

**Transformational Feedback:**  
Breaking the vicious cycle of information use in  
Health Information Systems-A case from  
Malawi

by

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## **Dedication**

To my family

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## **Abbreviations and Acronyms**

ANC	Antenatal care
AR	Action Research
CMED	Central Monitoring and Evaluation Division
DHIS2	District Health Information Software2
DHMT	District Health Management Team
DHO	District Health Office
HIS	Health Information System
HISP	Health Information Systems Programme
HMIS	Health Management Information System
HSSP	Health Sector Strategic Plan
IT	Information Transparency
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NGO	Non- Governmental Organization
PHC	Primary Health Care
SWap	Sector Wide Approach
TF	Transformational Feedback
WHO	World Health Organization

## Abstract

The thesis has been motivated by the weak and inconsistent feedback practices and strategies in health information systems in developing countries. This affects the quality of reporting by those that gather the data and the use of information by policy makers and health managers. A circular relationship exists between fostering data use and increased data quality. Limited information use is thus both a cause and a result of poor data quality, a vicious cycle that is hard to break. The vicious cycle concept can be used to understand the circular relationships between the data collection and reporting routines on the one hand and the information use routines on the other. The thesis introduces the concept of transformational feedback with its related dimensions of information transparency, two-way dialogue and networks for learning to help in breaking the vicious cycle of information use.

This study was conducted in Malawi within the context of Health Information Systems Programme (HISP), a global research and development initiative on health information systems in developing countries. The initiative, which is in more than 50 countries, is aimed at contributing to the generation of knowledge as well as implementation of interventions to solve problems in health information systems in developing countries.

The study was guided by two research questions: (i) how can transformational feedback be conceptualized in the context of HMIS in developing countries? and (ii) what approaches can be used to implement transformational feedback to break the vicious cycle of information use in the context of HMIS in developing countries?

The thesis adopted primarily an interpretive and critical tradition in order to increase the understanding of feedback practices and at the same time implemented change in feedback practices and processes. It used a pluralist action research approach involving the mixing of action research with other research methods. The multi-method approaches to research adopted action research as the dominant approach and was supported by case study and field experiment research methods. A multiplicity of methods for data collection was used including semi-structured and in depth interviews using open-ended questions and focused group discussions targeting district health managers and district data officers; participant observations; and document analysis. Findings were presented in five conference and journal papers.

The thesis primarily contributes to practice by developing guidelines on how *transformational feedback* can be implemented to influence information use. Based on insights from Malawi, it proposes three promising implementation approaches to *transformational feedback*: league tables, peer based reviews and mobile reporting. The thesis also contributes to theory through the development of the concept of *transformational feedback*.

# **Chapter 1: Introduction**

This chapter presents an overview of the thesis. It introduces the background of the research including the research problem and possible venues to address it; presents the motivation of the study and the significance of the research; and gives the empirical setting of the study. This is followed by presentation of the research objective and questions and a discussion of the research approach adopted. A summary of the research findings and the contributions of the research are then highlighted. Finally an overview of the structure of the thesis is presented.

## **1.1 Background and research problem**

### ***1.1.1 Background***

Healthcare is critically dependent on the availability of and accessibility to high quality data (Nutley & Reynolds, 2013; AbouZahr & Boerma, 2005). Data quality has multiple dimensions and its meaning is defined by the data users and it changes over time (Orr, 1998; Miller, 1996; Wang & Strong, 1996). While there are many dimensions of data quality, in this thesis it is defined in terms of relevance, accessibility and accuracy. Relevance refers to whether the information meets the users' needs (Miller, 1996). Accessibility is the extent to which information is readily available to the users (Pipino et al., 2002; Miller, 1996; Wang & Strong, 1996). Completeness is part of the accessibility of the data quality attributes and means all the requisite data are available so that there are no missing values. It also means that all the expected reports are available. Timeliness is another accessibility aspect of data and is defined as the availability of data on time and which is regularly updated. Both aspects should be fulfilled to ensure relevancy of data. Accuracy refers to the perception that information is correct to the extent possible (Schnackenberg & Tomlinson, 2014). All these dimensions complement each other.

Good quality data are the foundation of the functioning building blocks of a health system (WHO, 2007; Nutley & Reynolds, 2013; AbouZahr & Boerma, 2005). The demand for quality data varies at different levels of the health system: patient care, system management and policy making (AbouZahr & Boerma, 2005). For instance, at the patient/client level, information is used for effective clinical management. At the

district level, quality data is important as it enables district health managers to take decisions on the management of health facilities and district health system. At the national level, quality data is required for policy making, monitoring and evaluation of health policies, programmes and services. This thesis focuses on health management at district level in line with the primary health care (PHC) strategy (WHO, 1978) for health care delivery which considers a district as a focus for its implementation. In addition, the focus on quality data has increased in the wake of the push towards strengthening evidence based and informed decision making to track the Millennium Development Goals and the practice of performance based financing (Aqil, Lippeveld, & Hozumi, 2009).

### **1.1.2 The Problem: Weak feedback in health information systems**

Health information systems in developing countries are designed and implemented to generate quality data to be used for taking action: planning, resource allocation and strategy development and other decision making (Mutale et al., 2013; AbouZahr & Boerma, 2005; Lippeveld et al., 2000). Despite the availability of huge amounts of data in national databases, its quality and use remains limited at best, particularly at the district and health facility levels (Manya et al., 2015; Sultan et al., 2011). In the context of public health, *data quality* should make it relevant or *fit for use* (Strong et al., 1997; Wang & Strong, 1996) by health managers. Use is a difficult concept as it can be interpreted in various ways (Nutley & Reynolds, 2013; Van de Walle & Bovaird, 2007). In this study, we refer to *information use* to mean the analysis, interpretation and review of data to improve performance of health management.

Low data quality and limited data use in health management are some of the major challenges of health information systems in developing countries. Research has discussed the multiplicity of causes of information systems failure (Odhiambo-Otieno, 2005; Lippeveld et al., 2000; Lyytinen & Hirschheim, 1986). For instance, Lyytinen & Hirschheim (1986) developed a framework for better understanding information system failure and introduced the concept of expectation failure. Expectation failure is referred to as the “inability of an information system to meet the specific stakeholder groups’ expectation” (Lyytinen & Hirschheim, 1986, p.264). Other researchers have identified some notable contributing factors for information system failure including, among others, *design*: cumbersome procedures of data collection and processing

(Simba & Mwangu, 2006; Mshana, 2004); *training*: problems of poor recording and underreporting which is associated with lack of knowledge, training and initiative for using information (Nyamtema, 2010; Mshana, 2004; Lippeveld, et al., 2000); *incentive*: failure of health workers to appreciate the importance of using information and low motivation to improve data quality and promote its use (Ikonje, 2014; Simba & Mwangu, 2006; Mshana, 2004; Robey & Lee, 1990); *workload*: inadequate staff for data management (Lippeveld et al., 2000) leading to heavy workload; and inadequate attention to completeness and quality of data during monitoring/supervision visits. Furthermore, good quality data are not generated because of the failure by health workers to use the data in managing health care services at that level. The health workers at facility level consider that the primary purpose of data collection is for reporting to higher level rather than for local use to improve quality of care (Simba & Mwangu, 2006).

While acknowledging these factors, this thesis focuses on feedback in strengthening health information systems (HIS). Feedback is one of the strategies that can effectively be used to enhance data quality and information use, and yet its implementation in many developing countries has been found to be weak (Aqil, et al., 2008; Odhiambo-Otieno, 2005; Lippeveld et al., 2000; Chae et al., 1994). Feedback from the health managers to the data collectors is one of the fundamental weaknesses that affect the quality of reporting by the data collectors, and the analysis and use of information by policy makers and health managers (Rotich et al., 2003). In addition, feedback practices can positively improve not only performance but also learning among the health managers.

