical assistance were left to offices outside the Ministry of Health.

The structure of the Ministry of Health has been described to operate in an isolated top-down manner, from the central level, through the provinces to the district level. Ministries are themselves divided into national directorates that cannot easily be integrated by the Minister and whose separation is magnified by independent donor funding (Batley, 2002). For example the current Minister of Health in an interview paraphrased by Batley (2002) said that:

"The ministry was a ministry of projects' rather than a Ministry of Health. This led to confusion. Officials lacked clear direction. They dealt with different donors and owed their loyalty to the donor, competing with each other to keep certain teams of individuals around certain projects, receiving differential and unknown top-ups from different donors (even now). The demands are on the few qualified staff to serve particular donors, to follow their routines, to ensure that the donor's money goes to what donor requires. ...Even now in the provinces it is common to hear people say 'this is a Country X project, while this is Country Y's. This is an issue of symbolic importance, undermining the sense of nationhood and weakening the sense that issues are a matter for government. Government is frequently seen as the problem while donors are the solution" (Batley, 2002, Box 3, p.20).

Notwithstanding, the Ministry of Health has recognised the need for effective coordination of donors support through a unit known as GACOPI (in its Cooperation Department), which has however proved to be a very complex task. First, negotiations are usually bilateral between the Ministry of Health and agencies. The most relevant discussions take place within technical departments or programmes (e.g. Tuberculosis programme within National Directorate of Health for Communicable Diseases), where professionals come together and agree on the contents of the proposal. Second, the Cooperation Department functions primarily as a clearance body. Proposals are developed elsewhere (mainly outside the Ministry), and submitted only for formal approval. Cooperation agencies and NGOs usually have to take the initiative

in identifying intervention areas and drawing up various proposals. Only occasionally is the Ministry of Health successful in preparing its own proposals which are to be submitted to cooperation agencies for funding and implementation. Monitoring, follow-up, and even changes to the project contents are usually managed by technical departments. Consequently, the Ministry of Health is generally seen as a composite organisation (or set of agencies), needing internal coordination if external coordination with donors is to be effective. Often, the Ministry of Health departments and officials appear to be pursuing their own agendas with particular agencies, hindering coordination as a whole (Pavignani and Durão, 1997).

The Ministry of Health receives a substantial contribution (in grants and loans) from the international community, estimated at 50% of the total recurrent expenditure and more than 90% of the capital expenditure. The budget to support the health sector comes through the Ministry of Planning and Finance, therefore entering the general state budget. About 60% of the general state budget is financed by donors through the system of counterpart funds. Additionally, there are budgets that are given in the form of earmarked support to specific projects (Pavignani and Durão, 1997).

So, in general, external resources enter the system through two main modalities: counterpart funds resulting from programme aid, and project or sector aid (see Figure 2.3 below). The former, a part of the structural adjustment programme, consists of debt relief, commodity import support, and foreign currency donations, all of which take the form of generic budget support. The latter is earmarked for special purposes or sectors and is managed by special implementation units, under joint donor-government or only fully donor control.

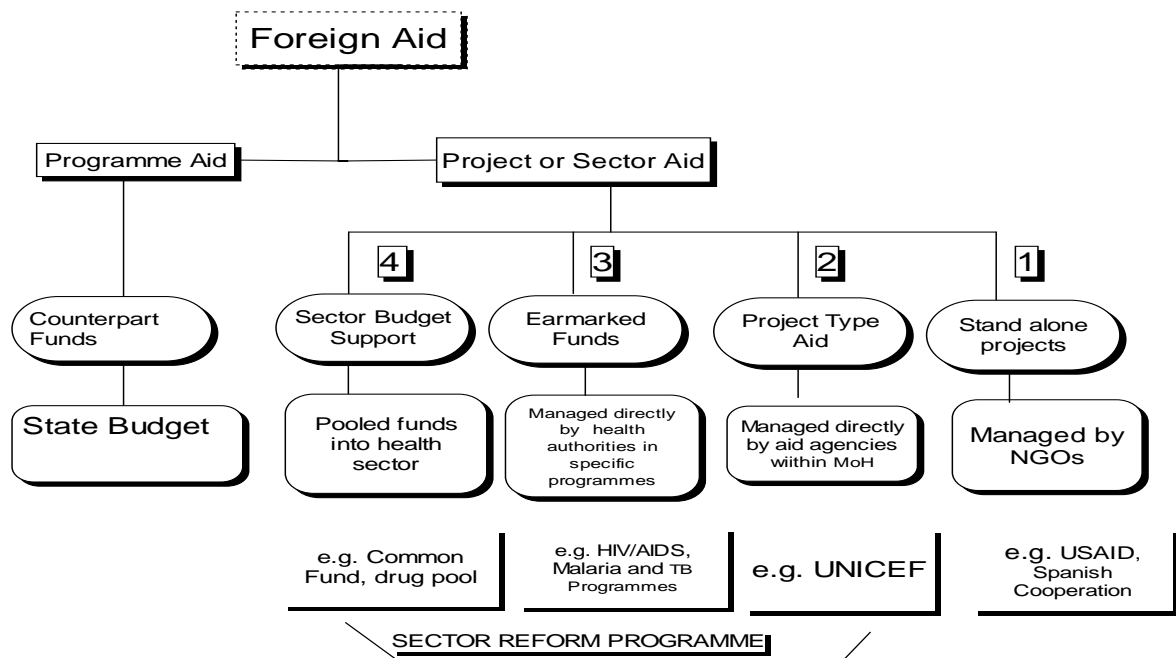


Figure 2.3 - Diagram showing external resource flows
Adapted from: Pavignani and Durão 1997 and I.H.S.D 2001

Project and Sector aid patterns vary enormously, from stand alone projects to sector budget support (Figure 2.3), here divided into four categories. (1) Stand alone projects, donor-funded, completely outside the government sectors reform programme. The donor funds are fed into project accounts accessed only by an intermediary agency which is accountable to the donor (e.g. NGOs projects). (2) Project Type aid, donor-funded activities to support government sector policy framework but are managed by the state as projects (e.g. relying on donor management systems, reporting, contracting, etc). (3) Earmarked funds, donor(s) funding support(s) government sector policy framework. Financing through dedicated accounts with conditionality agreements linked to their release (e.g. drug pooling mechanisms, donor support to TB, malaria, HIV/AIDS programmes). (4) Finally, the sector budget support, where donors provide sector budget support pooled with other donors. Some pre-conditions may apply to the release of funds. Increased reliance on common procedures, e.g. appraisal, reporting, monitoring and evaluation, and joint review processes as it is now in the drug pooling mechanisms (Pavignani and Durão, 1997; I.H.S.D, 2001).

The donor community is very diverse (Pavignani and Hauck, 2001) ranging from the reform-oriented 'like-minded' agencies such as Ireland, the Netherlands, the Nordic Countries, Switzerland and the United Kingdom, to those that prefer to act in isolation through their own NGOs such as USAID, Germany, France, Japan and the Southern Europeans. The United Nations agencies, the European Union and the World Bank actively participate in SWAps, although independently from other aid agencies.

The heavy donor dependence, the recurrent natural calamities, the inadequacy of resources and technical skills, and the limited control over events experienced in the past have deeply shaped the national health policy, and contributes to a high degree of opportunism with respect to foreign aid by both donors and national stakeholders. The opportunism leads to a situation in which donors actively influence the formulation and implementation of national health policy, with particular effects on the integration efforts of the health services and their associated information systems.

2.2.4. Empirical strategy

Of particular relevance in this thesis is the analysis of the multiplicity challenges associated with the integration of diverse information systems of three specific health programmes. In order to examine this, the strategy adopted was as follows: (1) To analyse each specific programme reporting system in terms of work practices and constraints, data quality and usefulness of data gathered for decision-making from the point of services delivery to the higher administrative levels; (2) To explore the tensions, conflicts, commonalities and interests among actors at district, provincial, national and international levels in the context of ongoing institutional transformation; and (3) To understand the extent to which the "functional integration" of health programmes is taking place. The points of services delivery selected were both the testing facilities (mainly clinical laboratories) and infirmaries in the district hospitals and health centres. The rationale for this was that district clinical laboratories generate vital data (case definition or confirmation) and the infirmaries deal with selected patients for special care. So, both directly

influence the functionality of the respective health programmes. Hence, these facilities were seen as the common shared starting point for the reporting system of all these disease programmes and consequently for clinical and epidemiological management. Data collection was conducted adopting the above described strategy. Further details of the empirical approach are described in Chapter four.

CHAPTER THREE

CONCEPTUAL FRAMEWORK

“The selection of given theoretical concepts is both a way of seeing and a way of not-seeing, since the use of a particular theory excludes other ways of viewing the same events (Walsham, 1993, p.70)”. Therefore, is not surprising that one can see limitations of the chosen ones.

3. CHAPTER THREE

CONCEPTUAL FRAMEWORK

The aim of this thesis, as discussed in the previous chapter is to understand the challenges of integrating health information systems related to different disease-specific health programmes within a developing country context.

This chapter is divided in two interconnected parts:

- A. *Literature review on integration.* The first part of this chapter reviews the debates concerning two relevant issues; the integration of health programmes and the integration of information systems. The former, concerns the debates within an international health care arena around the most appropriate way (vertical versus integration) to deliver services to the community in poor settings. The later, relates to the challenges experienced by organisations in integrating diverse and often disparate information systems. Taken together, these two aspects help to emphasise the need for a historically situated socio-cultural perspective on the challenges of integrating health information systems in low income countries.
- B. *Theoretical framework,* which is developed around three sets of conceptual linkages, namely: integration and organisational change, integration and rationalities and integration and representations. These concepts taken together help to unpack some of the dynamics underlying the complex problem of integration of health information systems.

3.1. Literature review on integration

3.1.1. Approaches to the delivery of community health care services

- ☞ *Should the interventions to reduce the specific and general disease burdens among the poor be delivered through an integrated approach or through separate vertical programmes?*
- ☞ *What are the advantages and disadvantages of each option?*
- ☞ *And what are the potential gains of a combined approach?*

These questions have been raised by various authors to debate the merits and drawbacks of organising health programmes under vertical or integrated approaches (Oliveira-Cruz, Kurowski and Mills, 2003; Brown, 2001; WHO, 1996; Mills, 1983).

Vertical approaches, also called *priority, categorical or stand-alone programmes* refer to the delivery of health services through largely free-standing programmes, designed to address a particular condition or disease with clear objectives, within a limited time frame.

“The ‘vertical approach’ calls for the solution of a given health problem through the application of specific measures through single-purpose machinery” - Mills (1983) paraphrasing Gonzalez (1965).

Vertical programmes date back from the 1950s, when they were applied to the control of various diseases like malaria, smallpox and sexually transmitted infections. Such vertical programmes were not necessarily confined to communicable diseases or to a single disease but also included control strategies which affected several diseases (e.g. immunisation) or provided a particular service (e.g. family planning, mother and child health, etc.). Vertical programmes could also refer to the activities of a particular health department or those taking place within a pre-defined geographical area (Mills, 1983).

Horizontal approaches, also known as *integrated health services or integrated programmes* constitute a delivery mode of health interventions

through the regular infrastructure of health services. WHO (1996) defines this approach as:

“the process of bringing together common functions within and between organisations to solve common problems, developing a commitment to shared vision and goals and using common technologies and resources to achieve these goals (p.4).

The ideal example of integrated services was formally launched by the WHO Alma-Ata declaration in 1978 (see Box 3.1). The aim was to promote comprehensive ‘Primary Health Care’ services which were fully integrated under the management of a district health team, led by a district health manager, in order to make the most efficient use of ‘scarce’ resources.

Box 3.1 – The ‘Primary Health Care’ Approach (Declaration of Alma-Ata, 1978)

Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.

However, the implementation of this ambitious Primary Health Care approach was soon undermined by the economic crisis of the early eighties, especially in poorer countries. Hence, to prioritise health care interventions, WHO promoted alternative modes of providing integrated programmes, namely ‘Selective Primary Health Care’ approach (e.g. Expanded Programme of Immunisation) and ‘Packages’ of health policies and services such as Essential Services Package Reproductive Health; Essential Services Package Health Services and Integrated Management of Childhood Illness, which address various priority conditions (Brown, 2001; Oliveira-Cruz, Kurowski and Mills, 2003).

Vertical or integrated approaches have a range of advantages and disadvantages (see Table 3.1) that have raised debates concerning the most appropriate approach to follow in a given setting.

Table 3.1 – Advantages and disadvantages of vertical and integrated programmes

Advantages Vertical Programmes	Disadvantages Vertical Programmes
<ul style="list-style-type: none"> - May set clear objectives and targets which motivate those working on the programme; - Operational planning of activities may lead to more efficient and effective delivery of the service; - May provide performance incentives leading to higher quality of care; - Ability to monitor the restricted outputs and outcomes related to the programme may improve identification and resolution of problems. 	<ul style="list-style-type: none"> - May concentrate resources on a limited range of problems, detracting from development of comprehensive health systems; - Heavy dependence on donor funding with consequent sustainability problems and vulnerability to changing fashions in donor policy; - Single-purpose structure parallel to the general health service, with budget controlled and targets set from above rather than by health authorities; - May overload grassroots health services with many uncoordinated tasks, training programmes and reporting systems, usually determined by the central level of the health system; - Cost effectiveness may reduce as time goes on; - May fail to mobilise sustained political and community support because intervention is imposed from above.
Advantages Integrated Programmes	Disadvantages Integrated Programmes
<ul style="list-style-type: none"> - Allows delivery of a range of services selected to suit national health policies and local needs; - Incorporates inputs from different components of the health system and thus reflects the multidimensional concept of health; - Has the capacity to take on new activities and react to disasters; - Allows multipurpose use of resources, such as personnel, and allows more outputs to be achieved for a given input; - Allows planning and management of health services according to local circumstances with appropriate political, inter-sectoral and community involvement; - Makes it easier to respond to user needs, which saves time, and encourages personalised service and continuity of care and thus increases convenience and user satisfaction; - Allows a more holistic approach to health, centred on the health needs of individuals and communities. 	<ul style="list-style-type: none"> - May fail to set appropriate priorities; - May fail to adopt a programming approach, with clearly defined objectives, targets, operational planning and monitoring by outputs/outcomes; - May fail to achieve the levels of output and impact in key health care areas that would be reached by single-purpose programmes; - May cause uncertainty and dissatisfaction among health service employees if adequate explanations and reassurances are not given.

Source: WHO (1996)

Arguments against integration are concerned with the threats created to the objectives of vertical programmes. Gounder (1998), argues that the full integration of vertical programmes can potentially weaken the goals of single programmes and hamper their effectiveness. One example is the failure of

tuberculosis control in Zambia after its integration, within this scope Brown (2001) writes:

“The recent state of tuberculosis control in Zambia paints a bleak picture of a health priority which is suffering from its integrated status. The National Tuberculosis Review found that: (i) Tuberculosis focus has been lost and key activities of tuberculosis control such as reporting and recording, patient follow up and treatment outcome monitoring were not being performed in the majority of districts; (ii) Technical capacities for tuberculosis diagnosis including laboratory microscopy had dwindled both at central and district/peripheral levels; (iii) Funding for tuberculosis control activities including drugs and laboratory supplies was been inadequate; (iv) Procurement of anti-tuberculosis drugs had since 1998 been on emergency basis leading to erratic supplies and shortages; (v) No laboratory supplies have been procured since 1997. The health management information system was inadequate to monitor and evaluate key tuberculosis control activities” (p.9).

In spite of the concerns related to the potential detrimental effects on objectives of vertical programmes when merged into horizontal services, there have nevertheless been some examples of successful integration of control programmes (Brown, 2001; Oliveira-Cruz, Kurowski and Mills, 2003).

“In the region of Gizan in Saudi Arabia, a schistosomiasis control programme, once integrated into primary health care services, was able to maintain the prevalence of infection at a very low level (<1%) and in some areas the infection was reported to have been eradicated (Ageel and Amin, 1997). A further illustration of integrating a schistosomiasis programme in Peri-Peri, Brazil, where it was shown that the management of the control measures at the municipal level was as effective as under a vertical programme (Coura Filho et al., 1992). And in rural South Africa, the integration of vertical tuberculosis services into the district health system was described as being feasible and highly cost-effective (Wilkinson, 1999)” (Oliveira-Cruz, Kurowski and Mills, 2003, p.78).

In Ghana, the influence of integration has also been described to have brought some gains:

“... [the] DPT-3 [i.e. Diphtheria, Pertussis and Tetanus] drop out rates have fallen and coverage has increased, from 51 per cent in 1996 to 71 per cent in 1999. Measles coverage and drop out rates have also improved. Ante-natal care has been increasing. And the proportion of deliveries supervised by trained personnel (including traditional birth attendants) was increasing” (Brown, 2001, p.8).

Usually, characteristics of vertical programmes, such as having specific objectives, clear schedules of work, operating with well-defined techniques and under frequent supervision have been argued to result in efficiency gains (Mills, 1983). In addition, these programmes are often driven by donors like UN agencies or national governments, implying that in many cases extra funds are made available, earmarked for a specific disease control programme or intervention. Such availability of funds creates the potential to attract highly qualified personnel. In contrast, integrated services tend to be characterised by shortage of essential drugs, irregular or insufficient funds, lack of adequate staff training, and infrequent supervisions. These factors contribute to ineffectiveness of the integrated programmes, a pattern that is common in many aid-dependent countries (Mills, 1983).

Oliveira-Cruz, Kurowski and Mills (2003) argue that the dichotomy between vertical and horizontal is not as rigid as it may seem in theory.

“The degree of verticality or horizontality of the delivery of different types of interventions can be influenced by factors such as internal organisation and structure of the health system, for instance levels of decentralisation; health system capacity and dependence on donor support for funding of basic infrastructure; demographic and epidemiological profile; and international priorities and politics” (ibid. p.70).

Verticality or horizontality of a health intervention should not be treated as a dichotomy but as a continuum (see Figure 3.1), ranging from a vertically managed and delivered programme such as ‘Polio Eradication Initiative’ to a fully and comprehensive ‘Primary Health Care’ approach.

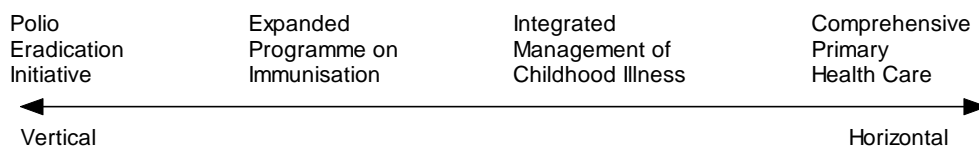


Figure 3.1 - The flexible relationship of health service delivery programmes (a continuum)
Source: Oliveira-Cruz, Kurowski and Mills (2003).

Currently there is a global trend, backed by major actors such as World Bank, International Monetary Fund and WHO, towards the integration of the vertical programmes into larger sector or sub-sector programmes, which are often named SWAp – Sector Wide Approach programmes (see Box 3.2). A SWAp project implies developing a common vision and setting priorities for

resource allocation amongst different health programmes. It aims at rationalising and improving the coordination of external assistance (i.e. donor support) (Cassels and Janovsky, 1998) and at supporting national governments in reaching their development goals, defined by an appropriate institutional structure and national financing programme (Schreuder, 2002).

Box 3.2 - Definition of the Sector Wide Approach (SWAp)

The sector wide approach defines a method of working between Government and donors, a mechanism for co-ordinating support to public expenditure programmes. The defining characteristics are that:

- All significant funding for the sector supports a single policy and expenditure programme;
- Government provides leadership for the programme;
- Common implementation and management approaches are applied across the sector by all partners;
- Over time, the programme progresses towards relying on Government procedures to disburse and account for all funds.

Source: Brown (2001)

Table 3.2 presents a matrix of four different possibilities arising from the interplay between donor funding mechanisms and the implementation strategies towards integration. The ultimate goal of integration is that all delivery systems should be national and all funding from donor partners for those systems should be un-earmarked budget support (i.e. they should fall into the cell labelled '4' in the Table 3.2). However, the practice is rather different. Brown (2001, p.3) argues that the three countries reviewed in his study (Ghana, Zambia and Bangladesh) were all evolving their SWAps and therefore the degree of integration in each place varied largely, and even within each country and also across different activities. For example, in Ghana many programmes still received elements of earmarked funding and were partially vertical in implementation (e.g. Expanded Programme of Immunisation) but may be regarded as integrated into the SWAp in so far as they are clearly factored into the annual Programme of Work (ibid. p.3). Many public health programmes e.g. tuberculosis, HIV/AIDS, guinea worm were moved from 'earmarked funding, vertical delivery category' on the matrix but in practice continued to receive some elements of earmarked funds to support specific activities (e.g. HIV/AIDS surveillance). Therefore they are still partially

in the 'earmarked funding, vertical delivery category'. There were variations across administrative levels, for example malaria, despite being in the 'pooled funding, integrated delivery category' for district level, had a vertical/earmarked programme management structure at the national level (ibid. p.3).

Table 3.2 - 'Integrated' funding and implementation options

		Donor funding arrangements	
		<i>Earmarked</i>	<i>Pooled</i>
Implementation arrangement	<i>Vertical</i>	1 earmarked funding, vertical delivery	2 pooled funding, vertical delivery
	<i>Integrated</i>	3 earmarked funding integrated delivery	4 pooled funding, integrated delivery

Source: Brown (2001)

3.1.2. Implications of the vertical-horizontal debates on information systems integration

Given the capacity constraints of existing health services, especially in low income and high aid-dependent countries, there is a need to concentrate resources on a limited set of programmes or activities (e.g. 'Packages' of health services) oriented to priority interventions. There is thus the need to rely on vertically delivered programmes. However, the longer-term perspective emphasises the importance of strengthening the health systems to a level such that most interventions can be delivered in an integrated way. This integration requires education and training, strengthening of management and information systems, and the development of a sense of ownership in communities and health workers (Oliveira-Cruz, Kurowski and Mills, 2003). A local health service can therefore continue to have vertical or special programmes where and when required but, at the same time, this emphasises the need for an integrated service with the capacity to sustain the activities of the vertical programmes in the long term. In theory, the two approaches need not to be mutually exclusive, but complementary (WHO, 1996). However, in practical terms the implementation of these modes in a synergistic way has shown to be complex, conflicting and challenging. It often

happens that vertical programmes oppose the integrated approach to health care delivery, contributing to a state of fragmentation, redundancy and multiplicity of (information) systems. We argue that one key aspect of conciliating these approaches includes the subsequent need to strengthen and reframe the existing diverse health information systems. For these to happen effectively, some lessons from attempts in integrating information systems in large organisations can be useful.

3.1.3. Challenges of information systems integration in organisations

Integrating heterogeneous data sources is a fundamental problem in information and database management systems, and has been a topic of research over the last two decades (Mykkänen and Korpela, 2003).

Organisations, both for-profit and not-for-profit, typically experience multiple challenges as they attempt to progress from stand-alone systems to an 'organisation-wide' integration approach. These challenges include changing organisation environments, processes, data and applications, data flow, technology as well as support mechanisms. Research has established that information systems integration is not simply a technical – rational process of “solving problems”, but involves important economic and political processes in articulating interests, building alliances and resolving conflicts over shaping outcomes (Webster, 1995).

Several approaches have been used for integration all around the world, including Electronic Data Interchange (EDI), Enterprise Application Integration (EAI), Business Process Reengineering (BPR), Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), technologies for data warehousing and e-commerce. All these approaches seek to rationalise the organisation and the information systems, with the espoused aims of enhancing quality and speed of services, avoiding fragmented and redundant work processes. Integration of these diverse and fragmented information systems, usually seen as a core requirement for better effectiveness of large corporations, is often portrayed as a relatively

solvable minor technical issue. This technical focus has led to minimal gains been achieved in practice. Currently, there is a widespread recognition within information systems communities that such change process is challenging and involves both technical and organisational issues (Davenport, 1998; Mabert, Soni and Venkataramanan, 2003). The relatively simplistic approach to develop technical solutions was also reflected in early research in this area which tried to identify success factors. Such approaches have been criticised by researchers that humans do not always act in rational ways (Feldman and March, 1981) and that political processes in the organisations are important (Webster, 1995).

Challenges related to information systems integration are illustrated through the following four examples.

- ✎ The first example is from Webster (1995) concerning the dichotomy in the use of EDI in the supply chain. Powerful users, both politically and economically, such as the major UK motor manufacturer, unilaterally imposed their own in-house computer systems or information handling practices upon their trading partners. They did this by extending their own hardware systems into their suppliers' premises, dictating product and inventory coding and data handling procedures according to their own established in-house information systems and standards. As a result they achieved information sharing through relationships of domination, coercion and subordination rather than partnership and collaboration.
- ✎ The second example is of Rolland and Monteiro (2002)'s description of an extensive case study of an integration project in a global ship classification company. The ship surveyors' work practices around the world needed to be standardised and supported by a new system, including one common database. However, exactly because the system was integrated, the local changes and workarounds did not just stay local, but propagated throughout the network and had "global" consequences. This had the effect of partially undermining the central standardisation attempts, and leaving the enterprise with a less than "perfectly integrated" information system.

- ✎ The third situation is provided by Lee and Madnick (1992) citing Argyris and Schön (1978), in which an international bank attempted to install integrated information systems for letters of credit, accounts procedures, and reports across geographical boundaries. It ended up developing and redeveloping some fifty different information systems.
- ✎ The fourth example is regarded to the integration of various hospital information systems (e.g. patient administrative systems) with the ongoing introduction of electronic patient records systems in Norwegian hospitals (Monteiro, 2003). The integration of different information systems modules are creating tensions around the level of autonomy that should be granted to these different systems. Over time, the autonomy of the non electronic patient records modules is eroding as the vendors of the electronic patient records are also developing modules for patient administrative systems (ibid.).

In summary, integration of information systems as demonstrated by information systems researchers is an extremely complex task and full of surprises. From the examples above, we see that some of the complexities are contributed to by the following conditions:

- ✓ Tensions between standards and local adaptations;
- ✓ Asymmetrical power inter-organisational relationships;
- ✓ Divergent agendas and interests of multiple actors;
- ✓ Intra-organisational conditions including a blend of institutional, technological, socio-economic and cultural factors.

While the findings of information systems research sensitise us to the problems of integration, they however cannot just be taken directly into our problem domain. There are additional complexities arising from the particularities of the public health domain, the particularities of diseases addressed, the involvement of donor agencies, the constrained settings of developing countries and various other contingencies. Thus, to understand the complexities of the problem domain there is a need for additional analytical concepts, as described in the next section.

3.2. THEORETICAL FRAMEWORK

After having described the context of the problem of integration including debates over the most appropriate approach (vertical versus horizontal) to deliver health services, we have analysed the challenges and complexities of integrating disparate information systems in large organisations. Theoretically, we analyse the challenges of integration of information systems of disease-specific health programmes in relation to three sets of conceptual linkages (see Figure 3.2):

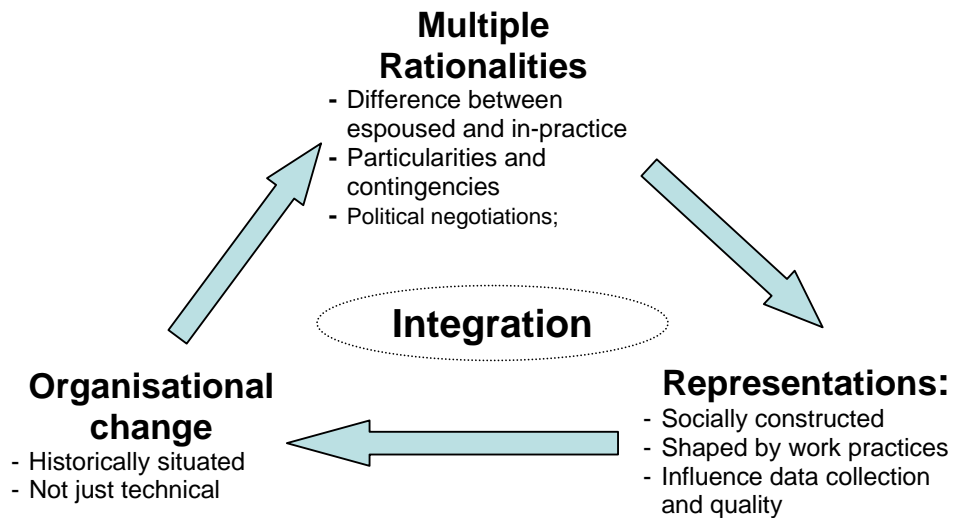


Figure 3.2 – The inter-linkage between the theoretical concepts

- i. Integration and organisational change – Integrating systems that have historically existed independently involves a process of change that extends beyond the technical to include aspects of institutions, people, culture and politics. The relation between integration and organisational change is examined in the specific context of the health sector in a low income country setting which have quite unique institutional conditions and demands.
- ii. Integration and multiple rationalities – Typically, the impetus for integration comes from top management with an espoused rationality that is primarily based on the quest for increased efficiencies – saving

time and money. However, attempts of integration at a practical level are challenged by the alternative rationalities on the ground, including, in the example of the health sector, the particularities of the diseases and the work practices of the users who are responsible for operating the health information systems. Understanding these multiple rationalities and how they simultaneously play out with each other provides insights to understanding the integration challenges.

- iii. Integration and representations – Since the aim of a health information system is to construct a required representation, for example of the prevalence rate of HIV/AIDS, the integration of multiple health information systems also require the integration of the representations themselves, associated with these various health information systems. For example, if there are parallel information channels to represent HIV prevalence rates, then an integration of these particular information systems require the representation to be also consolidated so as to get an overall picture of the prevalence of the disease. Understanding how representations are socially constructed, and how are the multiple representations that are associated with the different health information systems interact each other, provides further insights to the integration problem.

We discuss each of the above described three sets of linkages and also their inter-relationships. Taken together they help to develop an overall theoretical framework to analyse the challenges of integrating multiple health information systems within a developing country context.

3.2.1. Integration and Organisational Change

We adopt a social systems perspective in information systems implying a focus not only on the technology, but to include also the means by which people and organisations utilise technology, gather, process, store, use and disseminate information [United Kingdom Academy of Information Systems]. Thus the domain of this research involves the study of practices related to the

social and technological phenomena, which determine the development, use and effects of information systems in organisations and society (Ward and Peppard, 2002).

Over the years, information systems researchers have expanded this social systems perspective to include aspects of *context*, for example web models (Kling, 1986), of *processes* around the design, implementation and use of systems (Sahay, 1998), and the mutually shaping linkages that exist between content, context and processes of information systems (Walsham, 1993). Various theories from the social sciences have been drawn upon by information systems researchers, for example Structuration Theory (Giddens, 1984; Orlikowski, 1992), Actor Network Theory (Latour, 1987) and Activity Theory (Kuutti, 1991; Korpela, Mursu and Soriyan, 2001) to conceptualise, develop and empirically apply such a social system perspective to understanding the phenomena of information systems in organisations.

Using this perspective, the **content** of a health information system is seen as both constituting and constituted by its **context** and **social processes** around its design, implementation and use. The content may include data collection tools, reports, computer hardware, software, operating systems, etc. The social context includes social relations among human actors (e.g. health workers, health managers, planners, reformers, etc.) related to information systems, the social infrastructure and routines for its support (e.g. the administrative hierarchy for the information flows) and the history of previous commitments made in relation with the existing information systems. The social process considers the socio-cultural and political aspects that draw from and recreate their life world (e.g. language, tradition, values and political structure) (Walsham, 1993).

This social systems perspective is especially relevant in the case of developing countries which often have very unique contextual conditions as compared to those that exist in the Western world. For example, many developing countries experience a combination of multiple and complex constraining factors including high vulnerability and dependency on political rather than organisational power (Heeks, 1998), a high degree of external donor dependency (UNDP, 2004), constraints of human capacity (Martínez

and Martineau, 2002) and high cultural diversity (Atkinson, 2002; Figueras, Saltman and Mossialos, 1997). These conditions, and many others, contribute to highly fragmented health management information systems, mostly linked to specific vertical health programmes, characterised by excessive and uncoordinated data collection systems in health facilities (Braa and Blobel, 2003).

A social system perspective to analysing the phenomenon of health information systems related organisational change thus helps to move beyond a technologically deterministic approach of a causal relationship between information systems and organisational change, to see these relationships as being complex and being influenced and shaped by multiple processes including those related to history, culture, infrastructures and people. The above perspective helps us to develop deeper insights to understand the challenges of integration surrounding information systems in general and health information systems in particular.

In various developing countries, integration of health information systems is part of a larger organisational change programme initiated since the early nineties subsequent to the 2003 World Development Report⁵ (World Bank, 2003). Some significant changes attempted in many countries included *structural* reforms of health care services through decentralisation, privatisation, pooling of donor funds, and *process* related improvements including of logistics support and of the information basis of decisions (Atkinson, 2002; Heeks, 1998). However, these reforms have raised strong debates in international research that continue to be unresolved, mainly

⁵ The 2003 World Development Report (World Bank, 2003) examines the interplay between human health, health policy and economic development. The report advocates a shift in investment from specialised and tertiary services to the provision of a broad base of widely accessible care in community facilities and health centres, referred to as a minimum 'essential clinical package'. Thus, government emphasis should be to:

- ⌘ Ensure the provision of essential clinical care (pregnancy and family planning services, TB control, control of malaria, HIV, etc);
- ⌘ Disseminate health information (control of contagious diseases, hygienic practices...) and investment in scientific research;
- ⌘ Foster and manage private sector competition in the supply of health services and inputs;
- ⌘ Enforce adjustment policies that preserve cost-effective health expenditure;
- ⌘ Target the needs of the poor through investment in schooling and appropriate economic growth policies;
- ⌘ Decentralise management of the health sector to regional and district-level offices.

because the outputs are not readily visible and are long term in nature. In general, there continues to be a widespread failure of the health sector in delivering adequate services and also of adequate information systems in documenting the work processes (Gilson, 1995; Heeks, 1998; McLaughlin, 2001; Braa and Blobel, 2003). The following statement from one former Zambian Minister of Health reflects these continued failings:

“Specific reform strategies and policies were not yet resulting in improvements based on commonly used measures of service coverage. Thus, reform strategies and policies must be inappropriate and should be revised. ‘The reformers were unable to counter such a message because they had no data to back up their strategies or progress expected as a result of reform....’ (Extracted from McLaughlin, 2001, p.2).

The potential of information systems to strengthen processes of gathering, storing, analysing, sharing and using information as a basis for public sector reforms has been recognised by policy makers in most developing countries (Heeks, 1999; Braa and Blobel, 2003). Now, routinely health information systems efforts are found to be taking place being couched as components of larger projects for building health systems. Not all these efforts have resulted in the potential of health information systems being realised in practice, and end up as Heeks (2002) describes as “partial” or “total” failures. Various conditions have been identified to contribute to this lack of success, including the focus of some funding agencies (donors) on establishing computerised information systems for specific programmes accountability measures (McLaughlin, 2001), which tend to place an overemphasis on reform content, rather than process. This overemphasis has contributed to persistent implementation problems, including insufficient tracking of the effects of the reforms (Thomason, 1997).

Drawing from Orlikowski and Hofman (1997), we argue that the process of organisational change in public health settings should be seen as a combination of three types of *improvisational* change: anticipated, emergent and opportunity-based (see Figure 3.3). Anticipated change concerns events that are planned for the future, for example establishment of National Integrated Programmes or strategic frameworks to guide health policy. Emergent changes are those that arise spontaneously from local innovation and were not originally anticipated or intended. For example, in Mozambique

a programme called *SIMP* was locally developed through the initiative of a Dutch medical doctor with an interest in computer applications. Seeing the inadequacy of the existing legacy systems, he developed a simple database application that integrates data coming from the different health programmes and generates reports feeding some of the requirements of the national strategic framework. This application was not pre-planned or anticipated but emerged in response to local problems inherent in the national health system. However, whether *SIMP* has achieved this aim still remains open to debate. Opportunity-based changes are neither anticipated nor emergent but are introduced purposefully and intentionally during the change process in response to an unexpected opportunity. For example, new donor funds coming from Global Initiatives, like the Global Fund to fight HIV/AIDS, malaria and tuberculosis or the Bill Clinton Fund for HIV/AIDS antiretroviral drugs, are now posing new information requirements that were previously unexpected, and funds being earmarked towards it can also be used to improve the existing inefficient system.

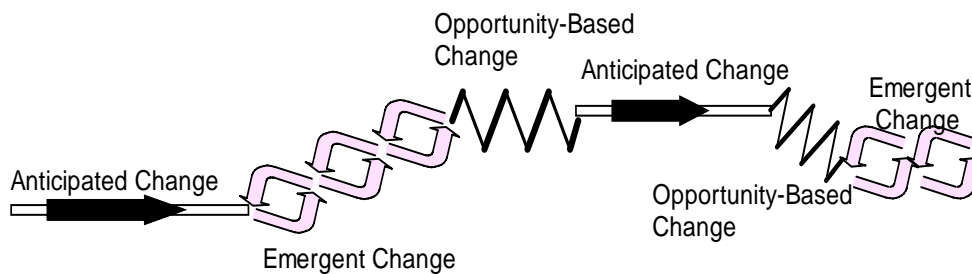


Figure 3.3 - An improvisational model of Organisational Change
Source: Orlikowski and Hofmann, 1997

The three forms of change often co-exist over time and are linked to both intra-organisational and broader social contexts. Change plans thus should not be viewed as a straightforward, rational process but as a complex, analytical, and political process that is historically situated (Walsham, 1993, p.53). Integration attempts of the kind we are studying tend to be typically treated as a rational, top-down and technically planned change, which marginalises the potential and contributions of emergent or opportunity-based change.

3.2.2. Integration and Multiple Rationalities

The above discussions which point out to the overemphasis on planned change, bring us to the questions of rationality which emphasises the relationship between means (for example, the integration of health information systems) and ends (for example, improved efficiencies in health care delivery).