Available literature in information systems shows that a circular relationship exists between fostering data use and increased data quality (Braa, Heywood & Sahay, 2012; Cibulskis & Hiawalyer, 2002; Heywood & Rohde, 2002). Braa et al. (2012) clearly note this linkage and observe that “data quality and data use are interrelated: poor quality data will not be used, and because they are not used, the data will remain of poor quality” (p379). If data is not used, it affects the quality of data being collected because one can only appreciate the quality of data if it is used. This results in further generating poor data quality and limited use of such information. Limited data use is thus both a cause and a result of poor data quality; a vicious cycle has been created

that is hard to break. Other researchers also support the development of the *use-based data quality* approach which states that in order to improve data quality we have to certainly improve its use (Orr, 1998). The concept of vicious cycle is relevant in many other contexts. For instance, it has been applied in development economics (Nurkse, 1953) to help understand the essential variables and relationships between poverty and development. The concept is also relevant in situations where there is distributed collaboration for improving data flows and interpretation between healthcare and information technology domains.

Another example of circular relationship comes from the Malawi case which I study in this thesis. Previous research has found that one of the major barriers to data use is incomplete records and untimely reporting (Chaulagai et al., 2005). The Health Management Information System (HMIS) assessment studies (Health Management Support Team, 2013; Ministry of Health & Health Metrics Network, 2009; Calcon, 2008) have similarly found that data quality and information use are a challenge and have highlighted the health workers' dissatisfaction with feedback they receive on HMIS data and confirmed the lack of trust in HMIS data (Health Management Support Team, 2013). These assessments identified weak feedback practices as one of the major contributing factors to low data quality and limited information use. Adding on to this challenge, with data being seen as of poor quality, the vertical health programme managers tend to develop their own parallel systems, contributing to fragmentation and magnifying the poor quality of data. It is also used to analyze the mechanisms that tend to work against improvements of the performance of health information systems. Furthermore, accessibility to HMIS data has been problematic especially at the district level. District health managers have no or limited access to not only their district data and information but also of other districts' data for comparison.

These results are not only confined to Malawi. Weak feedback is also a major concern internationally. Experiences from other countries point to the fact that there is weak feedback in health information systems in developing countries in general (Ikonje, 2014; Simba & Mwangi, 2006; Mshana, 2004; Robey & Lee, 1990). Other researchers have also underscored the importance of feedback as a basis for improvements in health information systems (Bradley et al., 2004; Boerma, 1991; Schwabe, 1987). For instance, Schwabe (1987) emphasizes that the success of a health information system

depends on feedback as it provides incentives for health workers to provide accurate and up-to-date data. Similarly, Boerma (1991) observes that feedback is the backbone of a sound health information system and that it should be provided to those that are generating the data.

Feedback can be categorized into *performance* and *process* feedback and can take place at individual, group/team, or organization levels. Gabelica et al. (2012) conceptualize performance feedback as the provision of information about individual or group performance to reinforce good performance or to correct poor performance enabling improvements to be made. Process feedback is defined as information regarding the way one performed a task and reached expected results. Available literature indicates that team feedback compared to individual feedback research has not been explored extensively (Gabelica et al., 2012). A team refers to “two or more people who interact interdependently to achieve specified, shared and valued objectives” (Gabelica et al., 2012, p.125).

### **1.1.3 Addressing the problem: Transformational Feedback**

No single approach can address the significant and complex problem in public health in developing countries. A variety of approaches have been suggested including supervision and feedback that is intended to improve performance (Heywood & Rohde, 2002; Lippeveld et al., 2000). And data use workshops have been implemented to enable relevant stakeholders to discuss and see the value of data for local action (Braa et al., 2012). Most of these approaches are not very specific in detailing what sort of feedback should be promoted. In addition, most of the approaches have focused the short term improvements rather than on long term solutions.

Feedback has been defined from many perspectives (Åstrom & Murry, 2010; van de Ridder, et al., 2008; Greller, 2003; von Bertalanffy, 1968). From a general communication process, feedback is defined as *information transmission* (Sadler, 2013; Nicol & Macfarlane-Dick, 2006; Askew & Lodge, 2004) sent to a recipient regarding their behavior or performance with a view to meeting particular individual and organizational goals. Considering the wide range of effects of feedback, the focus of the simple feedback model on information transmission has received criticism for being narrow and limited (Carless et al., 2010; Nicol & Macfarlane-Dick, 2006; Yorke,

2003; Boud, 2000; Sadler, 1998). Feedback process should not only focus on information transmission but should also encompass additional dimensions of feedback. The simple feedback model offers insufficient explanatory power on how to break the circular relationship of poor data quality and limited information use. The thesis introduces the concept of *transformational feedback* that can be used in breaking the vicious cycle of limited information use by promoting information transparency, two-way dialogue and learning networks. A detailed discussion on the concept is in the next chapter.

## **1.2 Motivation**

This thesis has two main motivations: personal and theoretical. First, the thesis is motivated by my experience as a practitioner in health management information system (HMIS) in Malawi. As the former head of the Central Monitoring and Evaluation Division (CMED) of the Ministry of Health, I was at the helm of the office responsible for managing the implementation of HMIS in Malawi for more than fifteen years. During these years, I was responsible for providing strategic leadership in the design and implementation of a decentralized and comprehensive HMIS in the country. This coincided with various health sector reform initiatives by the Ministry of Health, such as decentralization of health service delivery to district councils; implementation of sector wide approaches (SWAp); and, introducing new HIS based technologies like DHIS2 (District Health Information Software). All these efforts required a strong health information system to provide the required quality data. This called for an intervention that could help to build strong links between the data collection and information use in decision making processes.

In a complex sector such as health, balancing the information needs of the various and diverse health managers and what the health information system can offer is a challenge. My observation and experience in implementing HMIS in Malawi have shown that many health managers have a good appetite for more data and yet they are unable and unwilling to actually use the already existing data.

Further, multiple data reporting systems from the health facilities to the national level exist, motivated by health managers claiming that the national HMIS is not meeting the information needs of their vertical health programmes. As a result, most of the



health managers emphasized data from a quantity rather than quality perspective. I have also experienced instances where health managers express dissatisfaction in the data quality produced by the HMIS. They openly state that they do not trust the HMIS data and that this is the reason why they do not use the data in their decision making. For instance, one of the district health offices produced its district HMIS annual bulletin whose data was clearly of questionable quality. For example, one health facility reported data on child deliveries and yet the facility does not provide such services. This can contribute to health managers to lose trust in the HMIS data and consequently not use it.