The concept of rationality is 'vague' in it self, and has been a topic of extensive debate in various academic disciplines such as Sociology (for example, Weber, 1947, 1987), Philosophy (for example, Habermas, 1984), Organisational Studies (for example, Simon, 1957, 1982) and Information Systems (for example, Avgerou, 2002). Simon (1957, p.76-77) argues that a decision can reflect different forms of rationalities:

- ✓ A decision may be called "objectively" rational if in fact it is the correct behaviour for maximising given values in a given situation;
- ✓ It is a "subjectively" rational if it maximises attainment relative to the actual knowledge of the subject;
- ✓ It is "consciously" rational to the degree that the adjustment of means to ends is a conscious process;
- ✓ It is "deliberately" rational to the degree that the adjustment of means to ends has been deliberately brought about (by the individual or by the organisation).
- ✓ A decision is "organisationally" rational if it is oriented to the organisation's goals; and,
- ✓ It is "personally" rational if it is oriented to the individual's goals.

Within the context of health care sector reform, integration as proposed by managers, planners and reformers at both national (e.g. Mozambican health authorities) and international (e.g. the WHO, the World Bank) levels seeking to increase efficiencies of health care interventions, reflect a rationality that can be described as *formal* (Weber, 1947) or *instrumental* (Habermas, 1984) or *economic* (Simon, 1957).

Formal rationality refers to the calculability of means and procedures for achieving predefined ends. It is logical, rule-based and codified and usually governs the bureaucracies and administrative systems as ‘technically rational machines’ (Weber, 1978). Habermas (1984) further subdivided the Weber’s formal rationality into **strategic** (ends achieved by influencing others), **instrumental** (ends achieved according to technical rules) and **communicative** (ends achieved from inter-subjective relationships based on consensus reached through critical discussions). **Economic rationality** (Simon, 1957) reflects the logical consistency of goals and action to maximise benefits to the organisation, primarily valued in economic terms.

In integrating diverse health information systems of disease-specific programmes it is crucial not only to see this narrowed assumption of rule-based and techno-economic rationality but to also consider the values, contingencies, particularities of the local settings and also of the diseases that may be equally important. Techno-economic rationality thus needs to be complemented with considerations of *substantive* (Weber, 1947, 1987), *bounded* (Simon, 1957, 1982), and *territorial* (Lee and Madnick, 1992) rationalities.

Substantive rationality, an orientation to an absolute value standard, involves ‘a conscious belief in the absolute value of some ethical, aesthetic, religious, or other form of behaviour, entirely for its own sake and independently of any prospects of external success’ (Weber, 1947, p.115). In the context of health information systems integration, this would imply a consideration of values or value clusters that guide people in their daily lives, especially in their choice of means to ends rather than weighing trade-offs between available means and competing ends as is the case in formally rational behaviour – it is a “matter of value” instead of a “matter of fact”. We argue that emphasis should also be given to understand how a particular rational course of action satisfies the value choices of the planners, reformers, managers and health workers. The outcome of economic action is judged differently in relation to different underlying ends, which may be ethical, political power, social equity, etc. In substantive rationality, the economic

activity itself may be of secondary importance, or in conflict with the attainment of the social values of a society (Avgerou, 2002).

Integration, as we have argued above, needs to be conceptualised within the historical context in which it is situated. Such contextualisation can be described by Avgerou (2002)'s notion of **organisational rationality** as follows:

The recognition of multiple, historically based, substantive rationalities and congruent models of organising provides an orientation towards a non-universalist perspective in the study of information systems.... Rather than aiming to develop general knowledge and practice to a-contextual rules of rational behaviour, the recognition of differences in substantive rationality directs attention to local meanings and legitimate action (ibid. p.92-93).

There is also need to acknowledge the cognitive human limitation imposed by given conditions and constraints (e.g. lack of skills) in the process of integration – a state illustrated by Simon (1982)'s **bounded** or **situated rationality** as 'a style of human behaviour that is appropriate to the achievement of given goals, within the limits imposed by given conditions and constraints' (ibid., p.408). Health reformers are bounded by various constraints, for example, of bureaucratic and political structures, that constrain them from taking purely economical rational decisions.

To emphasise the role of political negotiations in the process of information systems integration, we draw upon the notion of **territorial rationality** suggested by Lee and Madnick (1992). The Mozambican National Health System is a large and complex organisation comprised of several directorates, sub-systems or health programmes, which in their turn encompass departments, sections at various administrative levels in between the individual and organisation as a whole. Each of these health programmes may be simplified according to strategic, managerial, functional and operational levels and represent **territorial entities**. So, the National Health System consists of several territorial entities that can be formed at a combination of different levels (hierarchical) and functions:

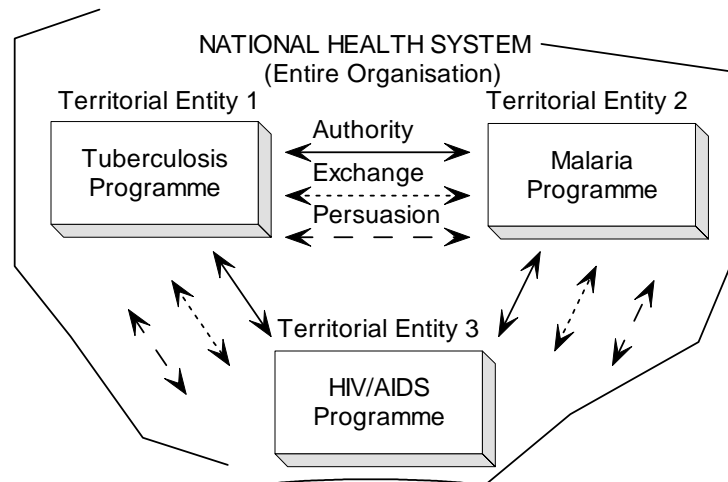
"[The] territorial entities are partly autonomous [within the large organisation, but] yet are interrelated, with each one setting constraints on the kinds of changes that it can cause to occur in other territorial entities. This does not mean that each entity is

mutually exclusive. An individual could be a member of multiple territorial entities. Such flexible boundaries explain why members of an organisation designated to share organisational goals, resources, information, and liability do not necessarily share all of these. What is more, there might be multiple territorial entities within an organisation. A territorial entity may not necessarily correspond to traditional sections or divisions” (ibid. p.227).

Three main characteristics of a territorial entity include: it is self-centred, aims at protecting its own socioeconomic and political position, and it has limited time span of interest (ibid. p.227). So, a territorial entity has *an independent decision-making capability, an internal or informal reporting system, resource and information sharing, and liability-sharing system*. These characteristics lead a territorial entity to inherit and to develop its own **territorial rationality**, that is, its own perspective for viewing problems and issues in question, which serves as a philosophical basis for a territorial entity to interact or make coalition with others (ibid. p.227). Thus, territorial rationality (which is a combination of techno-economic and socio-political rationalities) helps to provide a perspective for understanding decision-making and technical choices within a territorial entity.

Within the public health domain, tuberculosis and HIV/AIDS programmes for example, represent territorial entities with their respective funding arrangements and agendas. Political negotiations are required to integrate these territorial entities, which however is extremely complex given their historically existing territorial rationalities.

Lee and Madnick’s **transformational modes** help explain how these negotiations can take place in practice. Transformational modes of communication (Figure 3.4) represent three different kinds of power (authority, exchange and persuasion). *Authority* refers to the power inherited from the position a territorial entity has in relation to others (position-based transformation), *exchange* is seen as the power coming from the resourcefulness of a territorial entity (resource-based transformation). And *persuasion* refers to power based on the quality of information and knowledge-in-practice a territorial entity holds (information/knowledge-based transformation).



*Figure 3.4 - Transformational Modes - how one territorial entity communicates with other entities in order to make a decision - these modes influence the basic characteristics of the interactions among territorial entities.
Adapted from Lee and Madnick (1992)*

These three forms of power need to be negotiated in the process of integration of territorial entities including their information systems. Three interlinked issues are important in this regard:

- (i) The characteristics of the territorial rationalities held by the territorial entities involved;
- (ii) The combinations of the modes of transformations among the participating territorial entities; and
- (iii) The platform of the contending themes of territorial entities.

In summary, we have argued that multiple rationalities are important in information systems integration efforts (see Figure 3.5). Our understanding of the problem needs to go beyond merely considering techno-economic rationality to also including substantive and situated rationality, organisational rationality and territorial rationality.

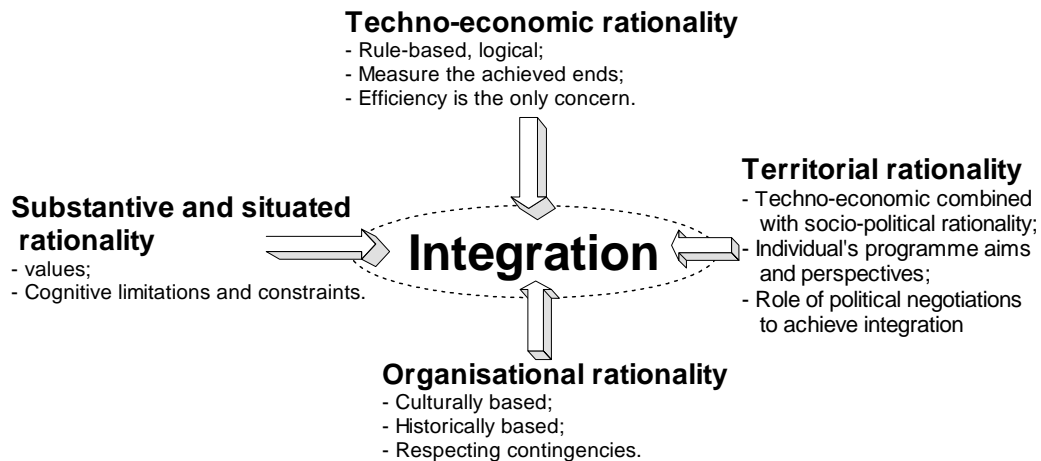


Figure 3.5 - Multiple rationalities' view for IS integration

3.2.3. Integration and representations

In this section, we attempt to build the conceptual bridge between work practices, information systems and integration through the concept of representations. The notion of representation has been of particular concern within information systems research and Science and Technology Studies (Latour, 1999; Sahay, 1998; Puri, 2003; Bowker and Star, 1999; Sachs, 1995; Suchman, 1995). We argue that one way of understanding the challenges of information systems integration is by examining how the diseases phenomena and key work practices are represented by health authorities. Information systems are used to construct these representations, and socio-technical influences on the design and use of information systems also affect the associated representations.

Representations are part of our day-to-day life. Everyday we use artefacts that refer to other objects or events that extract what is considered the most relevant characteristics of these objects/events, for a given end (e.g. money representing change value) (Bratteteig, 2004). Thus, representations stand-in instead of the object or event they represent, for example a map which is used to represent a particular geographical area (Puri, 2003).

Providing health services to the community and managing the respective services is constituted through multiple representations which vary with people, systems and levels. For example medical reports, laboratory reports, codes used for labelling test tubes, HIV testing pads, malaria or

tuberculosis slides, statistical reports and register books are all representations frequently used to share information about patient diagnosis, treatment and follow-up which are interpreted differently in a given context situated in time and space. Bratteteig (2004) gives an example of the use of Kardex as an important representation tool in patient care. Kardex is the patient record used by nurses to document key observations and evaluations during the patient's hospital stay, and thus provides a common source of information about the patients to multiple groups of people including doctors, nurses, physiotherapists and managers, who interpret the representation based on their respective needs.

The main motivation for integration disparate information systems concerns the improvement of monitoring activities being carried out in health facilities. In fact, an information system construction required by decision makers is the health indicator – which is a typical representation of the events in the health sector. Indicators are referred to the tools we use to convert day-to-day observations (e.g. cases of the diseases, resources usage, services coverage, etc. as related to the size of target population at risk of the event) into useful information for decision making and thus enabling comparison between different facilities or regions or countries. The health indicators stand-in to represent a given situation and thus can be used to measure change. Representations are created by actors (health workers or managers) in the service of particular interests and purposes specifically positioned to the work represented (Suchman, 1995; Kyng, 1995). Representations are fundamentally social constructions shaped by the work practices of health staff that take place within an institutional and historical evolution.

The ultimate end of establishing health information systems is to collect essential data at the facility and community levels to calculate the indicators, which represent how well the various programmes are performing. Activity data are collected about special programmes, routine services, and epidemiological events in addition to semi-permanent data (i.e. data that change more slowly) which comprise population and administration data.

For the health programmes in question in this study (Malaria, tuberculosis and HIV/AIDS), the selected key representations (e.g. prevalence

rates, treatment dropout rates, mortality rates, etc) are created through various information systems based upon data being routinely collected, interpreted and analysed to construct the representation. However, the construction of these representations is often shaped by social, political, economical and ethical aspects. Hence, the integration of these multiple health information systems requires the representations to be also strengthened so as to improve the quality of decisions. In the HIV/AIDS case discussed in this thesis, representations like the HIV prevalence rate are changed, knowingly or unknowingly at various levels of the administrative hierarchy through the operating networks constituted by people, artefacts, practices, values, contingencies and politics.

Despite the socially-constructed nature of the process of developing and using representations, a dominant techno-economic rationality prevails. Health indicators are taken as objective facts and reported in national and international documents, and masking the multiplicities of rationalities that shape its construction.

3.3. Summary

This chapter has reviewed the theoretical concepts and relevant literature related to integration of diverse information systems of disease-specific programmes in the context of ongoing reforms in a constrained setting. A conceptual framework has been derived from this analysis which includes the following features:

- Context of information systems integration;
- Integration and organisational change;
- Integration and multiple rationalities; and,
- Integration and representations.

The major theoretical issues addressed are summarised in Figure 3.6.

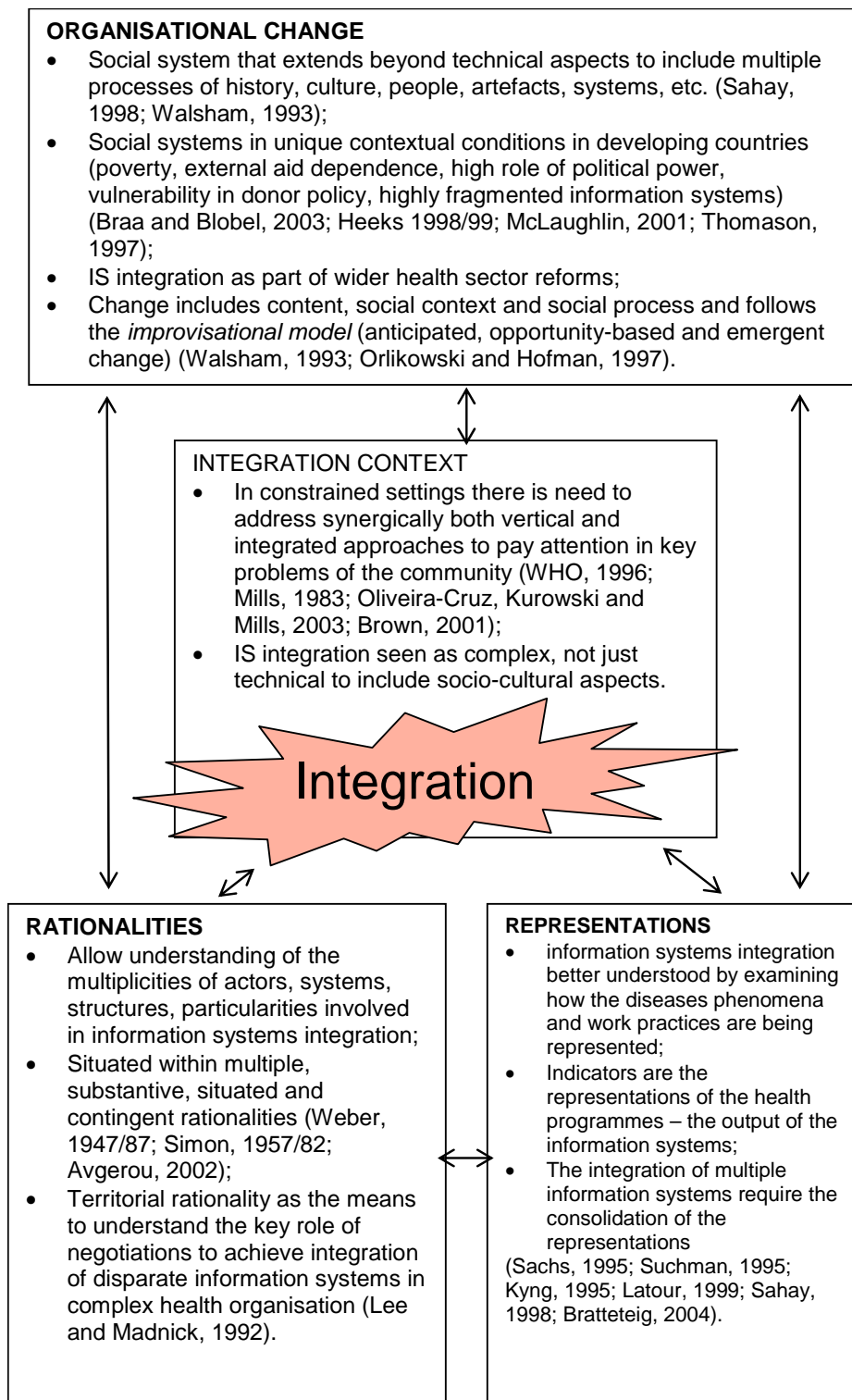


Figure 3.6 – Synthesis of the conceptual framework

CHAPTER FOUR

RESEARCH METHODOLOGY

All research is based on some basic assumptions or beliefs about what constitutes 'valid' research, what the 'underlying nature of phenomena' are and which research methods are considered appropriate to generate valid evidence (Myers and Avison, 2002).

4. CHAPTER FOUR

RESEARCH METHODOLOGY

In the previous chapter, the conceptual framework of the thesis was described, emphasising the theoretical concepts and literature relevant to the integration of diverse information systems of disease-specific programmes in the context of ongoing reforms in a constrained setting. This chapter discusses the research design and methods adopted. The chapter starts with the origin of the research by providing the background of the researcher to enable the reader to get more insight into the motivation of this research. It continues by providing the reasons of using qualitative research methods including the underlying interpretive philosophical assumptions. Details of the research setting and case study strategy adopted are then described. The chapter ends by presenting details of selection of research sites, data collection techniques and modes of analysis.

4.1. Origin of the research

The researcher is a Medical Doctor employed as a faculty member at the Faculty of Medicine – ‘Universidade Eduardo Mondlane’ in Mozambique. Since 2000, the *Health Information Systems Programme* (HISP) was situated within this faculty which gave the researcher the possibility to understand the aims of HISP, and then subsequently join it in 2000.

Within the umbrella of HISP, the researcher has been involved in a variety of activities including the development of software (*District Health Information System*) specifically in its translation and adaptation into the Mozambican context, and training of health workers and managers on the use of ICT and management of health information. This broad exposure helped the researcher to develop a general appreciation of the complexities in using information for public health management, and subsequently in defining the research problem of the thesis which is presented in this document.

The academic environment of the University of Oslo encouraged the development of a multidisciplinary perspective spanning primarily the domain of information systems and public health. The social science perspective to information systems studies adopted in this thesis has been nurtured through readings of various social-science theories and its applications, and through discussions with colleagues.

4.2. Qualitative research in information systems

Acknowledging the social character of the information systems research and the phenomena under study, this thesis mainly adopts **qualitative research methods**. Qualitative research (as opposed to a quantitative approach) was adopted because it is widely accepted within the information systems research community as being able to provide insights into information systems phenomena (Myers and Avison, 2002; Orlikowski and Baroudi, 1991; Walsham, 1995, 1993). In this thesis, it enabled the exploration of the social and cultural aspects related to the challenges of integrating diverse information systems of disease-specific programmes in a public health organisation embedded in a process of change.

Philosophically, the study follows the **interpretive approach**, which has increasingly been adopted in contemporary information systems research. This philosophical perspective is based on the constructivist paradigm that social theory should not be based solely on empirical observations stemming from general laws, but to understand the social, one should analyse the reasons for the action of an actor. In line with the interpretive approach, the case studies presented in this research 'assume that people create and associate their own subjective and inter-subjective meanings as they interact with the world around them' (Orlikowski and Baroudi, 1991, p.15). The interpretive approach adopts the position that our knowledge of reality is a process of social construction by human actors (Walsham, 1995). The researcher's role as an interpretivist is on attempting the difficult task of accessing other people's interpretations, filtering them through their own conceptual apparatus, and feeding a version of the events back to the informants (ibid. p.77).

In contrast to interpretive approaches, positivist studies attempt to test theory or hypothesis based on the ontological assumption that reality is objectively given and can be described by measurable properties, which are independent of the researcher and his/her instruments. The distinction between interpretive and positivist approach to research is summarised in Table 4.1.

Table 4.1 – Differences between interpretive and positivist research approaches

	Interpretive	Positivist
Ontology	✓ Empirical world is subjective, exists only through human social action;	✓ Empirical world is objective, independent of humans.
Epistemology	✓ Social reality can only be interpreted; aim at understanding meaning; ✓ Analytical generalisation (e.g. developing concepts, generating theories about phenomenon.	✓ Theory is true only if it is repeatedly not falsified by empirical events. ✓ Statistical generalisability.
Research methods and techniques	✓ Field (case) studies; ✓ Interviews, documents review; ✓ Observation, discussions...	✓ Sample surveys; ✓ Laboratory experiments; ✓ Questionnaires...
Modes of analysis	✓ Describe, interpret and understand the social world from the participant's perspective.	✓ Inferential statistics.
Role of researcher	✓ Never assume a value-neutral stance; ✓ Always implicated in the phenomena under study	✓ Impartial observer; ✓ Can comment on means; ✓ Cannot comment on ends; ✓ Position of value-neutral.

Based on Orlikowski and Baroudi (1991)

Figure 4.1 presents a diagram adapted from Walsham (1993, p.22) which outlines the research perspective adopted. The research draws on social theories (mentioned in Chapter three) that help provide the basis to develop the findings and implications of the study, which are respectively presented in chapters five and six. The focal level of analysis is the public health organisation in a low income country (Mozambique). The methodological approach is focused on explorations of the multi-level contexts of information systems (both computer and paper based), and the process of organisational change within which the information system is one (key) element. The research method used involves multiple case-studies of integration attempts of information systems related to programmes concerning Malaria, Tuberculosis and HIV/AIDS (ibid.).

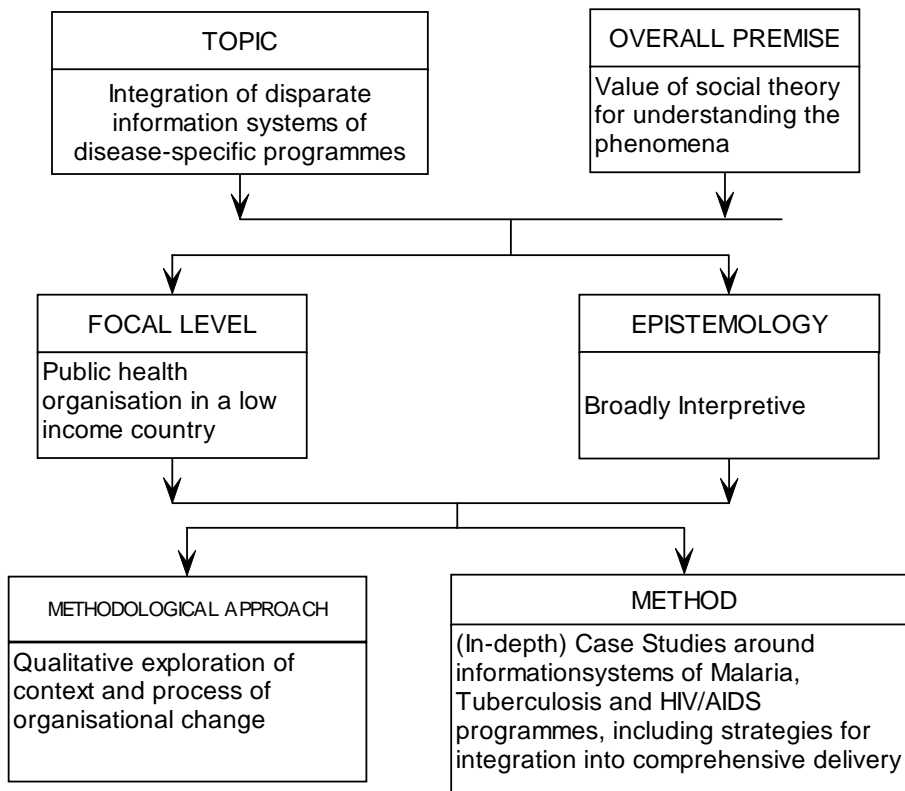


Figure 4.1 - Outline of the research perspective of the thesis
 Source: adapted from Walsham (1993, p.22)

4.3. Research setting and case study strategy

This research was carried out in a public health organisation, i.e. the National Health System of Mozambique. This organisation has for several years been attempting to implement various computer and paper based information systems aimed at monitoring the performance at the level of health care services delivery. As mentioned in Chapter two, the National Health System is comprised of heterogeneous actors, systems and programmes that are organised in different interconnected levels of hierarchy from the health facilities, to district, provincial and national directorates of health. This interconnection represents a complex 'network' of organisation that is now involved in the process of reforms characterised by attempts of decentralisation and re-organisation of health programmes through 'functional' integration that also implies the need for information systems redesign.

To examine the complexities of information systems integration of these health programmes, this research has adopted the interpretive case study method since it allowed the research to 'be carried out over a reasonably long period with the opportunity to directly observe the unfolding of events over time' (Walsham, 1993, p.14). Case studies can be positivist (Benbasat, Goldstein and Mead, 2002), interpretive (Walsham, 1993, 1995), or critical (Hirschheim and Klein, 1994) depending upon the underlying philosophical assumptions of the researcher. Case studies are seen as 'appropriate where investigators either desire or are forced by circumstances to (a) define research topics broadly rather than narrowly, (b) cover contextual and complex conditions and not just isolated variables, and (c) rely on multiple and not singular sources of evidence' (Yin, 2003, p.ix). The complexity of ongoing reforms, including the redesign of health programmes and information systems cannot be examined by placing clearly and predefined boundaries. The process involves multiple actors often with heterogeneous interests at various levels of the health administration stretching from the recipient of the health care services at the level of the community to the international donor community. A case study strategy was thus adopted to try and unpack some of the complexities surrounding the phenomena of integration.

The case study strategy adopted, concerned a comparative design including four districts of two southern country provinces of Mozambique over a period of approximately three years. The comparative strategy allowed the researcher to see patterns of events around information systems integration across districts, and how these are shaped by the similar context. An outline of the case studies conducted is depicted in Figure 4.2.

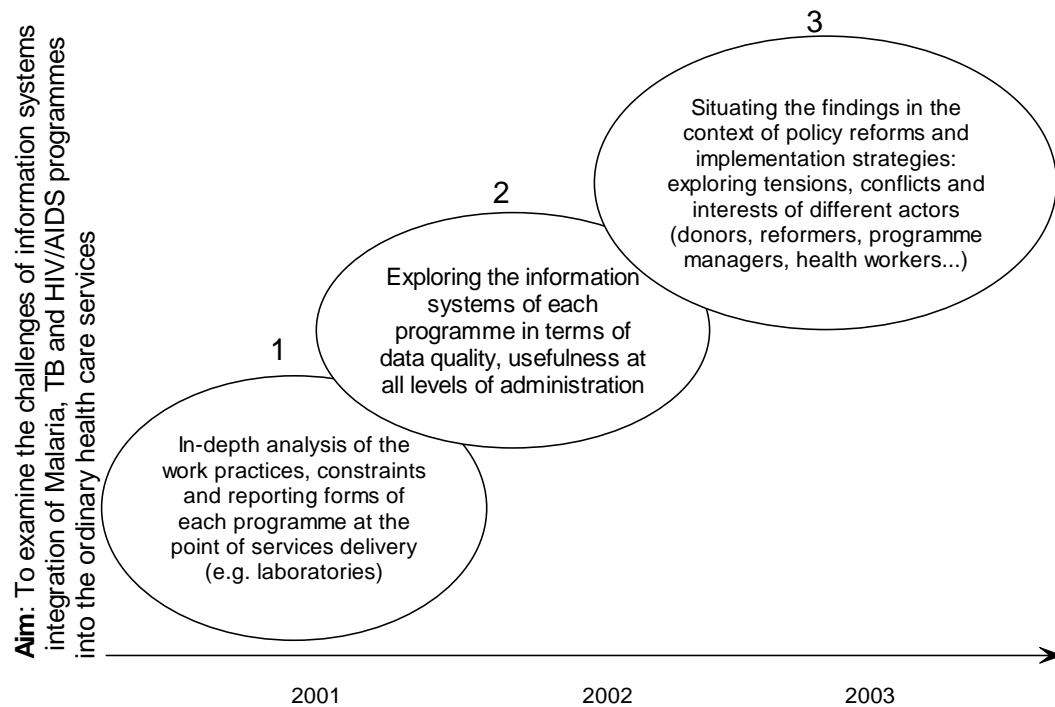


Figure 4.2 - Brief overview of the case studies undertaken over a period of three years

The specific research aim was to examine the challenges of information systems integration of Malaria, Tuberculosis and HIV/AIDS programmes with routine health care services. First, an in-depth analysis of the work practices was conducted at one common point of services delivery (clinical laboratories) including their existing contingencies and reporting discrepancies within and across different levels of the health administration hierarchy. Second, in order to get a better picture of the differences encountered in the first phase of the field research, individual information systems of the disease-specific programme was examined in terms of data/reporting quality at the different administrative levels (i.e. health facilities, and district, provincial and national directorates of health). Third, to help answering the ‘why’ questions, the findings from the first two stages were situated within the overall context of reforms, and the tensions and conflicts, between the interests of actors on the ground (health facilities, sub-districts and districts levels) and those at the top (provincial, national and international levels). This analysis helped to examine the existing “functional integration” of

health programmes and their information systems within the broader institutional context.

This study has sought to generalise the findings from multiple case studies to selected theories rather than from a sample to a given population or from experimental subjects to a theory. Walsham (1995, p.79-80) explains that beginning with the rich description of a case (in interpretive research), the researcher can generalise to concepts, to a theory, to specific implications, or to rich insights. Walsham provides instances of generalising from empirical statements (reflecting the observations made in a case study) to theoretical statements (concepts, theory, specific implications, and rich insight). In this research, an attempt has been made to develop rich insights of the integration problem. For example, in one of the case studies of this research, an empirical finding concerned the manner in which HIV prevalence rate was calculated. The theoretical concept of 'representations' was developed that can help to provide rich insights to examine information systems of other health programmes in other settings. Similarly, insights around multiple and territorial rationalities helped to further unpack the integration problem.

4.4. Selection of research sites

The study focused on two of the eleven Mozambican provinces both located in the south, namely Inhambane (in two out of fourteen districts of the province) and Gaza (in two out of eleven districts of the province). These two provinces were selected because they are the pilot provinces for HISP and included districts (Maxixe and Chókwe) that are training sites for medical students of the Eduardo Mondlane University. The maps provided of Gaza (Figure 4.3A) and Inhambane (Figure 4.3B), locate the specific field sites researched in the two provinces respectively. The empirical investigation was carried out in the health facilities, and district, provincial and national directorates of health. The facilities were selected in order to obtain a picture of the work practices of health workers and administrators surrounding malaria, tuberculosis and HIV/AIDS care mainly in the infirmaries and testing facilities which were the common shared points of service delivery of the

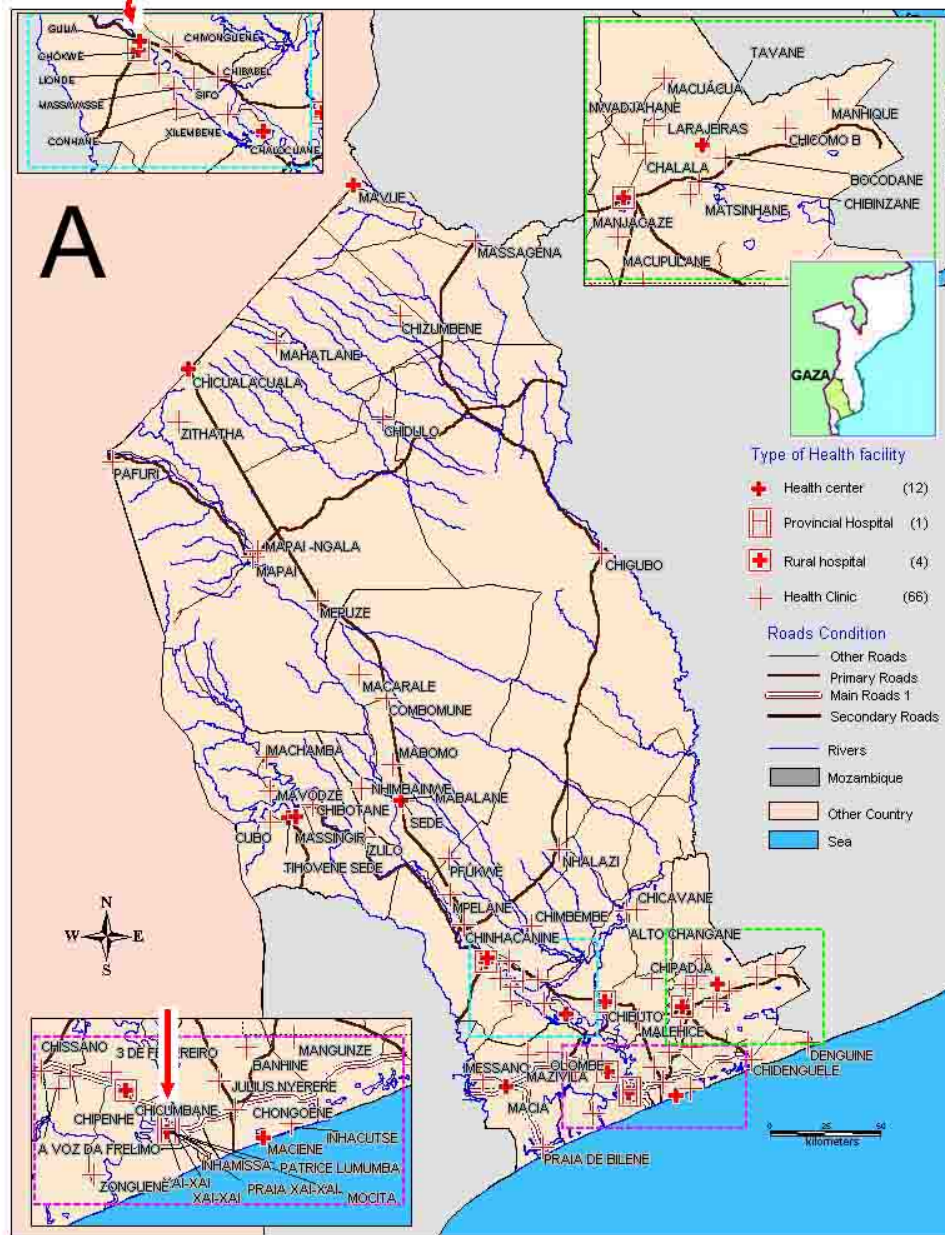
respective programmes. Particular focus was on understanding the information flows, i.e. how data were gathered first from selected health facilities (health centres and district hospitals), and its flow and quality in terms of completeness, correctness and consistency, from the district to the province and national levels. Another strategy in site selection was to explore both the rural (usually more distant to their district offices) and urban health facilities (usually more crowded) to analyse the variations and contingencies in terms of availability of resources and the demographic characteristics of the patients visiting the facilities.

The data gathering process was performed at four organisational levels, described as follows:

- a) Facility – Maxixe and Urbano health centres and Chicuque rural hospital in Inhambane province; Chókwe-sede health centre and Chicumbane and Chókwe rural hospitals in Gaza province⁶;
- b) District – health directorates of Maxixe and Inhambane-city in Inhambane province and Chókwe and Xai-Xai in Gaza province;
- c) Provincial – Inhambane and Gaza directorates of health; and,
- d) National – HIV/AIDS, Malaria and Tuberculosis Programme headquarters, Departments of Epidemiology and Endemics (National Health Directorate) and of Health Information (Planning and Cooperation Directorate).

⁶ To a lesser extent, exploratory study was also performed in Manjacaze rural hospital (Gaza Province), and Zavala and Inharrime health centres (Inhambane Province).