As I have managed the implementation of the HMIS over these years, I have observed that the focus in the implementation process is on data collection and reporting to national level. Data flows are primarily unidirectional and upward from the health facilities to the next levels with little or no feedback from the higher levels to where data is generated. Empirical data from this study indicates that the provision of feedback on HMIS data at all levels is not a routine practice but is done when there are errors in the report. As a data clerk observed: *“at the district level, feedback is only given if there are errors with the data.”* Regarding no feedback being received from the district health office, the in-charge of a hospital had this to say: *“But we would like to know whether we are doing better or we are lagging behind, or which are our strengths and weaknesses so that we know where we can improve.”* This sentiment was also expressed by a district medical officer who noted that: *“at the district health office level, feedback to health facilities is more reactive, if something is wrong rather than proactive. This is due to limited financial resources and time.”* Similarly, at the national programme level, an M&E technical advisor of a national programme indicated that: *“the programme provides one-to-one feedback to district [programme coordinator] to clarify the problem or address the anomaly. If the data is fine no feedback is given.”*

Furthermore feedback is not properly coordinated and not targeting the appropriate group. As echoed by a senior M&E Technical Advisor who observed that:

*“Feedback mechanisms are fragmented, not well coordinated thus not expect to improve the health information systems. There is need to coordinate feedback practices. Communication of feedback done in the DHIS2 is seen as one way of improving the situation. However feedback goes to the information*

*processors [the district HMIS officers] and not to the decision makers at the district level. Communicate to the district health management team and the district health officer and it should be on a regular basis.”*

These show that there are weak and inconsistent feedback strategies and practices for information dissemination and use, especially at the district level. In addition, there is poor data accessibility, sharing and coordination among the district health managers. This is due to, among others, poor vertical flow of feedback between different levels as well as limited horizontal flow of information between health managers and/or departments at the same level of the health system. Furthermore, district health managers have limited access to data and information of other districts in order to compare and benchmark their performance.

Second, the concept of feedback can be considered as an essential characteristic in a variety of settings (Greller, 2003) and disciplines and fields including, among others, engineering, biology, learning and management. Available feedback literature indicates that feedback is an effective tool in education and learning, and management settings (Thurlings et al., 2013; Shute, 2008; Mory, 2003; Hattie & Timperley, 2002) and has motivational and informational functions (Kulhavy & Wager, 1993; Mory, 2003). In the motivational meaning, feedback could be considered as an incentive for behavioral change. In an informational meaning feedback is information that can be used to improve performance (Nelson & Schunn, 2009). While the various functions are important, this thesis focuses on the informational feedback in order to understand the potential of feedback in performance and learning improvements. For a long time, the dominant view feedback has been *information transmission* focusing on one-way message disclosure from the sender to the receiver (Sadler, 2013; Nicol & Macfarlane-Dick, 2006; Askew & Lodge, 2004). The dominant view has some limitations and the thesis is addressing the shortcomings by introducing the concept of *transformational feedback* and its related dimensions of information transparency, two-way dialogue, and networking for learning.

### **1.3 Empirical setting**

This study conducted in Malawi is situated within the context of Health Information Systems Programme (HISP), a global research and development initiative on health information systems in developing countries coordinated by the University of Oslo,

Norway (hisp.uio.no). The initiative is aimed at contributing to the generation of knowledge as well as implementation of interventions to solve problems in health information systems in developing countries.

Malawi has been engaged in implementing HMIS since 2002. The system is paper based at health facility level and electronic at district and national levels. Since 2012, Malawi has used DHIS2 (see [www.dhis2.org](http://www.dhis2.org)) a web-based, free and open source data management platform running in more than 50 developing countries globally. The software is used for data entry, storage, analysis and presentation. The Ministry of Health maintains a central database using DHIS2 for routine data received monthly from all districts. The districts are using DHIS2 as a data repository managed at the national level and it is facilitating ways of providing feedback through the collection, processing, displaying and accessing data.

One of the HMIS design principles in Malawi was to have data collected processed and used at health facility level (Chaulagai et al., 2005). However, during the implementation of the HMIS, the main focus was on getting the data reported from the district to national level for further analysis and use rather than ensuring its use at district and lower levels. While using DHIS2 has improved the vertical flow of data from the district to the national level, it has not significantly improved the horizontal flow of data among the health workers, especially at the district level. Until 2012, only the district health information officer was familiar with the system at the district level and therefore availability, accessibility and sharing of data by the district health managers was very limited. The Malawi health sector has established channels, such as review meetings, for providing feedback on health systems performance. The establishment of such channels at the national, district and health facility levels provide an opportunity to ensure that data quality and information use for action can be promoted and integrated in health management.

The thesis is based on the study conducted in the public health sector in Malawi between 2014 and 2016. It is focused on understanding feedback approaches for improving low data quality and limited information use. In this regard, I studied the effects of introducing the *performance league tables*, an intervention done at the district level, for health managers to use in providing feedback to improve data quality

and information use. As part of the research team, I undertook a number of activities including a situation analysis done in pilot districts in several rounds. The first round was conducted in the first situation analysis in Mchinji district, in July 2014. The second round of the diagnosing phase was conducted in the districts of Karonga, Rumphi, Mzimba north, Mzimba south and Kasungu and in the Northern health zone in October 2014. The third round of the diagnosis phase took place in Dowa district in September 2015. The objectives of the situation analysis were to assess the implementation status of DHIS2 in the districts; conduct a situation analysis on the dimensions of feedback at the district level; identify challenges and feedback issues to be addressed during subsequent phases; and introduce and test a scorecard concept in form of *performance league tables* for districts to use in providing feedback.

League tables consist of many things as reflected in a number of different definitions and implementations. For example Adab et al., (2002) define league tables as a “technique for displaying comparative rankings of performance indicator scores of several similar providers” (p.96). Others have defined it as a set of quantitative data designed to present comparative evidence regarding the quality and performance of organizations (Robert & Thompson, 2007). What is common in these definitions is that league tables can be used to rank and compare performance of different entities using particular standardized set of performance indicators.

League tables can be applied in many sectors and at various levels. For example, within the health care, League tables can be implemented at the national, at the sub national, at the district, at the facility and the programme levels. In addition, league tables can be useful in a number of ways. They can be used for data presentation and help interpretation of data. They can provide critical information to help make management decisions. They can provide a way of displaying comparative rankings of performance indicators, improving data sharing and access, as well as providing feedback regarding the performance of organizations and providers. Furthermore, they can help to identify areas of weaknesses that require attention and support. League tables can promote local participation as users define their requirements and generate reports according to need.

League tables can be developed in a number of ways. In order to gain wide acceptance amount the stakeholders, a participatory bottom and decentralized development process is proposed to appreciate and buy-in in the concept of the league table and ensure flexibility and usefulness, and build consensus.

Despite its potential use the league table has its shortcomings. The value of league tables depends on the availability of and access to quality of the data used to calculate the performance indicators used in the league tables. Data quality is problematic especially in developing countries. In addition selection of indicators should be based on relevance for local action rather than on just data availability. In addition most performance indicators are selected based on data availability rather than on relevance.

#### **1.4 Research objective and questions**

The overall research objective of this thesis is to introduce the concept of *transformational feedback* and find out how it can be used to break the vicious cycle of information use related to HMIS in developing countries. In order to achieve this objective, the thesis addresses the following two research questions:

RQ1: *How can transformational feedback be conceptualized in the context of HMIS in developing countries?*

RQ2: *What approaches can be used to implement transformational feedback practices to break the vicious cycle of information use in the context of HMIS in developing countries?*

RQ1 will mainly be handled as a theory issue, while RQ2 will be answered based on the empirical findings.

#### **1.5 Research approach**

The study is primarily based on an interpretive research approach which assumes that our knowledge of reality is socially constructed (Walsham, 2006). This approach aims at increasing understanding of the phenomenon in its natural context (Walsham, 2006; Cavaye, 1996; Orlikowski & Baroudi, 1991). This research has adopted an interpretive approach because I want to understand transformational feedback in HMIS from the health managers' perspective. At the same time, the study is based on the critical

tradition as it challenges the existing status quo and introduces an intervention that can change or influence the vicious cycle of information use related to HMIS in developing countries.

The thesis used a pluralist action research approach involving the mixing of action research with other research methods. It adopted an action research strategy (Davison et al, 2004) as the dominant approach to address organizational problems through interventions and at the same time contributing to knowledge creation. This was supported by case studies and field experiments. The study was undertaken in four pilot districts in Malawi and followed the five stage cyclical process of: diagnosing; action planning; action taking; evaluating; and reflecting (Davison et al., 2004; Susman and Evered, 1978). A multiplicity of methods for data collection was used including semi-structured and in depth interviews using open-ended questions and focused group discussions targeting district health managers and district health information officers; participant observations; and document analysis.

The unit of analysis for this study is the district health management team (DHMT) comprising of a group of health managers based at the district health office. The district health management team is the main structure for managing district health services and it is responsible for, among others, taking planning and resource allocation decisions, and monitoring the implementation of these decisions. While data collection was done at individual level; data analysis was at group and organization level.

## **1.6 Research findings**

The research findings are addressed in the following papers which are in Appendix 1:

**Paper 1:** Moyo, C., Manda, T. & Nielsen, P. (2015). Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi, *Proceedings of the 9th HELINA conference 2014*, 2(2), Ghana, March 2015, 89-95

**Paper 2:** Moyo, C., Nkhonjera, T. & Kaasbøll, J. (2015). Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi, *Proceedings of the IST-Africa 2015 Conference, Malawi*, 6-8 May 2015

**Paper 3:** Moyo, C. M., Frøyen, M. H., Sæbø J. I. & Kaasbøll, J. J. (2015). Using performance league tables to promote accountability and feedback in health

management in Malawi, *Proceedings of the ifip9.4 Conference, Negombo, Sri Lanka, 20-22 May 2015*, 265-276

**Paper 4:** Moyo, C., Kaasbøll, J., Nielsen, P. & Sæbø, J. (2016). The information transparency effects of introducing league tables in the health system in Malawi. *Electronic Journal of Information Systems in Developing Countries*, 75(2), 1-16

**Paper 5:** Sæbø, J., Moyo, C. & Nielsen, P. (2016). Promoting transparency and accountability with district league tables in Sierra Leone and Malawi (Submitted to *Health Policy and Technology*)

### **1.7 Research contributions**

This thesis primarily contributes to practice by developing guidelines on how *transformational feedback* can be implemented to influence information use. Based on insights from Malawi, it proposes three promising implementation approaches to *transformational feedback*: league tables, peer based reviews and mobile reporting. The thesis also contributes to theory through the development of the concept of *transformational feedback*.

### **1.8 Structure of the Thesis**

After this introduction, the rest of the thesis is structured as follows. Chapter 2 discusses the related literature on feedback in organizations. This is followed in Chapter 3 by a discussion of the conceptual framework of transformational feedback and its related dimensions. Chapter 4 presents the methodological approach the thesis adopted and the empirical research process. Chapter 5 presents an overview of the research context and setting. An overview of the main research findings from the individual papers and summary of individual paper contributions towards addressing the research questions are presented in Chapter 6. Chapter 7 presents a discussion and contributions including conclusions and suggested areas for future research.





## **Chapter 2: Related literature**

This chapter discusses the existing related literature on feedback in organizations drawn from different fields including health information systems. The first section discusses the concept of feedback. This is followed by a discussion on the simple conventional feedback model. The final section discusses the purposes of feedback. This chapter helps to gain a better understanding of feedback and in the development of the conceptual framework in the next chapter.

### **2.1 Feedback**

The concept of feedback has a long history. It originated in engineering and it is now widely used in the various fields such as education and learning, management and social science (Åstrom & Murry, 2010; van de Ridder, et al., 2008; Greller, 2003; Richardson, 1983; von Bertalanffy, 1968). The use of the feedback concept in these disciplines differs in terms of approach and assumptions and it ranges from controlling the dynamics of a system in engineering to influencing and stabilizing behavior in social sciences. There are many definitions of feedback from various fields and this reflects its complexity and multi-dimensionality nature of the concept. From management perspective, Ramaprasad (1983) broadly defined feedback as “information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap some way” (Ramaprasad, 1983, p.4). This broad definition recognizes that there is a gap between the actual level of performance and the standard level of performance. It also highlights the power or significance of feedback to alter the gap between the levels. Furthermore the definition allows the comparison between the actual and standard performance (Mory, 2004). Feedback is one of the key components of information systems (IS) management (Baker, 1995). Literature on information systems design and implementation has tended to address aspects related to data collection and analysis but rarely on feedback routines for improving such systems (Lippeveld et al., 2000). While data collection and analysis might have been institutionalized within the organizations, feedback practices, on the other hand are yet to find their place in the development of the organization’s feedback culture (London & Smither, 2002).

Feedback occurs in a cultural context and any discussion on feedback should take this into consideration. Feedback culture refers to the organizational policies, practices, interventions and structures that can help and support interpret and use feedback (London & Smither, 2002). Feedback strategies are affected by the context in which they occur. Contextual factors within the health systems affect not only data capture (Kanjo, 2012) but also feedback in organizations. Both theoretical and empirical work shows that feedback processes in organizations depend on cultural and societal values (Anseel & Lievens, 2007). Feedback environment thus refers to the contextual factors that shape the impact of feedback (Dahling & O'Malley, 2011; Steelman et al., 2004). In theory, literature may identify the need for having good feedback to be put in place, in practice this has not been the case. The little attention given to feedback may be due to various reasons including non-existence of feedback mechanisms in practice or the form they should take has not been identified (Baker, 1995).

Researchers have underscored the importance of feedback in health information systems (Bradley, et al., 2004; Boerma, 1991; Schwabe, 1987). For instance, Schwabe (1987) emphasizes that the success of a health information system depends on feedback as it provides incentives for health workers to collect and report accurate and up-to-date data. Similarly, Boerma (1991) observes that feedback is the backbone of a sound health information system and that it should be provided to those that are generating the data in order to improve it. From networks point of view, Alter & Hage (1993) point out that feedback is a key management mechanism in networks as it offers communication link between all parts of the network. Despite its importance, feedback practices in health management information systems implementation in many developing countries are generally weak (Aqil, et al., 2008; Odhiambo-Otieno, 2005; Lippeveld et al., 2000; Chae et al., 1994). For instance, feedback practices in management information systems in general do not take a multi-dimensional view but focus on unidirectional top-down information transmission.

## **2.2 Conventional feedback view**

The dominant view of feedback in organizations is the simple feedback model which is characterized by the one-way information transmission from the sender to the recipient about their behavior or performance (Sadler, 2013; Nicol & Macfarlane-Dick,

2006; Askew & Lodge, 2004; Ashford & Cummings, 1983; Ilgen et al., 1979). This view is also supported by other researchers. For instance, Kluger & DeNisi (1996) defined feedback as “actions taken by an external agent to provide information regarding some aspect(s) of one’s task performance” (p.235). Similarly, Hattie & Timperley (2007) conceptualized feedback “as information provided by an agent regarding one’s performance or understanding” (p.89). According to Hattie & Timperley (2007) the “purpose of feedback is to reduce the gap between current understandings and performance and a goal” (p.86). It is clear that the definition focuses on information that aims to reduce the discrepancy between the actual performance and the expected or desired goal. In this case feedback focuses on closing the gap between performance and some standard or goal (Ramaprasad, 1983; Sadler, 1989). This approach helps in navigating the gap between present performance and expectations.

From information perspective, feedback is conceptualized as a process that is treated within a broader information environment for monitoring the information environment. Treating feedback processes from control perspective, feedback is viewed as information for correcting errors with a view to meet particular individual and organizational goals.

A simple descriptive feedback model can be used to illustrate the information transmission perspective (Figure 2.1). The feedback model provides a framework for understanding communication and control in organizations. From the general systems theory (von Bertalanffy, (1950), an input going through a process results into an output. From the output, feedback is drawn directly to the input in order to make adjustments.