Research sites in Gaza Province



Produced by EHP/USAID (Aug 2000)

Research Sites in Inhambane Province

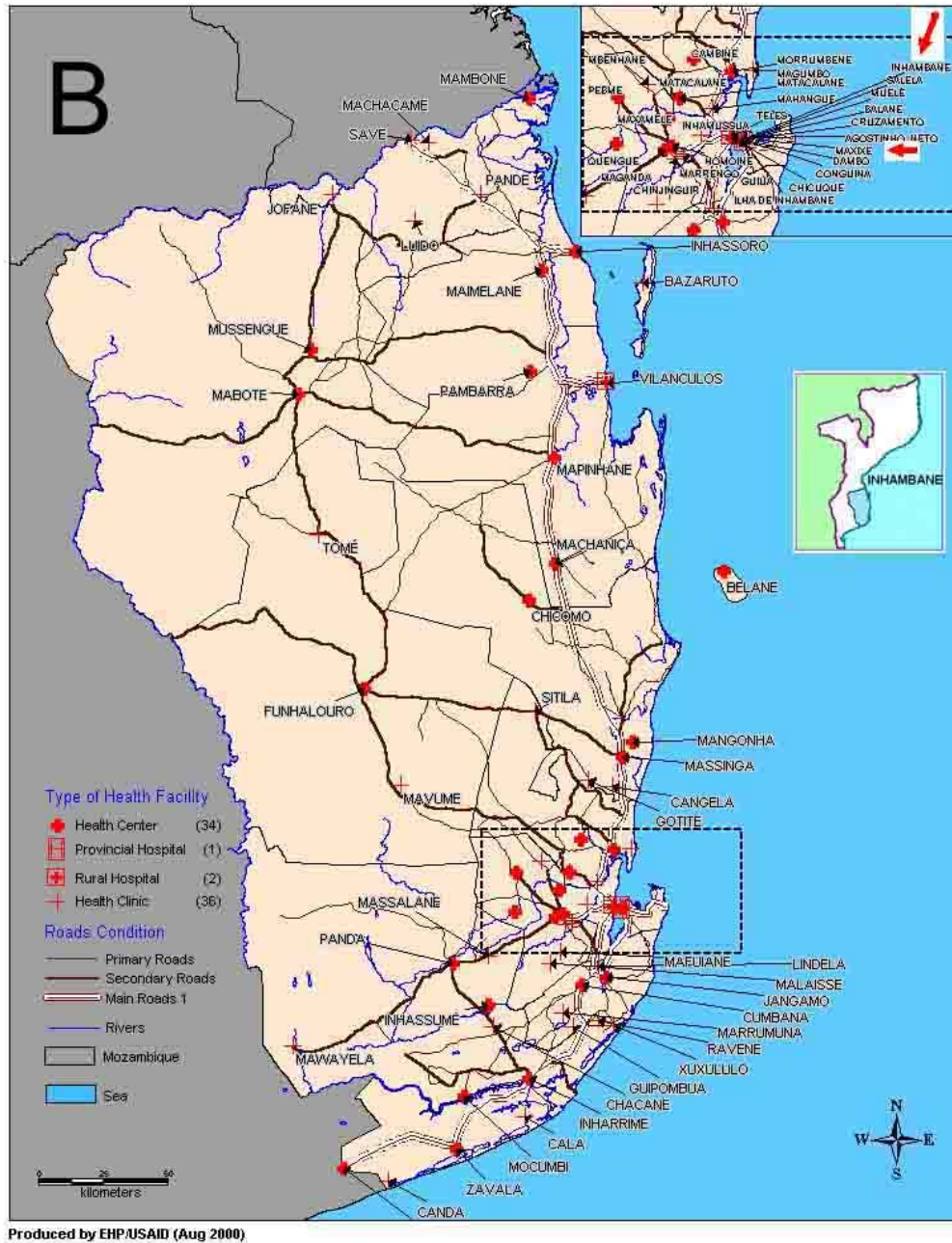


Figure 4.3 – Field research sites. A – Gaza Province; B – Inhambane Province (shown by red arrows)

4.5. Data collection techniques

The research took place over four time periods: June to July (2001), May to September (2002), March (2003) and August to September (2003). Data were collected through semi-structured interviews with key informants (see Table 4.2), observation of work practices, and in-depth review of secondary data including official reports and registers used to document the data. A number of photographs of the research sites and of the people at work were taken. To protect ethical concerns and to respect the privacy of the patients and health workers, sensitive data were not included, for example which could identify patients or health workers.

4.5.1. Semi-structured interviews

The interviews conducted were based on both formal and informal appointments with key respondents such as health workers, persons dealing with statistics and health managers. Table 4.2 presents a summary of the respondents in relation to their place of work.

Health workers such as the persons dealing with testing procedures (laboratory workers, blood bank workers and counsellors) and clinicians (including medical doctors, nurses, medical technicians and agents), were asked questions pertaining to clinical practices, patient management, treatment and possible discrepancies between the three diseases programmes, use of register books, their use of statistics and their perceived usefulness of data reported. In addition, information about education level and training sessions attended was gathered. The persons working on statistics and the managers⁷ were asked specific questions regarding the usefulness and quality of data received, data handling practices in paper and computer systems, the existing constraints in the different database management systems, existing plans and integration strategies as well as about the potential influence from donors towards influencing local decisions.

⁷ In this study, managers were considered as those in decision-making position at various levels, amongst health facility directors, health district directors, programme managers and health planners.

A research diary was maintained to document relevant notes and in some cases, a tape recorder was also used after taking prior approval of the concerned respondents. All interviews were conducted in Portuguese and translated into English during the analysis.

Table 4.2 – Summary of interviewees in relation to their working places

Working level	Health workers	Staff Responsible for statistics	Managers	Total
Inhambane Province				
Maxixe health centre	5	1	2	8
Urbano health centre	3	1	1	5
Chicucue rural hospital	6	1	1	8
Other health facilities	8	2	1	11
Maxixe district office	-	2	1	3
Inhambane-city district office	-	1	1	2
Provincial directorate of health	-	3	5	8
Gaza Province				
Chókwe-sede health centre	2	1	-	3
Chókwe rural hospital	4	1	1	6
Chicumbane rural hospital	5	1	1	7
Other health facilities	6	1	1	8
Chokwe district office	-	1	1	2
Xai-Xai district office	-	2	1	3
Provincial directorate of health	2	2	6	8
National Level		1	5	6
Total	39	21	28	88

Note: The term 'other health facilities' refers to the ones that were only included during the exploratory study, in which the interviews were more unstructured. These are Manjacaze rural hospital in Gaza Province, and Zavala and Inharrime health centres in Inhambane Province.

4.5.2. Observation of work practices

The researcher mainly played the role of an 'outside observer', and to a lesser extent as the 'involved observer' while training health managers and workers either in-situ or in seminars. Walsham (1995) argues that the merit of the approach of 'outside observer' is that the researcher is seen as not having a direct personal stake in shaping various interpretations and outcomes, and thus is seen to be relatively frank in expressing views, which helps to establish rapport and trust. The drawback of this role is that the 'outside researcher' will not be present on many occasions, and will have limited sense of the field organisation from the inside. Sometimes the researcher may be denied access to certain data that are regarded as being too confidential or sensitive. The focus of observations and questions differed between the various levels of health administration, as described below:

- i. Facility – observation of the routines for data collection for local statistics and reporting, clinical practices and procedures in infirmaries and testing facilities (laboratories, blood banks and voluntary counselling and testing centres);
- ii. District – examining data collation and reporting routines, data usefulness, organisational structure, supervision schemes and key problems and constraints from the perspective of district managers.
- iii. Provincial and National – studying the routines of data processing, data entry, and processes of matching, checking for completeness, correctness and consistency in both paper and electronic data in addition to the analysis of essential indicators used by individual programmes.

To help exploring finer details of observations and the role of artefacts (e.g. forms, register books, syringes, lancets, etc) several photographs were taken and interpreted. Figure 4.4 presents some examples of photographs from different facilities.

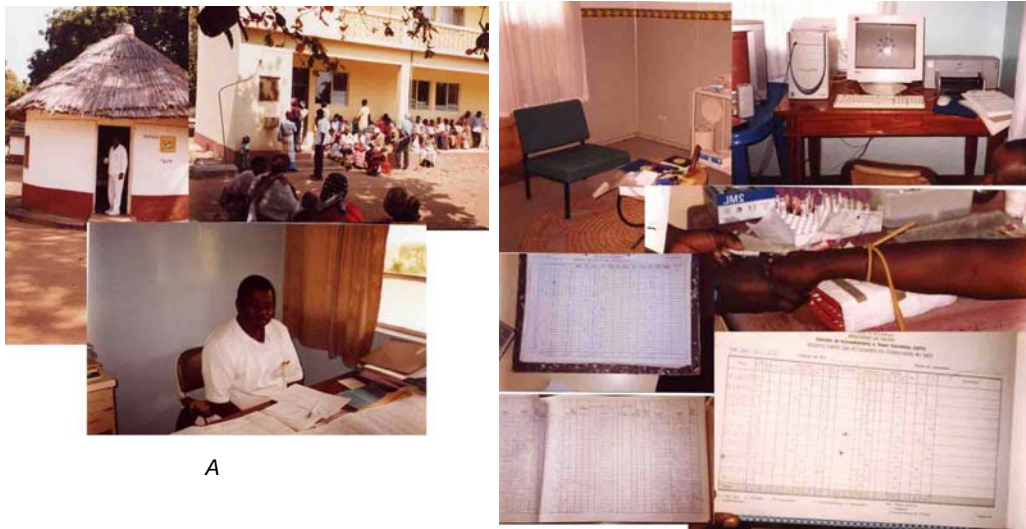


Figure 4.4 - A few illustrations from field work. A - Health workers and patients; B - Some artefacts

4.5.3. Review of secondary data

To complement the interviews and observations, secondary data in the form of paper-request forms, clinical reports, statistical reports, register books, client cards and other documents were obtained from the various levels of health administration. In addition, an in-depth review of scientific and official reports, papers, guidelines and books produced by the Mozambican Ministry of Health, WHO, potential donors and other relevant international documents was conducted.

4.6. Modes of analysis

In doing qualitative research, there is no clear distinction between the gathering and analysis of data as is commonly made in quantitative research (Myers and Avison, 2002). The analysis of qualitative data is a continuous process that starts in the research field involving processes of data collection, validation and its interplay with given theoretical concepts. 'The analysis affects the data and the data affect the analysis in significant ways', so the modes of analysis involve 'different approaches to gathering, analysing and interpreting qualitative data' (ibid.).

Interviews were viewed as the 'text' in the hermeneutic analysis process (Boland, 1991). The transcripts were first prepared and summaries of the interviews were in some cases cross-checked with respondents themselves. Since each facility was visited more than once it helped to observe ongoing changes for example associated with the introduction of a new system or new data collection forms. Where possible, this was followed by joint discussions with respondents about the interpretations, in order to further refine the researcher's understanding of the different issues, and to develop more coherent explanations.

Some of the interview transcripts were also separately prepared and discussed with HISP team members both in Mozambique and abroad.

Finally, the analysis of the case studies continued to evolve through a continual review of the relevant research literature and case studies presentations at seminars organised by the Mozambican health authorities

and at international conferences and workshops in which feedback and comments from a wider audience helped to further refine the interpretations.

Conducting the empirical research posed a number of challenges. One, concerned the availability and access to people who were typically very busy, and/or frequently travelling to field sites and abroad. Two, availability to official documents and reports was difficult because of poor record keeping. This was especially true to access the literature that could allow a more comprehensive historical analysis of the many sectors involved. Finally, conducting this study was also difficult as there is almost no literature specifically related to information systems integration in public organisations of constrained settings of low income countries.

After presenting this overall description of the research approach, we now present a summary of the research findings and analysis in the next Chapter.

CHAPTER FIVE

SUMMARY OF RESEARCH FINDINGS AND ANALYSIS

5. CHAPTER FIVE

SUMMARY OF RESEARCH FINDINGS AND ANALYSIS

The previous chapter described the research methodology including the underlying interpretive epistemology and case study strategy adopted. Chapter five presents the summary of the research findings and analysis, as they relate to each of the research papers included in this thesis.

5.1. Papers included in the thesis and linkages between them

The thesis includes five research papers that reflect the multidisciplinary nature of this research. The research papers have been presented in journals and conferences that cover different academic disciplines (both information systems and public health) and also represent different geographical focus (e.g. Africa, developing countries, and more broadly the global). Figure 5.1, presents a diagram of the relationship between the thesis' research questions and the papers. Although the papers have been written together with other co-authors at different stages of the research process, the research questions referred to in Chapter one, are answered by analysing the set of papers in an interlinked manner.

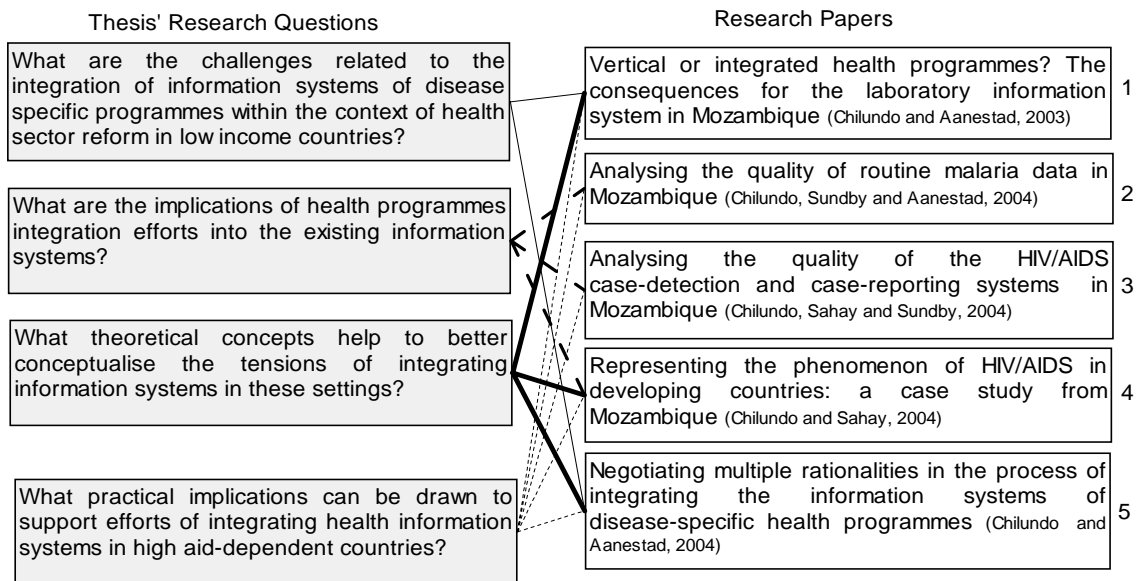


Figure 5.1 - The relationship between the research questions of the thesis and the research papers

The first paper (Chilundo and Aanestad, 2003), investigates the challenges associated with the integration of diverse health information systems at the point of health services delivery. Specifically, the paper analyses the contingencies of work practices and discrepancies in reporting routine data from clinical laboratories of vertical programmes (e.g. malaria and tuberculosis) that are under pressure of integration attempts. The second (Chilundo, Sundby and Aanestad, 2004) and third papers (Chilundo, Sahay and Sundby, 2004) present an in-depth analysis of the quality of the existing information systems for malaria and HIV/AIDS programmes respectively to better illustrate the implications of integration efforts on individual health programmes. The fourth paper (Chilundo and Sahay, 2004) explores the theoretical concept of representations to analyse how the picture of the phenomenon of HIV/AIDS in developing countries is being shaped by a range of political, cultural, socio-economical factors. Latour's (1999) ideas of 'circulating reference' and representations are applied to an empirical analysis of the information systems of HIV/AIDS in Mozambique. Finally, last paper (Chilundo and Aanestad, 2004) describes the context of information systems integration in public health organisation related to disease-specific programmes. The notion of 'multiple rationalities' is developed in order to analyse heterogeneous interests, contingencies and values in integrating information systems in complex and resources constrained settings. Some concrete implications on how to approach the integration problem are developed.

The next sub-section describes each of the five papers including the individual reference and the research questions with respective answers. This is followed by a summary of the research papers, and their inter-linkages as related to the broader research questions posed in the thesis.

5.1.1. Paper one

Reference

Chilundo, B. and Aanestad, M. (2003) *Vertical or Integrated Health Programmes? The consequences for the laboratory information systems in Mozambique*, In *Proceedings of the IFIP TC8 & TC9/WG 8.2+9.4 Working Conference on Information Systems Perspectives and Challenges in the Context of Globalization. Electronic version* (Eds Korpela, M.; Montealegre, R. & Poulymenakou, A.) Athens, Greece.

Research questions

a) *What is the current situation concerning clinical laboratory information flows and reporting?*

- ✓ The district clinical laboratories generate vital data for case definition or confirmation that are relevant for clinical and epidemiological purposes of the health programmes;
- ✓ Although laboratory information system is officially part of the national health information system, data collected is not used for decision-making, and in general the reported data are incomplete and unreliable;
- ✓ Unofficial and parallel routines coexist beside official ones. Unofficial channels are used by laboratory managers to report activities and request for supplies, for example reagents. Parallel routines are used by specific health programmes, e.g. Tuberculosis, HIV and malaria, leading to duplication and redundancies.

b) *What are the main differences between health programmes at the district level?*

- ✓ Significant differences exist between the reporting systems of health programmes. For example, the Tuberculosis programme has a standardised and well functioning reporting system in terms of order forms, register books, supervision visits, feed back reports and training sessions. The malaria programme reporting system in contrast is characterised by using improvised register books and request forms from ordinary exercise books and papers, dearth of supervision visits and training sessions.

c) *What are the potential challenges to the integration of the information systems of different health programmes?*

- ✓ Improving data quality and achieving integration of these systems requires a profound understanding of both inter- and intra-level of the health administrative hierarchy dynamics;
- ✓ Gradual improvements of the existing information systems are needed, with sensitivity towards the local work practices and the complex interdependencies;
- ✓ Reporting tasks need to be perceived as being relevant as contrasted with the general current attitude to it as being a burden.

5.1.2. Paper two

Reference

Chilundo, B.; Sundby, J. and Aanestad, M. (2004) *Analysing the quality of routine malaria data in Mozambique. Malaria Journal – BioMed Central*, 3(1)3.

Research questions

a) *What are the processes of data capturing and reporting from health facilities to national decision-makers?*

- ✓ Few malaria cases are being confirmed objectively in the laboratory; There is evidence of data being 'cooked' in health facilities prior to reporting;
- ✓ There are four reporting subsystems (weekly epidemiological bulletin, specific malaria programme reporting system, inpatients reporting as part of the main health information system and laboratory system). These multiple systems present significant data discrepancies among them.

b) *What is the quality of the information used to calculate the core malaria indicators?*

- ✓ Many data were found to be incomplete, incorrect and redundant;
- ✓ Important data to calculate core indicators are not gathered, e.g. data by age groups, gender and the status of pregnant women.

5.1.3. Paper three

Reference

Chilundo, B.; Sahay, S. and Sundby, J. (2004) *Analysing the quality of the HIV/AIDS case-detection and case-reporting systems in Mozambique*. Accepted for publication in the *African Journal of AIDS Research*.

Research questions

a) *Are HIV tests being performed according to UNAIDS/WHO standards in the various case-detection facilities of Mozambique?*

- ✓ Four population segments are being tested for HIV: Pregnant women (source sample for estimation of national HIV prevalence rate); Blood donors; Patients showing AIDS symptoms in district hospitals and Individuals voluntarily checking their HIV status in voluntary, counselling and testing (VCT) centres;
- ✓ Testing procedures are not being fully followed according to UNAIDS/WHO recommendations, especially in terms of the use of test kits within the expiry period, uneven distribution of test kits across facilities, bio-safety measures being largely disregarded and infrequent external quality control.

b) *What is the process by which HIV/AIDS cases detected are reported from the testing facilities to the national decision-makers?*

- ✓ There is multiplicity of reporting channels: VCT system, Blood banks system and two AIDS inpatients reporting systems from district hospitals;
- ✓ VCT system reports quite consistent data directly from testing centres to the national level; the system is loosely integrated into the general health services;
- ✓ Blood banks system reports data from district facilities with a range of redundancies and inconsistencies (e.g. blood donations reported without

HIV screening data and discrepancies between the totals of HIV and syphilis positive cases with the amount of discarded blood);

- ✓ The two AIDS reporting systems from district hospitals contribute to duplication of efforts and poor data quality. AIDS data from central and provincial hospitals are not yet included in official reports.

5.1.4. Paper four

Reference

Chilundo, B.; Sahay, S. (2004) *Representing the phenomenon of HIV/AIDS in developing countries: a case study from Mozambique*. Accepted for publication in the *Journal of Information Technology for Development*

Research questions

- a) *What is the nature of work practices that are involved in creating the representation of the HIV/AIDS phenomenon in Mozambique?*
- ✓ HIV/AIDS phenomenon being represented is constructed in the testing facilities (HIV test) and infirmaries (clinical diagnosis). For example: data on pregnant women is captured through regular antenatal surveys in selected sentinel sites. A small sample (1.2% of pregnant women in their first consultation) is used to generalise the HIV prevalence rate to the entire population through statistical projections using software promoted by UNAIDS/WHO.
- ✓ Although VCT services seem effective for HIV data reporting, covering men, women and children, they are unevenly distributed (60% in the southern region) and mostly in urban areas.
- b) *How does the socio-political-organisational context shape the representation of the HIV/AIDS phenomenon in Mozambique?*
- ✓ For routine services (blood banks, AIDS patients care and VCT centres), a range of factors contribute to shape HIV/AIDS representation. Few AIDS

inpatients are captured due to low healthcare coverage, lack of skills to perform clinical AIDS diagnosis, lack of test kits, unwillingness to report AIDS cases due to associated stigma, and data reported with inconsistencies and incompleteness. The representation of blood donors is undermined by the lack of clear design and standards. Recognised district underreporting in blood bank system is compensated by a correction factor of 40% to the reported figures at national level. Few people voluntarily seek VCT services despite the stigma being minimised by the use of identity codes. Many counsellors lack adequate skills to use the existing software (based on Epi Info Application) for local collection, analysis and data processing.

c) How are the representations of HIV/AIDS prevalence being used by the authorities for management of the disease?

- ✓ Planning actions are based on the prevalence estimates from pregnant women surveys – seen as the representational model of the HIV/AIDS in the country. Reports from the other three channels are excluded from the estimate.

5.1.5. Paper five

Reference

Chilundo, B.; Aanestad, M. (2004) *Negotiating multiple rationalities in the process of integrating the information systems of disease-specific health programmes*. Accepted for publication in the *Electronic Journal of Information Systems in Developing Countries*.

Research question

a) How to approach the diverse reporting and monitoring systems within the multiple separate programmes?

- ✓ Health authorities and donor's point of view in line with the need to strengthen and integrate the diverse information systems of the multiple separate programmes; The stakeholders (health reformers and information

systems designers) need to take into account the existing systems as they have historically been institutionalised, and represent a taken-for-granted and standardised set of actions.

- ✓ The stakeholders have to accept that the differences between the disease-specific information systems are not arbitrary; rather they are influenced by several reasons including the characteristics of the diseases, treatment specificities, resources constraints, and policies (i.e. acknowledging the local and contingent rationalities);
- ✓ There is need to cultivate “managerial rationality” to ensure data quality is improved in order to offer reliable evidence-based services.
- ✓ Integration needs to be a gradual process, involving the different stakeholders and parties in negotiations and discussions at different steps along the way taking the current ‘good’ practices as the point of departure;

After providing the summary of the research papers, the next section describes their inter-linkage as related to the thesis’ research questions.

5.2. Understanding the challenges of information systems integration of disease-specific health programmes – current work practices and contingencies, data quality and representations of the disease-phenomenon

The research initially adopted an exploratory field study, using a bottom-up approach, in which the attempts of health programmes integration taking place were analysed from the perspective of the peripheral health facilities (point of service delivery) and further following the data flows upwards to district, provincial and national levels of health administration. Thus, the clinical laboratories from district hospitals and health centres

constituted the research focus, as they provide important services for medical personnel from different health programmes simultaneously, functioning as 'hubs' in the health care facilities. At this level, there was clear evidence of discrepancies in the quality of tests across health programmes, with some laboratory tests being performed with a range of constraints, including inadequate logistics (e.g. malaria tests) compared to others (e.g. tuberculosis tests) and variations with respect to specific support to the laboratory workers (regular training, supervision, etc). These problems of inequities were also reflected in the reporting systems from the laboratories characterised by heterogeneity, with some programmes (e.g. malaria) being characterised by a lack of standardised forms and registers for general services as compared for example to the tuberculosis reporting system (for details see Chilundo and Aanestad, 2003).

From these findings and a study of the experiences reported in the information systems literature, it became clear that integration in larger organisations is a complex and challenging matter which needs a much more comprehensive approach requiring an analysis of the information systems of individual disease-specific programmes as well as situating these in its context of the politics, culture, values and socio-economical aspects surrounding it.

To better understand the information systems of the disease-specific programmes, an analysis of the quality of routine malaria data (Chilundo, Sundby and Aanestad, 2004) and of the quality of HIV/AIDS case-detection and case-reporting (Chilundo, Sahay and Sundby, 2004) was further performed. With some exceptions, both studies reported a range of data inconsistencies, redundancies and incoherence including important underreporting, multiplicities of reporting channels in a single health programme, lack of standardisation and non-evidence based decisions being quite common. For instance, malaria data captured in health facilities were flowing through four different reporting channels systems, with no horizontal linkages. Similarly, AIDS data gathered in infirmaries from district hospitals were managed in two different databases from different national directorates both illustrating significant discrepancies and inconsistencies.

The theoretical notion of representations and 'circulating reference' helped to analyse the manner in which HIV/AIDS phenomenon is being reported from the testing facilities to the higher levels of health administration. The study (Chilundo and Sahay, 2004) has shown that the representation of this disease from pregnant women, blood donors, volunteers and patients with AIDS symptoms is heavily shaped and constructed within a complex socio-political heterogeneous network.

5.3. Integrating the information systems of disease-specific health programmes: Negotiating multiple rationalities

The findings summarised in the previous section reflect the complexity of the existing information systems and their representational contingencies. These aspects were then situated in their organisational context characterised by a multiplicity of actors, structures, interests, tasks and systems involved in the process of integration. The differences between the various information systems and the reasons for such differences were analysed through the notion of 'multiple rationalities' which allow exploring the rationales behind these systems, how they have been historically formed, how they are shaped by the characteristics of the diseases addressed, and how they become embedded into different institutional settings, at the local, national and international levels (Chilundo and Aanestad, 2004). Analysing the different rationalities that are underpinning the local work practices of data collection and reporting, the programme-specific requirements, and the donor's practices are important to understand the challenges of integrating these disease-specific programmes' information systems. The aim of integration of health programmes requires also the 'rationality of information systems integration' to enhance efficiency and control through implementing a seamless, consistent, coherent, non-redundant and uniform reporting system. However, achieving the managerial rationality has to contend with the multiple rationalities related to organisational change, socio-economic contingencies, modes of service delivery, particularities of disease-specific programmes and the role of the negotiations. These are now briefly described.

Health sector reform, characterised by decentralisation, health programmes' reframing, information systems redesign and decentralisation, in theory reflects a planned form of change. However, in practice, as the Mozambican example suggests, an *improvisational model of change* (Orlikowski and Hofman, 1997) seems to dominate. Managerial practices tend to be 'reactive to events' rather than forward looking in anticipating needs. Systematic changes are negligible, especially in the peripheral health facilities which can be described as 'still operating as before'. While the proponents of the reform efforts may attribute this status-quo condition as a reflection of an 'irrationality', which is resistant to efficiency-centred change efforts, the reality of the resource constraints and heavy workload of patients care tend to be overlooked. These constraints arise from a '**socio-economic rationality**', related to Mozambique's status as one of six poorest countries in the world, high donor dependence, heavy disease burden, and inadequate staff. These conditions significantly affect data quality (Chilundo and Aanestad, 2004).

Historically, modes of health services delivery are primarily guided by economical terms, focusing on reliability of vertical approaches rather than appropriateness of comprehensive primary health care. This focus reflects a concern for '**economic rationality**' (consistency of means and ends) over '**situated rationality**' (appropriateness of services given the existing limitations). Disease-specific programmes, represent an autonomous entity within the public health domain, and come with their own '**disease-specific rationalities**'. These are shaped by interests of particular donors, their geographical and political affiliations, and contemporary diseases they are committed to combating.

In summary, these multiple rationalities co-exist, and require political negotiations which was captured appropriately by the '**territorial rationalities**' (Lee and Madnick, 1992). Taken together, how these research findings of the individual papers sum up to help address the overall research questions posed in the thesis is summarised in Table 5.1.

Table 5.1 – Brief answers to the research questions posed by the thesis

Research question	Findings
<p>1. What are the challenges related to the integration of information systems of disease-specific programmes within the context of health sector reform in low income countries?</p>	<ul style="list-style-type: none"> ▪ Context of improvisational change in constrained settings; ▪ Dearth of qualified staff; ▪ High disease burden; ▪ Existing information systems have historically been developed within justifiable financial and skills constraints with discrepancies across health programmes; ▪ Heterogeneity of interests among donors, managers, and health reformers; ▪ Multiplicity of reporting systems (even within an individual programme);
<p>2. What are the implications of health programmes integration efforts into the existing information systems?</p>	<ul style="list-style-type: none"> ▪ Although the need to strengthen information systems is recognised, practically all programmes' information systems continue to operate as before: ▪ Malaria and HIV/AIDS reporting systems overwhelmed with data redundancies, inconsistency and incompleteness. Most data reported are not used for decision-making; as opposed to the consistency of the TB reporting system;
<p>3. What theoretical concepts help to better conceptualise the tensions of integrating information systems in these settings?</p>	<ul style="list-style-type: none"> ▪ Adoption of social systems perspective of information systems to highlight the influence of culture, history, values, systems beyond the technical aspects; ▪ Integrating disparate information systems involves understanding the multiple rationalities behind them including the particularities of the diseases, contingencies, rationality of the modes of service delivery and the role of negotiations; ▪ Understanding how health indicators (representations of the work practices) are socially constructed provides important insights towards effective integration.
<p>4. What practical implications can be drawn to support efforts of integrating health information systems in high aid-dependent countries?</p>	<ul style="list-style-type: none"> ▪ Gradual improvements of the existing information systems are urged, with emphasis on work practices and data quality. ▪ Integration needs to be a gradual process, involving all actors in negotiations at different steps, taking the current 'good' practices as the point of departure; ▪ Need to respect the differences between the disease-specific information systems. There are multiple reasons for their construction.

CHAPTER SIX

CONTRIBUTIONS AND FINAL REMARKS

6. CHAPTER SIX

CONTRIBUTIONS AND FINAL REMARKS

The aims of this chapter are: (i) to draw theoretical and practical contributions of the thesis to both Information Systems and Public Health research; and (ii) to provide the final remarks of this work.

6.1. Theoretical contributions

Three key contributions of this multidisciplinary research applicable to both Information Systems and Public Health domains are discussed:

1. Development of a theoretical perspective to analyse the challenges of the integration of information systems of disease-specific health programmes;
2. Articulation of a theoretical model to support the integration of these health information systems; and,
3. Emphasis on the role of work practices in shaping data quality reported for surveillance purposes.

6.1.1. *Development of a theoretical perspective to analyse the challenges of the integration of information systems of disease-specific health programmes*

Contributions from interpretive research can be in the form of generalisations to a range of theoretical concepts, specific implications and/or rich insights (Walsham, 1995). Drawing upon various strands of information systems research such as that related to the social construction of information systems (Walsham and Sahay, 1999; Sahay, 1998), organisational change (Walsham, 1993), organisational rationality (Avgerou, 2002) and improvisational change (Orlikowski and Hofman, 1997) some rich insights were generated regarding the character of the integration problem of health information systems in the context of health organisations in low income countries.

A key insight concerns (the emphasis on) the **complexity** of the integration problem. While in general, integration of disparate information systems in large organisations is more complex and challenging than just 'solving' data management problems in technical terms (Webster, 1995; Davenport, 1998), this complexity is greatly magnified in the context of the health care sector in developing countries. This complexity arises from various particularities such as the pressure to harmonise vertical and horizontal modes of service delivery (WHO, 1996; Oliveira-Cruz, Kurowski and Mills, 2003), lack of adequate human resource skills (Martínez and Martineau, 2002), inadequate information systems (Braa and Blobel, 2003; Heeks, 2002), extreme foreign aid dependency (UNDP, 2004), and the pressures of life threatening diseases.

Recognising and understanding this multi-faceted and multi-level complexity of the integration issue, we argue, is a fundamental step in trying to address it. Recognition will caution us against adopting simplistic approaches that are grounded in primarily technical or economical assumptions.

A second contribution with respect to developing a theoretical perspective is in expanding the scope of integration research.

Research in information systems in developing countries is a relatively marginalised domain despite some encouraging trends to the contrary (Shoib and Jones, 2003; Madon, 2003). The growing body of work in the IFIP 9.4 community⁸, a recent special issue in a North American Journal (*The Information Society Journal*), and another call for papers for a special issue on information systems in developing countries in the prestigious *MIS Quarterly Journal*, are some of the welcome examples of these trends. Despite this, the problem of information systems integration, a topic of extensive recent debate in mainstream information systems research (for example, Mykkänen and Korpela, 2003; Ramankutty, 2003), has not been addressed at all in the context of developing countries.

In addition to helping to expand the geographical focus, this thesis also contributes to broadening the disciplinary focus of the information systems field in two ways. Firstly, the mainstream information systems literature has only rarely addressed public health issues from the developing world. Some examples of recent exceptions being Korpela et al. (1998), Braa and Hedberg (2002) and Braa, Monteiro and Sahay (2004). The research in the issue of health information systems integration is relatively non-existent. Secondly, literature on public health in developing countries rarely discusses in a rigorous and empirically based way, issues of health information systems, and the challenges in making them work in practice. While issues around the vertical and integrated health programmes is undoubtedly an important topic of debate (for example, Oliveira-Cruz, Kurowski and Mills, 2003), the issue of health information systems integration which is fundamentally a part of these health programmes, has largely been ignored. This thesis makes a significant contribution in emphasising both this inextricable link between health programmes and health information systems, and that the integration of

⁸ IFIP 9.4 - International Federation for Information Processing: Working group on Social Implications of Computers in Developing Countries.

health programmes cannot be discussed without considering their health information systems.

A third area of expansion is in emphasising that integration is not just a practical matter of interest to practitioners but an important topic of theoretical investigation. While in this thesis, a social-system informed theoretical perspective around integration has been developed, further developments drawing upon other conceptual bases such as economics and political science can further enrich our understanding of the integration challenges.

After discussing the domains of contribution in broader terms, the specific contributions of this thesis in terms of developing a socially informed theoretical perspective of health information systems integration, is presented. This perspective is built around three key ideas:

- (1) Health information systems integration is a historically and institutionally situated socio-technical phenomenon that can be best conceptualised as a **heterogeneous network** comprised of people (e.g. health workers, managers, planners, and reformers), artefacts (e.g. computer applications, hardware, data collection and reporting forms, etc.) and socio-political structures. Conceptualised in this way, integration is emphasised as something more than just a technical issue. It includes the interests of various stakeholders, artefacts like forms, softwares and reports relating to health information systems, the practices of people, and organisational routines. The emphasis on the multiplicity of stakeholders helps to place focus on their different rationalities and the challenges of aligning them.
- (2) A multiplicity of rationalities shape the process of integration including those concerned with donors, diseases, health programmes, and the work practices of health department staff. information systems integration is thus seen as the process of **negotiating multiple rationalities**, in which the social, substantive (Weber, 1947), organisational (Avgerou, 2002), situated (Simon, 1982) and territorial (Lee and Madnick, 1992) rationalities need to be considered along with the formal techno-economic rationality (Weber, 1947; Habermas, 1984;

Simon, 1957). The concept of rationality of integration is proposed to emphasise the need to deal with multiple contingent rationalities (for example, the existing poor data quality and the underlying reasons of why it is so) in order to develop a consistent, coherent and non-redundant reporting system.

At the heart of achieving this rationality of integration, lies the political negotiations that recognise the existing territorial rationalities (Lee and Madnick, 1992) of the different *territorial entities*. While the interests and decision making structures (territorial rationalities) of the different territorial entities (health programmes) need to be carefully considered, this understanding has to be situated within a larger framework of how other entities similarly operate, and the points of interface and interaction both horizontally (across programmes) and vertically (across different levels of the administrative hierarchy) between them. Such a negotiated approach, it is argued, can contribute to moving us from a narrow and compartmentalised focus of a particular disease or entity, to the development of a holistic picture of the overall health system. Considering the territorial rationality of the entire health system rather than the rationality pertaining to individual programmes is absolutely fundamental to integration efforts.

- (3) A third key aspect of our perspective is concerned with the concept of representation and the social and political nature of its construction (Sachs, 1995; Latour, 1999; Sahay, 1998). A key argument made here is that the integration of health systems requires that the representations constructed by their respective health information systems also need to be integrated. For example, to develop an overall picture of the HIV prevalence rate in a country, it is argued that the representations of the individual reporting channels also need to be unified. Given the socially constructed nature of representations, the integration across programmes however, is a complex task, and requires the perspective of rationality of integration discussed under the last point.

These three aspects taken together help us to develop a theoretical perspective on integration.

6.1.2. Articulation of a theoretical model to support the integration of disease-specific health information systems

The theoretical perspective around integration so presented helps us to propose a more elaborate theoretical model to help abstract and understand the complex phenomenon of integration of health information systems in poor country settings. After schematically presenting this model in Figure 6.1, its key features are summarised.

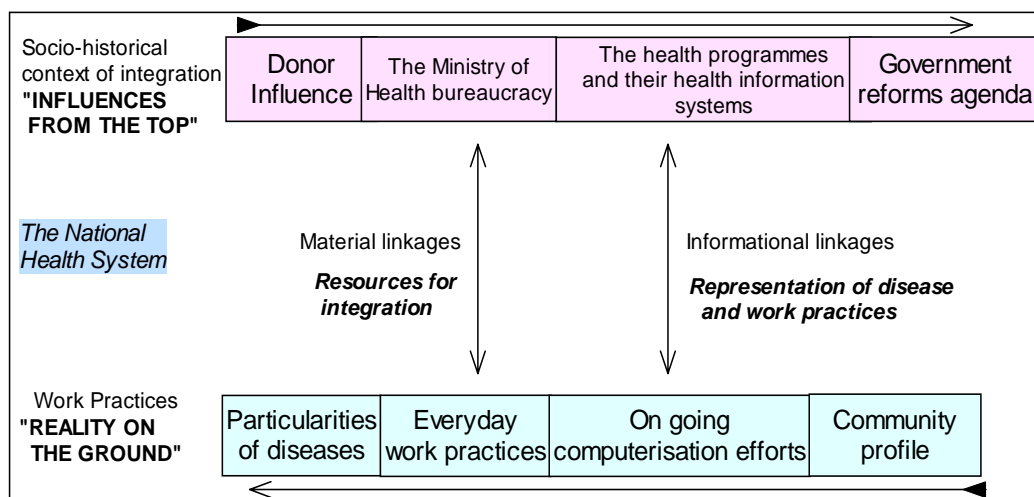


Figure 6.1 - Proposed theoretical model to support integration of disease-specific IS.

The basic idea of the model is to emphasise that integration is not just an issue to be discussed at the “top” but also requires an equal consideration of the reality on the “ground” and the inter-linkage between them. The model is comprised of three key elements:

- a) Reality on the ground;
- b) Informational and material linkages.
- c) Influences from the top;

The model emphasises the need to consider both the horizontal (at both the top and bottom) and vertical linkages across the different levels of the health structure. An example of a horizontal linkage at the top can be the relation between donor support and ministry budgets, while an example of a horizontal linkage at the bottom can be the relation between existing work staff loads and computerisation efforts. An example of an informational

linkage relates to the routine reports that are sent from the district to the national level through the provincial level. A material linkage can relate to the supply of drugs from the ministry to the province who then distribute it to the various district facilities.