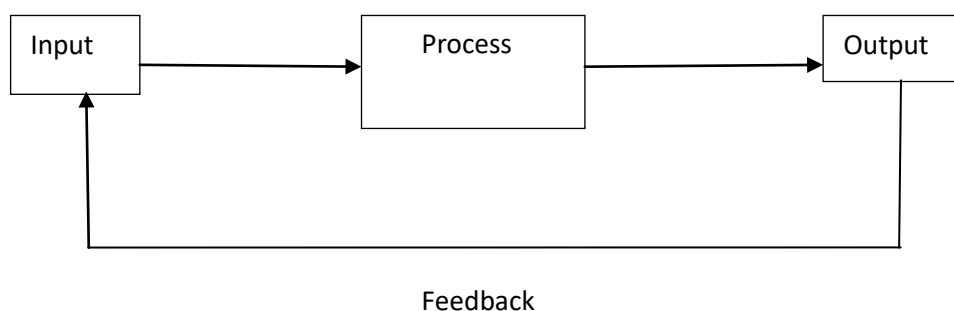


Figure 2.1: Simple feedback model

The simple feedback model is characterized by one-way transmission process of feedback information from the sender to the recipient (Nicol & Macfarlane-Dick, 2006) in order to close the gap between current performance and desired outcome (Sadler, 1989). In this traditional feedback model, the focus is on the content of the feedback message (Van de Ridder et al., 2008) where the sender transmits information to the receiver. The feedback messages transmitted are mainly about error detection. This approach has a hierarchical structure in the sense that the receiver depends on the sender for feedback. This is defined by an expert-non expert dichotomy (Johnson, 2007). Van de Ridder et al., (2008) conducted a literature search about definitions of feedback and found that the feedback concept was defined as information focusing on message content; as a reaction and interaction with information and as a process that connects inputs and outputs.

### **2.3 Purposes of feedback**

Feedback is used as a multi-dimensional concept in organizations, the focus of the thesis, and relates to feedback approaches, types of feedback and functions. The discussion focuses on group feedback in organizations and it is based on district health management teams as the unit of analysis. Group feedback is where the information about performance reflects the functioning of the group as a unit (Nadler, 1979). Performance feedback refers to the provision of information about individual or group performance to reinforce good performance or to correct poor performance enabling improvements to be made (Gabelica et al., (2012). In addition, performance feedback is effective in increasing motivation and stimulating learning (London, 2003). From the different conceptualizations, it is evident that feedback is important for performance improvements (Thurlings et al., 2013). The role of feedback and the effects of different types on performance have generated a lot of interest of researchers (Lam et al., 2011; Lurie & Swaminathan, 2009).

Feedback has different purposes and roles and can occur at different levels in organizations. Price et al., (2010) conceptualize feedback in five broad functional but not discrete categories: correction, reinforcement, forensic diagnosis, benchmarking and longitudinal development. Taking corrective action is central to the traditional function of feedback (Nadler, 1979). Here, the purpose of feedback is: “correcting

actions on the difference between desired and actual performance” (Åstrom & Murry, 2010, p.17). Other researchers advocate the reinforcement role of feedback which provides positive or negative reinforcement to existing behavior (Price, et al., 2010). Sadler (1989) acknowledges the role of feedback in the identification of errors or problems (diagnosis) and links this with the benchmarking role of feedback. Sadler (1989) also acknowledges the forensic role of feedback as an error detection device where its main purpose is to diagnose problems and stimulate identification of solutions. The benchmarking role of feedback identifies a gap between what has been achieved and expected performance. The longitudinal development function of feedback is directed at supporting improvements in the future performance or activity of the organization (Price et al., 2010). These categories are closely linked as each category feeds into the next one.

Many researchers have considered feedback as dialogical perspective (Kelly et al., 2013; Nicol, 2010; Nicol & Milligan, 2006; Nicol & Macfarlane-Dick, 2006). Kelly et al (2013) discuss the importance of feedback that promotes conversations and using technology as a platform for promoting dialogue. The focus of this perspective is on “collective process where information is used to provoke productive conversations” (Kelly et al., 2013, p.88). In this regard, feedback information is used to “promote productive dialogues that are oriented to exploring problems in a situated manner and the production of actionable outcomes” Kelly et al. (2013, p.86).

Other researchers view dialogic feedback from learning perspective. The work of Nicol (Nicol, 2010; Nicol & Milligan, 2006; Nicol & Macfarlane-Dick, 2006) emphasizes the importance of dialogue as a means of promoting learning. Nicol (2010) discusses feedback from a two-way dialogical perspective. Laurillard (2002) as quoted by Nicol (2010) developed a conversational framework in which dialogue is seen as an ongoing and discursive process. The framework defined four characteristics for an effective dialogue: adaptive, based on the need; discursive, two way communicative exchanges; interactive which is linked to action; and reflective (Nicol, 2010). From the management literature, feedback is considered as an instrument of adaptive change for understanding or improving organizations (Greller, 2003). The basic principle of feedback is about change: from poor to better performance or to change the pattern of behavior. However, this change does not occur in a vacuum. It takes place in an

entity, individual, group or organization. In order to facilitate change process there has to be a strong feedback system that is part of a broader organizational process (Greller, 2003).

Feedback systems can therefore facilitate performance in an organization through adaptive adjustments. Implications of feedback in information system implementation are many and varied. Feedback helps to build a culture of information use in organizations through the provision of feedback information to managers and policy makers. Feedback as communication can also help to bridge the communication gap between the different levels and among the actors within the same level.

## **2.4 Feedback levels**

There are several functions of performance feedback at individual and group levels in organizations (Ashford & Cummings, 1983). At the individual level, feedback can serve as information regarding how one is performing in relation to goals (Ashford & Cummings, 1983) as well as in relation to others. At the organizational level, it can help to stimulate and maintain high levels of effort (Hattie & Timperley (2007). In their feedback model, Hattie & Timperley (2007) identify and elaborate four levels at which feedback can be directed: at a task or product; at process level to create a task or product; self-regulation level and at personal or self-level (Hattie & Timperley, 2007). Feedback at the task or product level is concerned with whether work or task is correct or not. Feedback at the process level is aimed at understanding the process used to make a product or complete a task. At the self-regulation level, feedback is focused at having greater skill in self- evaluation. At the fourth level, feedback is directed at the personal level which is not related to performance on the task (Hattie & Timperley, 2007).

From the available literature, feedback is applicable at both the individual (London, 2003; Balzer, Doherty, & O'Connor, 1989; Ilgen, Fisher, & Taylor, 1979; Nadler, 1979) and group levels (London & Sessa, 2006; Mesch et al., 1994). While there has been extensive research on feedback at individual level (Nadler, 1979; Ilgen et al., 1979; Kluger & DeNisi, 1996) very little research has been conducted to examine the effects of feedback at group level (London & Sessa, 2006; Mesch et al., 1994; Nadler, 1979). Nadler (1979) suggests the need for additional attention on the effects of feedback on

the performance of groups. At the individual level, feedback provides information on individual performance as well as learning in relation to the goals. The effects of feedback depend on individual, situational and task characteristics and that of feedback itself (Balzer, Doherty & O'Connor, 1989). Research on feedback highlights the importance of feedback on individual learning and performance. Feedback can have both positive and negative effects on learning and task performance. Literature from learning and instruction shows that feedback at individual level has beneficial effects as it can direct, motivate and reinforce behavior (Ilgen, Fisher & Taylor, 1979; London, 2003; Nadler, 1979). In addition, it can help to set standards of performance and enhance individual learning. In that case, feedback provides information on how individuals are performing in relation to the goals (Lam, DeRue, Karam & Hollenbeck, 2011). Thus it is expected that there will be some change in the individual attitude or behaviour after feedback is given, whether positive or negative.