Integrating various disease-specific information systems involves foremost, the need to reconcile the tensions arising from the different rationalities at both levels, understanding how representations of diseases and work practices are constructed, as well as realistically estimating the material resources required for integration. Such an interconnected analysis needs to take into account the particularities of the diseases, everyday work practices (e.g. in infirmaries, clinical laboratories, district offices), the profile of the community along with the ongoing computerisation efforts. Furthermore, this analysis yields deep insights into the status of data quality, and the human, material, and disease related reasons that contribute to this. Building such a context-specific understanding is crucial to try to address the integration challenges.

At the top, integration is influenced by the structure and processes of the multiple monitoring and reporting systems of the different disease-specific programmes, shaped significantly by donor policies and the bureaucratic structures of the health departments. Understanding these multiple influences and how they relate to the realities on the ground is crucial to address the integration challenge. Such an integrated approach, both vertically and horizontally, can meaningfully contribute to the overall aim of operational efficiency by minimising redundancies and the duplication of efforts and by aligning the strategic objectives and practical actions of the multiple health programmes. The practical strategies for integration are further elaborated in the section on practical contributions.

6.1.3. Emphasising the role of work practices in shaping data quality reported for surveillance purposes

Classical epidemiological questions, such as ‘how many people have a given condition or have died from it?’, ‘how has the condition manifested itself,

or been distributed in the population?’ are usually answered by using data from surveillance systems. However, many surveillance systems in developing countries often provide unreliable data, which contribute to ineffective health interventions and a wastage of scarce resources (Braa and Blobel, 2003). In these constrained settings, health workers at the district level are usually called upon to perform several activities, including providing patient care, performing multiple administrative tasks, in addition to collecting primary data. This multiplicity of tasks, often exacerbated by the pressure of various health programmes and serious infrastructural limitations (both material and people), contribute to a situation where data related tasks are considered low priority and just a chore to be completed to meet the needs of bureaucracy. This attitude, coupled with inadequate and ineffective supervision routines, contributes to a situation where poor data quality is the norm rather than the exception. Poor data quality contributes to ineffective representations of the diseases, and a weak informational basis for evidence-based surveillance.

The theoretical model emphasises that improving data quality is fundamental to strengthening surveillance systems, which however cannot be done without reconciling work loads, infrastructural limitations and the multiplicity of responsibilities that shape existing work practices.

6.2. Practical contributions

The following four key practical contributions with implications to both the Information Systems and Public Health domains are discussed:

1. Developing a model to guide practical efforts to integrate disease-specific health information systems in low income countries.
2. Developing guidelines on how information systems associated with the Malaria, Tuberculosis and HIV/AIDS programmes can be integrated with the routine reporting systems;
3. Proposing recommendations to strengthen individual monitoring and reporting systems of the disease related programmes concerning HIV/AIDS and Malaria;
4. Proposing mechanisms by which donor agencies can provide more effective support to strengthen health information systems.

While the first practical contribution deals with overall disease-specific information systems integration in low income countries, the second focuses particularly on integration of the information systems of the Malaria, Tuberculosis and HIV/AIDS programmes with the routine information systems. The third contribution emphasises ways of strengthening the individual information systems of the Malaria and HIV/AIDS programmes given the particularities of the nature of the diseases. The fourth, goes one step beyond proposing mechanisms by which donors can contribute to strengthen health information systems under the SWAp strategy.

6.2.1. Developing a model to guide practical efforts to integrate disease-specific information systems in low income countries

The model presented in Figure 6.2, represents a socio-technical perspective to guide the process of information systems integration in practice, in an environment of organisational change.

The model proposes three practical steps:

1. Analysis of the overall information systems of the National Health System;

2. Conducting a stakeholder analysis of individual disease-specific programmes;
3. Guiding the process of implementation of information systems integration.

While the first two steps are concerned with problem analysis and diagnosis of the information systems of the overall health system and information systems of the individual disease-specific programmes respectively, the third step attempts to apply this diagnosis to practical implementation.

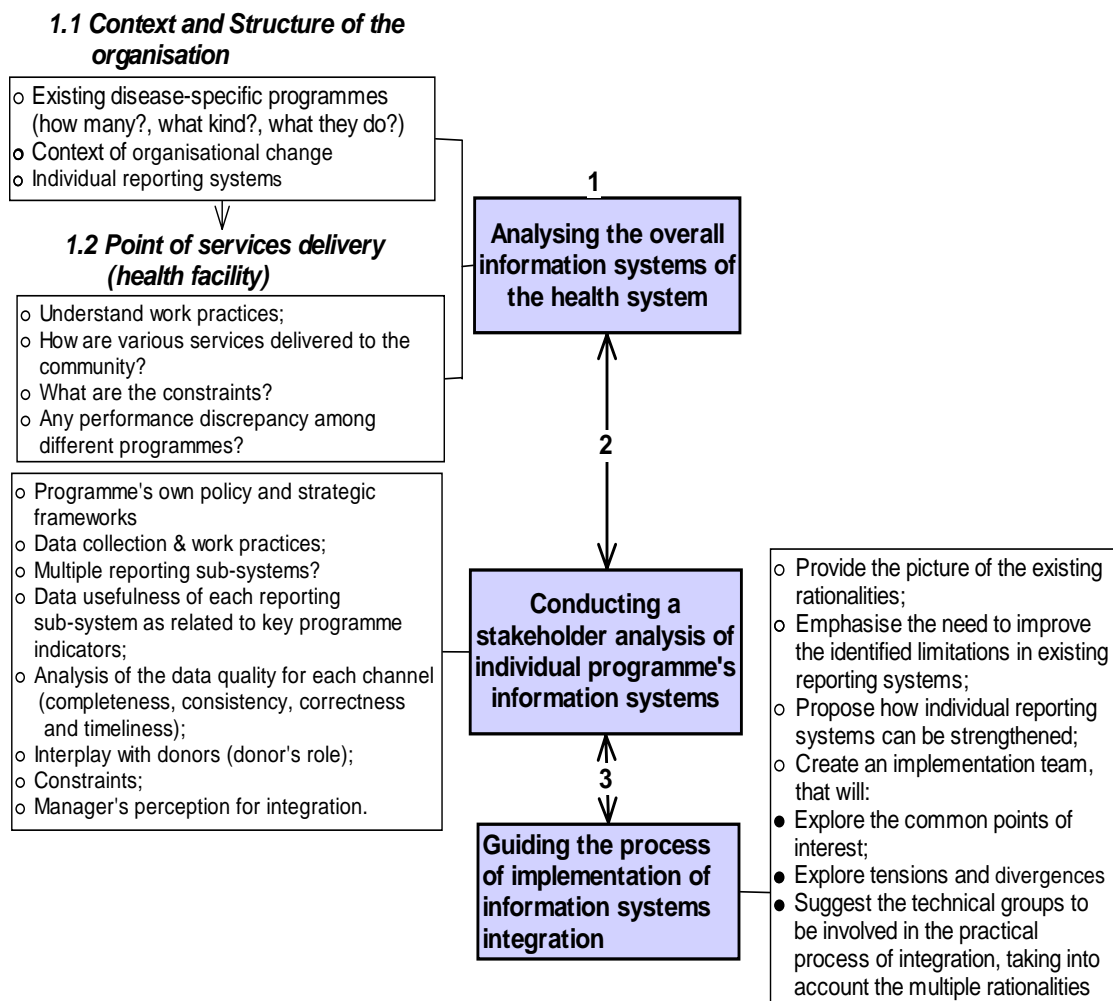


Figure 6.2 - Proposed practical model to analyse and implement integration of disease-specific health programmes in low income countries.

1. Analysis of the overall information systems of the National Health System

Given the interdisciplinary nature of the integration problem, a fundamental first step is the construction of an inter-group team of experts (drawn from both internal and external entities) to oversee the integration effort – both its design and implementation.

This “integration team” should be entrusted with the responsibility and resources to address the following two questions:

- a) What is the structure of the overall health organisation?
- b) How do the routines of the health service influence the tasks and performance of the various programmes at the point of service delivery (e.g. health facility)?

Table 6.1 presents a practical proposal for the ‘integration team’ to answer the above mentioned questions.

Table 6.1 – Analysis of the overall information systems of the National Health System

Broad questions of analysis	Specific tasks to address the questions
What is the structure of the overall health organisation?	<p>This will require:</p> <ul style="list-style-type: none"> ✓The conduct of a situation analysis of the existing disease-specific health programmes: How many? What kind? And what do they do? ✓An analysis of the context of organisational change, including the nature of policy and supporting budgets in relation to information systems; ✓Identification of the existing reporting systems in the entire organisation, including details of their owners, technical descriptions, inventory of reports being generated, and data being collected.
How do the routines of the health service influence the tasks and performance of the various programmes at the point of service delivery (e.g. health facility)?	<p>This will require:</p> <ul style="list-style-type: none"> ✓An analysis of existing work practices, including details about patient care, flow of the patients among different services in the health facility, tasks of health workers, interaction of different sectors (e.g. laboratories, pharmacies, radiology) etc; ✓An analysis of how the various services are being delivered to the community, for example, provision of anti-malarial drugs or bed nets, distribution of condoms, etc; ✓Identifying the main existing constraints, both related to material and human resources; ✓Examining discrepancies between different health programmes, for example, related to the availability of essential resources and training needs and programmes for staff.

2. Conducting a stakeholder analysis of individual disease-specific programmes information systems

The analysis of the information systems of the overall health system provides the basis to conduct an analysis of the information systems of individual disease-specific programmes. The theoretical ideas of territorial entities and rationalities, which emphasise the different interests of various actors supporting individual programmes, provide us with the conceptual basis to formulate this stage of analysis. We propose the analysis to be informed by the following questions:

- a) What are the reporting channels associated with the information systems of each of the disease-specific programmes?
- b) What are the different artefacts (e.g. forms, registers, books, computers, etc.) in use?
- c) What are the work practices that shape the data flows in the different reporting channels?
- d) What are the points of interface between the different programmes, and between the reporting systems of the same programme?

Table 6.2 summarises a practical proposal for the analysis of information systems for individual programmes.

Table 6.2 - Conducting a stakeholder analysis of individual disease-specific programmes

Broad questions of analysis	Specific tasks to address the questions
<p>What are the reporting channels associated with the information systems of each of the disease-specific programmes?</p>	<p>This will require:</p> <ul style="list-style-type: none"> ✓ An analysis of the strategic framework and associated role of donors of individual health programmes, including their information systems; ✓ Identifying the reporting channels used to report the programme's activities, and where and how they can be usefully integrated; ✓ Examining the usefulness of each reporting sub-system as related to the calculation of key programme indicators; ✓ Conducting a data quality audit of each reporting (sub)system in terms of their completeness, consistency, correctness and timeliness; ✓ Identifying the existing constraints – human and material – in relation to their integration within multiple reporting channels and across different health programmes.
<p>What are the different artefacts used?</p>	<p>This will require:</p> <ul style="list-style-type: none"> ✓ Examining in detail the data collection processes, standards and work practices (for example, use of artefacts like register books, forms, computer applications, etc.); ✓ Identifying the strengths and weaknesses of the various artefacts used;
<p>What are the work practices that shape the data flows in the different reporting channels?</p>	<p>This will require:</p> <ul style="list-style-type: none"> ✓ Identifying staff work load and job responsibilities; ✓ Analysing the possibility of treatment, availability of drugs and duration of such treatment; ✓ Analysing the availability of basic infrastructures such as transportation, standardised collection and reporting forms, etc; ✓ Analysing the skills of the health workers to collect, aggregate, analyse, interpret, report and use data; ✓ Analysing the time spent related to data collection and handling.
<p>What are the points of interface between the different programmes, and between the reporting systems of the same programme?</p>	<p>This will require:</p> <ul style="list-style-type: none"> ✓ Analysing the existing synergy between vertical programmes and horizontal provision of health services; ✓ Exploring the stakeholders' perception of information systems integration; ✓ Identifying key indicators to measure the impact of specific diseases, and the respective interventions; ✓ Analysing data sets needed to calculate indicators, including the denominator (e.g. target population data); ✓ Analysing data usefulness, data quality and timeliness of the various reporting systems from their source at the peripheral level to higher levels; ✓ Aggregating the common points of interests and divergences; ✓ Inventorying the resources (material and human) available and required.

3. Guiding the process of implementation of information systems integration

The analysis of the information systems of the overall health systems and the individual programmes provides a basis to propose some broad guidelines for implementing integration efforts. The basic approach taken is that of **cultivation** (Aanestad, 2002) where emphasis is on starting small, taking incremental steps, and building upon what is working rather than trying to design new things from scratch. The analysis stage gives us an idea of what aspects are working well in the individual programmes, and what the points of interface are between them. The implementation then follows four practical steps:

(i) Defining vision

Create implementation team, comprised of members of each of the national, provincial and district levels of the health administration. The members of each team should be constituted so as to represent the interests of different disease-specific programmes. These teams should be provided with adequate budgets and authority to design the overall framework and timeframe for the integration effort;

(ii) Implementing vision

Create task groups at different levels entrusted with different tasks such as: developing common data sets; rationalising indicators; standardising report forms; designing a flexible database; strengthening training programmes; unifying work load tasks; and other similar tasks seen relevant by the implementation team. These task groups would need to engage in a participating and consultation process to jointly design and implement particular actions within each task. Their recommendations need to be approved by the implementation team.

(iii) Evaluating the process

The implementation team is responsible for creating an evaluation framework that provides practical and achievable targets for each of the task

groups under their specific activities. According to the time-space specified, the various integration efforts will need to be evaluated against the benchmarks.

(iv) *Reflection and continued change*

Based on the assumption that the integration is an ongoing rather than a one-time process, structures and budgets would need to be created so as to enable continued reflection on the effects of the integration effort in order to identify best practices, discard approaches that do not work, and apply changes based on evolving needs for integration.

6.2.2. Developing guidelines on how information systems associated with the Malaria, Tuberculosis and HIV/AIDS programmes can be integrated with the routine reporting systems

Health authorities, the WHO and major donors concur in the need to strengthen and integrate the diverse information systems to achieve a harmonised, simple and standardised system. Operationally, this requires the disease-specific information systems for tuberculosis, malaria and HIV/AIDS to be linked to the overall national information system. Because of the particularities of the individual diseases however, this is a complex task. For example, the need for confidentiality is much higher in the HIV/AIDS system as compared to the Malaria system.

We argue for an incremental and gradual approach to this integration, where the attempt should be to take the positive working features of the different programmes and build upon those, rather than to create a grand solution decision from scratch.

Some steps towards this are proposed:

- ✓ A careful selection of essential indicators by each individual programme enables the development of a single integrated reporting system.
- ✓ Development of standardised user-friendly collection tools including register books, request forms and reports within each individual disease-

specific health programme. The use of minimum data sets to calculate core indicators suitable for each management level should be encouraged as well as regular training for health workers and persons dealing with health data. Simplifying the burden of data collection and reporting through unification contributes to improve quality. A key factor for the effectiveness of the reporting systems is the intra-integration of several datasets and data flows for the individual programmes;

- ✓ Providing a database (at district and provincial levels), which would support the generation of multiple views and reporting formats in order to fulfil the diverse demands of layouts, periodicity of different health programmes. This would require the design of a “flexible” database, organised modularly to support information related activities of specific health programmes including their data entry, the addition or modification of indicators and the generation of reports in required formats.

6.2.3. Proposing recommendations to strengthen the individual monitoring and reporting systems of the disease related programmes concerning HIV/AIDS and Malaria

(i) HIV/AIDS

With the advent of antiretroviral therapy (ART) under the WHO slogan of ‘*treat three million people by 2005*’, some health facilities will be required to deal with HIV patients over prolonged periods of time as they attain chronic conditions (Attawell and Mundy, 2003; WHO, 2003). This sustained interaction will require better-functioning health systems capable to offer comprehensive care while cumulatively receiving patients from multiple entry points, including prevention of mother-to-child transmission, mother and child health, voluntary, counselling and testing, tuberculosis programmes, etc. This in turn will require a strong and integrated information system for monitoring and reporting at both individual and collective levels, as well as to support the provision of care, drugs and follow up through laboratory services. Thus, for example the currently weak HIV/AIDS information system in Mozambique will need to be improved in line with the national STD/HIV/AIDS strategic

framework (2004–2008) and WHO guidelines which recommend the establishment of simple but effective monitoring systems (MISAU, 2003; WHO, 2003). Some steps towards this are now described:

- ✓ Designing and distributing to the facility level standardised forms and books that include the key indicators (established in the strategic plans). This should be accompanied with appropriate training on how they should be used. In Mozambique, for example, the system for HIV/AIDS might possibly be piggy-backed on the more successful and standardised tuberculosis reporting system, which is already patient centred and provides general statistics. However, the system would need to be customised to the specifications of the individual programme, for example the HIV/AIDS system would need to be confidential, using a unique patient identifier to link information (a practice already routine in voluntary, counselling and testing services);
- ✓ Respecting resource constraints, for example by allowing a quarterly instead of monthly cohort analysis of patients. Additional synchronisation should be added to the system to enable health staff to identify, in a timely manner, patients defaulting on the collection of drugs;
- ✓ Improving supervision routines and providing timely and constructive feedback to the staff on the ground.

(ii) Malaria

Malaria is an endemic disease in many low income countries which have strategic plans in line with the ambitious global Roll Back Malaria initiative. Major problems are related to their implementation. For example, while the Mozambique Malaria Plan (2002-2005) (MISAU, 1999) has clearly defined the minimum key indicators to be routinely calculated, the existing systems either do not include relevant data items or collect data that are often redundant, inconsistent and incorrect. Some recommendations to strengthen the Malaria reporting system are identified below:

- ✓ The various malaria reporting flows should be integrated into one standardised paper-based system, capable of collecting the essential

data to generate the key indicators. Reporting should occur only weekly from health facilities to the provincial level and further monthly from the provincial to national levels;

- ✓ Regular supervision and constructive feedback should take place at all levels of health administration;
- ✓ At the provincial and national levels the computerised system should be linked with Geographical Information System applications to allow mapping of the malaria cases by health areas and over time. This could support improved epidemiological analysis by correlating spatial characteristics to disease incidence.

6.2.4. Proposing mechanisms by which donor agencies can provide more effective support to strengthen health information systems

In many low income countries, donor support has been rearranged under the SWAp approach, in order to improve the coordination of external aid and support the national government in reaching their development goals. However, in practice a number of donors still tend to operate outside the joint efforts. As a result, despite recognising that the existing information systems are inadequate to document work processes, many health systems are still characterised by highly fragmented health management information systems, supported by stand alone donor support. Some suggestions on how donor agencies can provide more effective support to strengthen health information systems under the SWAp umbrella follow:

- ✓ Donors should avoid imposing special data requirements related to specific regions or programmes;
- ✓ Donor agencies should provide financial and technical assistance in line with SWAp approaches to build capacity in terms of local expertise development, adequate and regular training and appropriate technology;
- ✓ Donors should work to cultivate routines towards improving existing approaches to the collection and use of routine information rather than creating parallel or duplicate information systems.