At the group level, consisting of two or more individuals who interact in order to undertake a task, feedback allows groups to monitor the discrepancy between the performance and the goals they have established and adjust their behavior accordingly (Mesch et al., 1994). As group members share a common objective, a group goal may have beneficial effects for a group. For instance, group task performance may be improved as the group goal helps the members to make decisions based on what needs to be done and how to do it (Mesch et al., 1994). In addition, the group can compare the performance of the group with the performance of the other groups. From group learning and performance perspective, feedback at organizations level is used for not only motivational purposes but also as a mechanism for learning and performance improvement (Thurlings et al., 2013; Lam et al., 2011; Shute, 2008; Hattie & Timperley, 2007; London & Sessa, 2006; Mory, 2003). Feedback is a powerful tool that promotes group learning and interdependence as London & Sessa (2006) point out that “without feedback a group can change but cannot learn” (p.305). Learning processes include, among others, sharing information and ideas, and building understanding among the group members (Gabelina et al., 2012). In addition, feedback enhances performance as it serves as a directive and incentive function (Ashford & Cummings, 1983).

This thesis focuses on performance feedback at the district health management team level with a view to understand the implementation process for improving data quality and information use. This will ensure that the purposes of feedback and its different dimensions of information transparency, dialogue and networks for learning are achieved in health management.



## **Chapter 3: Conceptual framework**

This chapter discusses the conceptual framework of transformational feedback and its related dimensions. The first section discusses the limitations or shortfalls in the existing feedback research based on the literature review in the previous chapter. This is followed by a discussion on the framework and its key dimensions of information transparency; two-way dialogue; and networking for learning.

### **3.1 Limitations of the conventional feedback**

This traditional or conventional feedback model described in the previous chapter has been challenged by researchers in a number of ways due to its shortfalls or limitations (Sadler, 2013; Sadler, 2010; Nicol, 2010; Carless et al., 2010; Nicol and Macfarlane-Dick, 2006; Yorke, 2003; Boud, 2000; Sadler, 1998; Ashford & Cummings, 1983). Sadler (2010) argues that the major problem with the traditional feedback model is largely about one-way telling. Feedback should not be merely a way of transmitting information from one individual (sender) to another (recipient) or from one level to the other. It should create a new form of action and interaction with one another with the aim of sharing observations and experiences. One of the limitations of the feedback process is that while the model can be applied at any level of the organization, the process is too simplistic, descriptive and narrow in focus (Greller, 2003). It is simplistic because the model describes feedback processes as straight forward and linear (Thurlings et al., 2013). Viewing feedback as only transfer of information is narrow and limited in scope and ignores other dimensions of feedback. One-way messages from a sender to a receiver are essentially limited to telling or disclosure (Sadler, 2010; 2013). Feedback has a wide range of effects that may motivate change in behaviour for individuals and organizations such as learning, acquiring new skills and evaluating their abilities (Ashford & Cummings, 1983).

These models feedback have been restrictive and limited in scope as they have focused on one aspect. Attempts have been made to categorize feedback according to its potential sources (Herold & Greller, 1977). Greller, (2003) proposed a comprehensive model of feedback according to various dimensions that has three dimensions: input feedback, process feedback and executive feedback (Greller, 2003).

Sadler (2013) proposes of opening up the feedback agenda by shifting from the narrow focus of transmission towards the wider issues.

Another limitation of the traditional feedback is that it focuses at individual level of analysis with very little attention on the impact of feedback on group or organization behavior (Nadler, 1979) where information reflects the performance of the group as a unit. In addition, the feedback process has not been very transparent at group or organization level in terms of involvement of recipients in the design of the feedback. It has been a top-down rather than a bottom-up participatory design process. For instance, empirical data from Malawi (Paper 3) shows that that district managers suggested a participatory bottom up and decentralized process of selecting performance indicators to be used for feedback to ensure flexibility, relevance and acceptability.

The other limitation is that the traditional feedback system is characterized by a hierarchical structure as defined by an expert-non expert dichotomy (Johnson, 2007). In this case the sender (expert) sends information about performance to the receiver (non-expert). This structure is somehow restrictive as the receiver depends on the sender for information. The limitations of the traditional feedback system are a basis for the introduction of transformational feedback that is interactive and participative and able to develop capacities and promote networks of learning.

### **3.2 Addressing the shortfalls: Introducing transformational feedback**

Based on the shortfalls of the one-way transmission model of feedback, a fundamental reconceptualization of the feedback process is therefore required to address the shortfalls highlighted above. On account of these limitations, there is need to refocus feedback processes from data transmission to interactive and dialogic (Carless et al., 2010); understand the effects of feedback on task group by going beyond the individual actions (Nadler, 1979); promoting capacity at organization level through networking for learning among the group members.

Some of these shortfalls have been identified and addressed in other research fields. For instance, in the field of learning and instruction, Sadler (2013) proposes opening up the feedback agenda by shifting from the narrow perspective towards widening it to

include other dimensions. Nicol & Macfarlane-Dick (2004) have identified feedback practice principles to improve and accelerate learning and highlight the importance of feedback for the development of learning. In order to make feedback more effective, Nicol and Milligan have suggested to conceptualize feedback as “a dialogue rather than as information transmission” (Nicol & Milligan, 2006, p.7). While feedback information is received, there is an opportunity to be engaged in dialogue about that feedback and supporting the development of skills and promoting learning. Feedback should be characterized by a collaborative approach and mutual conversation. The introduction of transformational feedback is therefore intended to address the shortfalls of the traditional feedback systems. In addition the introduction of feedback in a complex and interrelated health sector requires widening the feedback approach from just information transmission.

This thesis is contributing to the reconceptualization of feedback by introducing *transformational feedback* concept and its dimensions at the group or team level. This emergent concept and its related dimensions were derived from the analysis of the empirical data which was supported by the review of relevant literature.

### **3.2.1 Transformational feedback**

The thesis introduces the concept of *transformational feedback* from organizational change literature. Specifically it is adopted from the management and transformational leadership literature (Wofford & Goodwin, 1994; Daszko & Sheinberg, 2005; Jacobs et al. 2010). It is concerned with performance and quality improvements

Transformation is *a process* of creating a change in performance and quality improvements and this occurs in individuals, organizations, industries and societies. Transformation is about ideas and structural changes or shifts in basic actions (Kitchenham, 2008). Transformational feedback (TF) is defined in this thesis *as a process of creating changes in organizational performance by increasing information transparency, dialogue, and networking for learning*. As a process, transformational feedback is not an immediate occurrence (Moore, 2005) but occurs in stages and over time. These attributes are in line with the thinking of the transformational feedback concept that is introduced in this thesis. Transformational feedback goes beyond the provision of information and includes addressing interactive exchange among users of

information and enhances capacities for learning (Mezirow, 1994). Transformational feedback has the following aspects: *focus* on dialogic, openness and data sharing at group and organizational levels; a collaborative, interactive and participative *structure* and a *process* for developing capacities and networking for learning.

*Transformational feedback* can be used in health management in many ways. It focuses on providing data to health managers which can be used for improvement. When there is feedback to the health facilities, it creates or motivates the health workers to improve their performance. *Transformational feedback* can bring health managers together to discuss data and identify actions for improvement (Jacobs et al., 2010). It is a process that can be used to enhance learning and promote change in district health management. Furthermore, transformational feedback improves not only data availability, quality and accessibility but also improves information use by the managers in decision making. As an approach, transformational feedback can be implemented in HIS practices and processes to break the vicious cycle of limited information use.