6.3. Final Remarks

The purpose of this research was to examine the challenges of integrating the information systems of the malaria, tuberculosis and HIV/AIDS programmes in the context of organisational change in low income and high aid-dependent countries. These challenges were examined by drawing upon the concept of multiple rationalities. This allowed the research to address the different health organisational perspectives arising from work practices, particularities of the diseases, the individual health programmes, and the influence of donors and national government's in shaping the policies.

Information systems integration was described largely as a socio-technical process, requiring the rationales of the existing systems and the heterogeneity that characterises the information systems to be taken into account. The human aspects, emphasised through the focus on work practices, and the information systems aspects emphasised through the representational features, all contribute to the historically situated heterogeneity.

A key finding of this thesis is that the notion of "territorial entity", which is now comprised of individual health programmes, should be expanded in scope to consider the territorial entity of the health system as a whole. This expansion in scope will require the policies, people, resources, etc. to be considered in an integrated rather than in a compartmentalised manner. Given the complexity of integrating information systems in large organisations, this thesis emphasises the need for political negotiations.

The ultimate goal of any health information system is to allow timely and effective evidence based decisions. This thesis, by attempting to find better mechanisms to strengthen the existing disparate information systems through their integration, is in line with this major public health goal. While the focus of analysis of this thesis was the organisation, implications of improvements to the organisation will be felt by individual members of the community as well as the society at large.

As noted by the economist *Amartya Sen* (1999), this thesis contributes to the broader development goals of nations by improving the informational basis of healthcare related decisions.

"Education is the most powerful weapon which you can use to change the world".
Nelson Mandela

REFERENCE LIST

- Aanestad, M. (2002) *Cultivating Networks: Implementing surgical telemedicine*, PhD Dissertation, Department of Informatics, Faculty of Mathematics and Natural Sciences, University of Oslo, Oslo.
- Atkinson, S. (2002) Political cultures, health systems and health policy. *Social Science & Medicine*, 55 113-124.
- Attawell, K. and Mundy, J. (2003) *Provision of antiretroviral therapy in resource-limited settings: a review of experience up to August 2003*, DFID Health Systems Resource Centre, WHO, UK's Department for International Development.
- Avgerou, C. (2002) *Information Systems and Global Diversity*. Oxford University Press.
- Batley, R. (2002) *Mozambique: A Country Case Study*, International Development Department.
- Benbasat, I., Goldstein, D. and Mead, M. (2002) *The Case Research Strategy in Studies of Information Systems*. In *Qualitative Research In Information Systems*, (Eds, Myers, M. and Avison, D.) Gateshead, SAGE Publications, pp. 79-100.
- Boland, R. (1991) *Information system use as a hermeneutic process*. In *Qualitative Research in Information Systems (2002)*, (Eds, Myers, M. and Avison, D.) Sage Publications, pp. 225-240.
- Bowker, G. C. and Star, S. L. (1999) *Sorting Things Out: Classification and its Consequences*. Massachusetts, The MIT Press.
- Braa, J. and Blobel, B. (2003) *Strategies for developing Health Information Systems in Developing Countries*. In *WITFOR 2003 White Book: IFIP World Information Technology Forum*, (Ed, Khakhar, D.) Laxenburg, Austria, IFIP Press, pp. 177-219.
- Braa, J. and Hedberg, C. (2002) The Struggle for District-based Health Information Systems in South Africa. *The Information Society*, 18 (2) 113-128.
- Braa, J., Monteiro, E. and Sahay, S. (2004) Networks of Action: Sustainable Health Information Systems Across Developing Countries. *MIS Quarterly*, 28 (3).
- Bratteteig, T. (2004) *Making change: Dealing with relations between design and use*, PhD dissertation, Department of Informatics, Faculty of Mathematics and Natural Sciences, University of Oslo, Oslo.
- Brown, A. (2001) Integrating vertical health programmes into sector wide approaches: Experiences and lessons, *Swiss Agency for Development and Co-operation*, Institute for Health Sector Development, Available at www.ihsd.org, [Last accessed in 26th March, 2004].
- Cassels, A. and Janovsky, K. (1998) Better health in developing countries: are sector-wide approaches the way of the future? *Lancet*, 352 (9142) 777-1779.

- Chabot, J., Heldal, E. and Zorzi, N. (2002) *Joint Review of the National Integrated Programme for the Control of Communicable Diseases*, Ministry of Health Mozambique and ETC Crystal-Partners in International Health.
- Chao, S. and Kostermans, K. (2002) Improving Health for the Poor in Mozambique: The Fight Continues, *Health, Nutrition and Population Discussion Paper*, World Bank Development Network, Available at http://www.worldbank.org/hnp/pub_discussion.asp, [Last accessed in 30th December, 2003].
- Collins, C. D., Green, A. T. and Newel, J. N. (2002) The relationship between disease control strategies and health system development: the case of TB. *Health Policy. Elsevier Science*, 62 (2) 141-160.
- Davenport, T. (1998) Putting the enterprise into the enterprise system. *Harvard Business review*, 4 (76) 121-131.
- Dgedge, M., Chabot, J., Koot, J., Mussa, A. and Zuidberg, L. (2003) *Second Joint Evaluation of Health Sector Performance in Mozambique during 2002*, Ministry of Health. Mozambique.
- Feldman, M. S. and March, J. G. (1981) Information in Organizations as Signal and Symbol. *Administrative Science Quarterly*, 26 171-186.
- Figueras, J., Saltman, R. and Mossialos, E. (1997) *Challenges in Evaluating Health Sector Reforms: An Overview*, LSE Health, Discussion Paper No 8, London School of Economics and Politics.
- Frieden, J. (1991) *External support and management of the health sector in Mozambique*, Unpublished draft report.
- Giddens, A. (1984) *The Constitution of Society: Outline of the Theory of Structure*. Berkeley, University of California Press.
- Gilson, L. (1995) Management and Health Care Reform in Sub-Saharan Africa. *Social Science & Medicine*, 40 (5) 695-710.
- Habermas, J. (1984) *The theory of Communicative Action - Reason and Rationalization of Society*. Boston, Beacon Press, MA.
- Hanseth, O., Ciborra, C. and Braa, K. (2001) The Control Devolution: ERP and the Side-Effects of Globalization. *The Data Base for Advances in Information Systems*, 32 (4) 34-46.
- Heeks, R. (1998) Information Systems and Public Sector Accountability, *Information Systems for Public Sector Management: Working Paper Series*, Institute for Development Policy and Management, Available at http://www.man.ac.uk/idpm/idpm_dp.htm#isps_wp, [Last accessed in 12th June, 2004].
- Heeks, R. (1999) *Reinventing Government in the Information Age: International practice in IT-enabled public sector reform*. Manchester, IDPM, University of Manchester.

- Heeks, R. (2002) Information Systems and Developing Countries: Failure, success and Local Improvisations. *Information Society*, 18 (2) 101-112.
- Hutton, G. (2002) Issues in integration of vertical health programmes into sector-wide approaches, *Introductory test and bibliography for discussion group*, Swiss Tropical Institute, Available at www.sti.ch/scih/swap.htm, [Last accessed in 20th March, 2003].
- I.H.S.D (2001) Orientation and Training Seminars for Agency Staff: Sector-wide Approaches for Health in a Changing Environment, *Seminar Handbook*, Available at <http://www.ihsd.org/swaps/handbook.htm>, [Last accessed in 30th December, 2003].
- INE (2003) População, Available at www.ine.gov.mz, [Last accessed in 10th June, 2004].
- INE, MISAU, MPF, CEP, UEM, CNCS and MINED (2002) *Demographic Impact of HIV/AIDS in Mozambique (update, year 2000)*, Instituto Nacional de Estatística.
- INE-Mozambique (2000) *Atlas Sócio-Demográfico de Moçambique*, Instituto Nacional de Estatística.
- Kling, R. (1986) *The social dimensions of computerization*. In *Proceedings of the SIGCHI/GI conference on Human factors in computing systems and graphics interface* ACM press, Toronto, pp. 337 - 339.
- Korpela, M., Mursu, A. and Soriyan, H. (2001) Information Systems Development as an Activity. *CSCW Journal, Special issue on Activity Theory and Design*.
- Korpela, M., Soriyan, H., Olufokunbi, K. and Onayade, A. (1998) Community participation in health informatics in Africa: An experiment in tripartite partnership in Ile-Ife, Nigeria. *Computer Supported Cooperative Work*, 7 (3-4) 339-358.
- Kuutti, K. (1991) Activity Theory and its applications to information systems research and development. *Information Systems Research*, 529-549.
- Kyng, M. (1995) Making Representations Work. *Communications of the ACM*, 38 (9) 46 - 55.
- Latour, B. (1987) *Science in Action*. Boston, Harvard University Press.
- Latour, B. (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Massachusetts, Harvard University Press.
- Lee, Y. W. and Madnick, S. E. (1992) *Integrating Territories: Information Systems & Territorial Rationality*. In *Proceedings of the 1992 ACM SIGCPR conference on Computer personnel research* ACM Press, Cincinnati, Ohio, United States, pp. 221-231.
- Mabert, V. A., Soni, A. and Venkataramanan, M. A. (2003) Enterprise Resource Planning: Managing the Implementation Process. *European Journal of Operational Research*, 146 302-314.
- Madon, S. (2003) 15 years of IFIP WG9.4. *Information Technology for Development*, 10 139.

- Martínez, J. and Martineau, T. (2002) Human resources in the health sector: an international perspective, *Issues paper*, DFID, Available at www.healthsystems.org, [Last accessed in 05th May, 2004].
- McLaughlin, J. (2001) Using Health Information to Sustain Support for Health Reform in Africa, MEASURE Evaluation - RHINO, Available at http://www.cpc.unc.edu/measure/rhino/rhino2001/theme2/mclaughlin_paper.pdf, [Last accessed in 10th June, 2004].
- MESCT (2000) *Plano Estratégico do Ensino Superior em Moçambique para o período 2000-2010: Análise da Situação Actual do Ensino Superior em Moçambique*, Ministério do Ensino Superior, Ciência e Tecnologia.
- MESCT (2001) *Higher Education Project 1 - Project Implementation Plan 2001-2010*, Ministry of Higher Education, Science and Technology Mozambique.
- Mills, A. (1983) Vertical vs Horizontal Health Programmes in Africa: Idealism, Pragmatism, Resources and Efficiency. *Social Science & Medicine*, 17 (24) 1971-1981.
- MISAU (1999) *Roll Back Malaria; Strategic Plan for 2002-2005*, Ministry of Health Mozambique and WHO.
- MISAU (2001) *Mozambique Strategic Plan for the Health Sector 2001-2005-(2010)*, Ministry of Health Mozambique.
- MISAU (2002) *Draft Report of the Joint Evaluation of the 2001 Health Sector Performance, Mozambique*, Ministry of Health Mozambique.
- MISAU (2003) *Plano Estratégico Nacional de Combate a ITS/HIV/SIDA Sector Saúde 2004-2008 Moçambique: 1º Rascunho*, Ministério da Saúde. Moçambique.
- MISAU DPC (2003) *O HIV/SIDA e o Sector Saúde em Moçambique: Uma Análise do Impacto do HIV/SIDA sobre os Serviços de Saúde*, Xavier Mòdol, Ministério da Saúde. Moçambique.
- MISAU PNC DTS/HIV-SIDA (2003) *Relatório sobre a Revisão dos Dados de Vigilância Epidemiológica do HIV-Ronda 2002*, Grupo Técnico Multisectorial de Apoio À Luta Contra o HIV/SIDA em Moçambique, Ministério da Saúde. Moçambique.
- Monteiro, E. (2003) Integrating health information systems: a critical appraisal. *Methods of Information in Medicine*, 42 (4) 428 - 432.
- Mozambique Country Coordinating Committee (2002) *Mozambican National Initiative to Accelerate Access to Prevention, Care, Support, and Treatment for persons affected by HIV/AIDS, Tuberculosis and Malaria*, Global Fund to Fight AIDS, Tuberculosis and Malaria, Global Fund Secretariat.
- Myers, M. and Avison, D. (2002) *An Introduction to Qualitative Research in Information Systems*. In *Qualitative Research in Information Systems*, (Eds, Myers, M. and Avison, D.) Gateshead, SAGE Publications, pp. 3-12.

- Mykkänen, J. and Korpela, M. (2003) *Integration Experiences in the PlugIT Project in Finland: How Applicable to eHealth Roadmap Development?* In *STEP 2003 Workshop on eHealth Software, Systems and Networks* Amsterdam.
- Oliveira-Cruz, V., Kurowski, C. and Mills, A. (2003) Delivery of Priority Health Services: Searching for Synergies within the Vertical versus Horizontal Debate. *Journal of International Development*, 15 67-86.
- Orlikowski, W. J. (1992) The Duality of Technology: Rethinking the Concept of Technology in Organizations. *Organization Science*, 3 (3) 398-427.
- Orlikowski, W. J. and Baroudi, J. J. (1991) Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research*, 2 (1) 1-28.
- Orlikowski, W. J. and Hofman, J. D. (1997) *An Improvisational Model for Change Management: The Case of Groupware Technologies*. In *Sloan Management Review*.
- Pavignani, E. (1999) The Reconstruction Process of the Health Sector in Mozambique, Available at http://www.who.int/disasters/hbp/field_experience/case_studies/reconstruction.htm, [Last accessed in 10th June, 2004].
- Pavignani, E. and Durão, J. R. (1997) *Aid, Change and Second Thoughts: Managing external resources in the health sector in Mozambique*, Ministry of Health Mozambique.
- Pavignani, E. and Hauck, V. (2001) *Pooling of Technical Assistance in the Context of Aid Management Reform: Mozambique Case Study*, Report to the Dutch Ministry of Foreign Affairs and the European Centre for Development Policy Management.
- Pöysä, M., Packalén, P. and Voipio, S. (2002) *Country Review Mozambique*, A Study commissioned by the Ministry for Foreign Affairs of Finland. Training Program for International Education Specialists.
- Puri, S. (2003) The Challenges of Participation and Knowledge in GIS Implementation for Land Management: Case Studies from India, PhD dissertation, Department of Informatics, Faculty of Mathematics and Natural Sciences, University of Oslo, Oslo.
- Ramankutty, P. (2003) Is "fully integrated" really the best thing? Know what enterprise applications need to connect (and what to leave alone), *Business Integration Journal*, Available at <http://bijonline.com/PDF/Se03Ramankutty.pdf>, [Last accessed in 30th December, 2003].
- Republic of Mozambique (2002) *Report on the Millennium Development Goals*, Government of Mozambique.
- Republic of Mozambique and Clinton Foundation (2003) *Plano Estratégico para Aumento Gradual dos Cuidados e Tratamento do HIV/SIDA em Moçambique*,
- Rolland, K. and Monteiro, E. (2002) Balancing the local and the global in infrastructural information systems. *Information Society*, 18 (2) 87-100.

- Sachs, P. (1995) Transforming work: collaboration, learning, and design. *Communications of the ACM*, 38 (9) 36-44.
- Sahay, S. (1998) Implementing GIS technology in India: Some Issues of Time and Space. *Accounting, Management and Information Technology*, 8 (2-3) 147-188.
- Schreuder, B. (2002) SWAps approaches for sustainable development in practice, Available at http://www.kit.nl/specials/html/sw_paper_bert_schreuder.asp, [Last accessed in 30th December, 2003].
- Sen, A. (1999) *Development as Freedom*. Oxford University Press.
- Shoib, G. and Jones, M. (2003) Focusing on the invisible: the representation of IS in Egypt. *Information Technology & People*, 16 (4) 440-460.
- Simon, H. A. (1957) *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*. London, Collier Macmillan.
- Simon, H. A. (1982) *Models of Bounded Rationality: Behavioral Economics and Business Organization*. Manchester, The MIT Press.
- Suchman, L. (1995) Making work visible. *Communications of the ACM*, 38 (9) 56-64.
- Technical Advisory Group (1998) *Towards a Sector-Wide Approach to Programming in the Health Sector: Options for Dialogue and Action*, Ministry of Health - Mozambique.
- The Global Fund to Fight AIDS Tuberculosis and Malaria (2003) The Framework Document, Available at http://www.theglobalfund.org/en/files/publicdoc/Framework_uk.pdf, [Last accessed in 30th December, 2003].
- Thomason, J. (1997) Health Sector Reform in Developing Countries: A Reality Check, Royal Children's Hospital, Available at <http://www.sph.uq.edu.au/ACITHN/Conf97/papers97/thomason.htm>, [Last accessed in 20th June, 2004].
- UN Population Division (2002) World Population Prospects: Population Database, Available at <http://esa.un.org/unpp/p2k0data.asp>, [Last accessed in 26th March, 2004].
- UNA-UK (2002) Mozambique - a profile, United Nations Association of Great Britain and Northern Ireland, Available at <http://www.una-uk.org/africa/mozambiqueprof.html>, [Last accessed in 10th June, 2004].
- UNDP (2004) *Human Development Report 2004: Cultural liberty in today's diverse world*, United Nations Development Programme.
- UTRESP (2002) *Mozambique-Public Sector Reform*, Government of Mozambique - Unit for the Reform of the Public Service.
- van Diesen, A. (1999) *Aid to Mozambique: An End to Dependence*. Christian Aid,
- Walsham, G. (1993) *Interpreting Information Systems in Organizations*. Cambridge, John Wiley & Sons.

- Walsham, G. (1995) Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4 (2) 74 - 81.
- Walsham, G. and Sahay, S. (1999) GIS for District-Level Administration in India: Problems and Opportunities. *MIS Quarterly*, 23 (1) 39 - 65.
- Walt, G. (1983) *The Evolution of Health Policy. In Mozambique: Towards a People's Health Service*. London, Zed Books Ltd.
- Walt, G., Pavignani, E., Gilson, L. and Buse, K. (1999) Health sector development: from aid coordination to resource management. *Health Policy and Planning*, 14 (3) 207-218.
- Ward, J. and Peppard, J. (2002) *Strategic Planning for Information Systems*. West Sussex, John Wiley & Sons.
- Weber, M. (1947) *The theory of economic and social organization*. New York, The Free Press.
- Weber, M. (1978) *Economy and Society*. California, University of California Press.
- Weber, M. (1987) *Rationality and Modernity*. London, Allen & Unwin.
- Webster, J. (1995) Networks of collaboration or conflict? Electronic data interchange and power in the supply chain. *Journal of Strategic Information Systems*, 4 (1) 31-42.
- WHO (1996) *Integration of Health care Delivery*, WHO Technical Report Series, Report of a WHO Study Group, World Health Organisation.
- WHO (2003) *The Monitoring and Evaluation (M&E) of the 3 by 5 Initiative*, WHO/HIV/2003.11, Treat 3 million by 2005, World Health Organisation.
- World Bank (2003) *World Development Report: Investing in Health*. Washington, Oxford University Press.
- Yin, R. K. (2003) *Applications of Case Study Research*. Sage Publications.