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*Transformational Feedback: a process of creating changes in group and/or organizational performance by increasing information transparency to improve relevance, accessibility and accuracy of data; promoting two-way dialogue leading to mutual conversation and participation among actors; and establishing networking for learning to develop skills and practices.*

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The next section discusses the dimensions of transformational feedback: information transparency, two-way dialogue and networking for learning. The need to dimensionalize transformational feedback allows meaningful description of the concept.

### **3.3 Dimensions of transformational feedback**

Transformational feedback goes beyond providing one-way information on performance and includes addressing interactive exchange among users of information and enhances capacities for learning. The conceptual framework of transformational feedback is based on its related dimensions of information transparency; two-way dialogue; and networking and learning. These dimensions were not predefined in

advance but were identified based on the empirical data from this action research study as well as a review of related literature. This is in line with what Winter (1998) observed that in action research “theoretical resources are not predefined but are drawn in the process of the inquiry” (p.371). These dimensions extend our understanding of the feedback concept from a narrow perspective to a broader scope with a view to widen its application in organizations. The framework also helps to understand the interaction processes within the organizations in terms of the roles, responsibilities and relationships among the dimensions. These dimensions are discussed below.

### ***3.3.1 The information transparency dimension***

The concept of information transparency has many meanings and it is used in the various fields of international relations, non-governmental organizations, public policy and politics (Ball, 2009). The concept has evolved and is interpreted differently in these fields. For instance, in international relations literature, transparency is associated with the degree of openness of sharing information to address problems of corruption, increasing public disclosure and creating trust. Making information transparent allows participants to evaluate past performance with a view to perform better in the future (Mitchell, 1998). However, Ball (2009) observes that making information available in itself does not create transparency. In the non-governmental organizations research, Ball (2009) notes that transparency is related to issues of accountability in order to increase public trust and good governance.

Information transparency refers to openness and sharing of information to make decisions to support and promote improved service delivery and management through feedback. Information is one of the mechanisms that create transparency in organizations (Ball, 2009). Information transparency relates to information or processes that are available and accessible to be used by health providers and managers in the implementation and provision of health services (Joshi, 2013).

There are many dimensions of transparency in the literature (Schnackenberg & Tomlinson, 2014; Ball, 2009; Rawlins, 2008; Bellver & Kaufmann, 2005) and these are used in a variety of disciplines and contexts. For example, transparency initiatives are gaining ground in developing countries as key strategies for improving health service delivery; countering corruption; improving the process of governance; and for

openness and sharing of information to make decisions (Ball, 2009). Other researchers have used the visibility, availability and accessibility to participants to describe the concept of transparency (Granados et al 2010). Fox (2007) refers to transparency as “revealing of reliable information which permits interested parties to pursue strategies of constructive change” p.667) with a view to transform individual or organizational behaviour. However, there are certain practices and structures that may promote information transparency (Fairbanks et al., 2007). While information transparency in management is concerned with organizational behavior, transparency in government looks at structural measures and administrative procedures that help to create a climate that promotes transparency (Fairbanks et al., 2007). Institutional structures such as peer based review meetings and administrative procedures can make information accessible and openly share information among the information users.

A review of the literature shows that informational transparency is associated with the disclosure and sharing of information (Vaccaro & Madsen, 2009; Ball, 2009). Two types of transparency can be distinguished: static and dynamic transparency (Vaccaro & Madsen, 2009). Static transparency is where information is disclosed using standardized reporting and the flow of information is unidirectional. In contrast, dynamic transparency is when there is a continuous interaction between organizations and their stakeholders (Vaccaro & Madsen, 2009). In addition, with dynamic transparency the information provided is customized to meet the needs of the individual or group of stakeholders as well as for information exchange among stakeholders. The customization of the information can help to guarantee that the information they receive can be understood. Dynamic transparency generates information that is modified to meet the informational needs of stakeholders (Vaccaro & Madsen, 2009). Through this arrangement a two-way information sharing is created. This is in line with the idea of promoting a dialogic feedback which is the focus of this thesis.

Different researchers have investigated the concept from different contexts including, among others, business, organizational governance and culture, strategic management and financial markets (Schnackenberg & Tomlinson, 2014). From organizational literature, Rawlins (2008) defined transparency as having three elements: *information* that is useful; *stakeholder participation* in identifying the information they need and

*reporting activities* of an organization that hold organization accountable. The information dimension relates to the relevance, and accuracy of the information (Rawlins, 2008). The participation dimension refers to the active participation of stakeholders in identifying the information they need and how to find it (Rawlins, 2008). Other researchers have also mentioned the participation dimension of transparency. For instance, Cotterrell (2000) refers to transparency “as a process that involves not just availability of information but active participation in acquiring, distribution and creating knowledge” (p.419). Ball (2009) mentions the importance of active participation of actors if transparency is to happen. Some empirical studies define informational transparency as the timely disclosure of information (Madhavan et al., 2005; Bloomfield & O’Hara, 1999) with a view to bring information or processes openly available and accessible for use by potential users such as providers, managers or policy makers. As transparency is connected to the dimension of openness it closely relates to information sharing among the actors (Rawlins, 2009; Ball, 2009). The accountability dimension is part of the information use in health management and it is considered in this study.

This thesis primarily focuses on the use of the information transparency in the field of public health in ensuring the availability and accessibility of information to health managers. While both attributes are important, we focus on accessibility and not just availability of information. It is concerned with the promotion of openness and sharing of information to support health management. Transparency is therefore used to refer to information visibility (Turilli & Floridi, 2009) while others have defined the concept in terms of relevance of information (Bushman et al., 2004; Winkler, 2000) or the level of accuracy in information (Granodas et al., 2006; Flood et al., 1999). Overall one can note that there are three basic dimensions of transparency relevant to management practice: *relevance*, *accessibility* and *accuracy* (Schnackenberg & Tomlinson, 2014). *Relevance* refers to the broader accessibility of information that meets the needs of the users (Miller, 1996; Schnackenberg & Tomlinson, 2014). It is a contextual data quality aspect as it is considered within the context of a specific task to be undertaken. Accessibility, as one of the dimensions of information transparency, refers to the extent to which the information is readily available to the stakeholders for their use (Pipino et al., 2002; Miller, 1996; Wang & Strong, 1996). *Accuracy* refers to information

that is considered correct or reliable for it to be transparent. It refers to the “perception that information is correct to the extent possible” (Schnackenberg & Tomlinson, 2014, p.10). Others specify data accuracy when the data values in the data base correspond to the real world values (Ballou & Pazer, 1985) or in terms of how close a data value is to the one that is considered correct (Redman, 1996).

Each of these three fundamental dimensions is contributing in some way in the understanding of information transparency (Schnackenberg & Tomlinson, 2014). Awareness and participation of stakeholders is critical so that top-down strategies may complement bottom-up mechanisms for strengthening feedback and accountability in information systems. Transparency is not only concerned with what an organization may communicate at different levels (vertical), it is also about what is communicated and shared within an organization (horizontal).

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*Information transparency dimension: information transparency concerns making relevant and accurate information accessible; interpreted and understood by the users. It is not only about the availability of information, but also the active participation of stakeholders in identifying the information they need.*

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### **3.3.2 The two-way dialogue dimension**

Dialogue is about interaction and participation and focuses on open communication among peers (Bohm et al., 1991). There are certain conditions or characteristics for a dialogue process to take place. Dialogue consists of interaction and exchange between peers who come together through activities with a view to increased understanding or solve problems. It is a process of shared thinking and understanding (Bohm et al., 1991) and it is characterized by openness and sharing to facilitate interaction and participation. There are a variety of models or methods that are used to facilitate dialogue. Of relevance to this study is the model that is using the group as a vehicle for individual development based on shared understanding (Bohm et al., 1991). There are many aspects of dialogue that are relevant here including the notion of openness and shared meaning within a group with a purpose of understanding and learning from each other and addressing common concerns and problems.

Many researchers have considered feedback as dialogical perspective (Kelly et al., 2013; Nicol, 2010; Nicol & Milligan, 2006; Nicol & Macfarlane-Dick, 2004). Kelly et al



(2013) and discuss the importance of feedback that promotes conversations. The focus of this perspective is on a “collective process where information is used to provoke productive conversations” (Kelly et al., 2013, p.88). In this regard, feedback is used to “promote productive dialogues that are oriented to exploring problems in a situated manner and the production of actionable outcomes” (Kelly et al., 2013, p.86).

Both theoretical and empirical work in the field of feedback shows that feedback processes in organizations depend on cultural and societal values (Anseel & Lievens, 2007). Some researchers refer to the feedback environment as the contextual factors that shape the impact of feedback (Dahling & O’Malley, 2011; Steelman et al., 2004). The feedback environment is the policies, practices and interventions that support feedback interactions and processes in an organization. There are various ways that can show that there is feedback culture in an organization. London & Smither (2002) identified three categories of organizational practices and interventions that support feedback. Organizational practices and interventions enhance the quality of feedback such as organized feedback reviews. The organizational practices and interventions emphasize the importance of feedback by ensuring that at least all receive feedback.

Feedback as a dialogic process helps to develop strategies for supporting interaction and identify areas that need improvement. The *two-way dialogue* is adopted as an attempt to deal with the limitations of the one way transmission of feedback (Yang & Carless, 2013; Carless et al., 2010) and to support learning. Researchers discuss dialogue as a process rather than a task or isolated events (Yang & Carless, 2013; Nicol, 2010; Carless et al., 2010). Nicol & Milligan (2006) have suggested conceptualizing feedback as a dialogue. Nicol’s recent work on feedback (Nicol, 2010; Nicol & Milligan, 2006) is to some extent an improvement on the simple feedback model and proposed a dialogic feedback model that views feedback as an interactive, participative and sustainable process (Nicol, 2010). It also enhances capacities for learning through the development of skills.

From a communication theory perspective, feedback can also be considered as an interactive dialogue on information amongst users. Kelly et al., (2013) mentions conversation with data as an innovative way to provide feedback. They argue that technology, as an information resource, can facilitate and promote dialogue. In this

setting, feedback is a collective process where information is used to provoke productive conversations. Kelly et al. highlight the importance of contextual aspects in any conversation in promoting “productive dialogues that are oriented to exploring problems in a situated manner and the production of actionable outcomes” (Kelly et al., 2013, p.86). Nicol (2010) also emphasizes the importance of context for effective feedback. Feedback can enable social interaction and communication among team members as well as desirable organizational changes.

The work of Nicol (Nicol, 2010; Nicol & Milligan, 2006) emphasizes the importance of dialogue as a means of promoting learning. Nicol (2010) discusses feedback from a dialogical process perspective which looks at feedback as a dialogical and two-way process that involves interactive engagement among actors within a shared context of understanding. Laurillard (2002), as quoted by Nicol (2010), developed a conversational framework in which dialogue is defined as an ongoing and discursive process. The framework defined four characteristics for an effective dialogue: adaptive, based on the need; discursive, two-way communicative exchanges; interactive which is linked to action; and reflective (Nicol, 2010). Peer based feedback is one of the approaches that provides opportunities for feedback dialogue and skills acquisition. From the research literature, Nicol & Macfarlane-Dick (2006) have identified principles of good feedback practice regarding performance to improve and accelerate learning and highlight the importance of feedback for learning from both internal and external sources.

Both vertical and horizontal dialogic feedback processes are beneficial in performance improvement. However, transformational feedback focuses on the horizontal (peer based) dialogic feedback as it provides richness in dialogue and develops skills for learning among the participants. Thus dialogic feedback is more than just information on performance; it should facilitate the development of feedback process (Carless et al., 2010).

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*Two-way dialogue dimension: Feedback as a dialogical and two-way process that involves interactive engagement among actors within a shared context of understanding. The two-way dialogue is adopted as an attempt to deal with the limitations of the one way transmission of feedback.*

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### ***3.3.3 The networking for learning dimension***

The concept of networking for learning is derived from development literature (Cummings & van Zee, 2005) however networking is a common phenomenon and therefore can be used in many other fields. The process of networking is characterized by relevance; have a clear focus; an atmosphere of openness among participants; commitment of participants and a shared problem or goal (Keijzer et al., 2006; Cummings & van Zee, 2005; Engel & van Zee, 2004). Networks facilitate learning processes and sharing knowledge and experiences among the participants. It is about building relationships among organizations and individuals to share knowledge and experiences through dialogue and exchange (Cummings & van Zee, 2005). The *networking for learning* model provides an opportunity for enhancing interaction between peers. *Networking for learning* is basically about individuals and organizations working around a common concern. Learning networks are aimed at building relationships, knowledge and experience, and learning from each other and are characterized by an atmosphere of openness among participants (Cummings & van Zee, 2005).

*Networking for learning* is linked to dialogue. According to Bohm et al., (1991) dialogue is an essential part of networking. Networking is more than just dialogue as it is about organizations, institutions and individuals joining forces around a common concern (Creech & Willard, 2001). Engel (1993) refers to networking as building relationships for sharing knowledge and experiences and for learning from each other with a common goal. Dialogue consists of interaction and exchange between peers who come together through activities with a view to increased understanding or solve problems. It is a process of shared thinking (Bohm et al., 1991).

In relation to feedback, there is peer based learning whereby participants learn with and from each other. Peer based learning fosters life learning skills related to collaboration, teamwork and communication (Boud et al., 1999). The focus of peer based learning is more on organizational than individual learning. Organizational learning refers to the process of improving actions through better knowledge and understanding (Fiol & Lyles, 1985). Organizations develop and maintain learning systems that influence members of the organization through norms and values.

Individual learning deals with the development of individual motor skills and may not constitute organizational learning.

Behn (2003) identified *learning* as one of the managerial purposes for measuring performance. There are many mechanisms that can be used to measure performance and this requires paying some attention to the feedback. Benchmarking has been a traditional form of performance measurement that facilitates learning (Behn, 2003). It is a continuous process for assessing the performance of an organization and facilitating learning from other benchmarked organizations with the aim of addressing the performance gaps.

The *networking for learning* dimension of transformational feedback is concerned with strengthening the networks among the various actors. *Transformational feedback* is characterized by the need to improve performance; it intends to build capacities for learning by supporting skills development in problem solving, team building and networking as well as strengthen behavior at organizational level. In addition, transformational feedback encourages interaction and collaboration based on the common interest of the actors with emphasis on organizational or group performance in order to bring everybody on board.

The involvement and participation of various actors in feedback practices promotes networking and this creates a feedback environment that encouraged interaction, communication and collaboration among the participants. Through this process, learning networks can be established.

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*Networking for learning dimension: The networking for learning dimension of transformational feedback is concerned with strengthening the networks among the various actors. It builds capacities for learning by supporting skills development in problem solving, team building and networking as well as strengthens behavior at organizational level. It also encourages interaction and collaboration based on the common interest of the actors with emphasis on organizational or group performance.*

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Figure 3.1 below synthesizes the framework of transformational feedback as a concept for understanding feedback practices and processes. As a concept it can be used to widen our understanding and application.

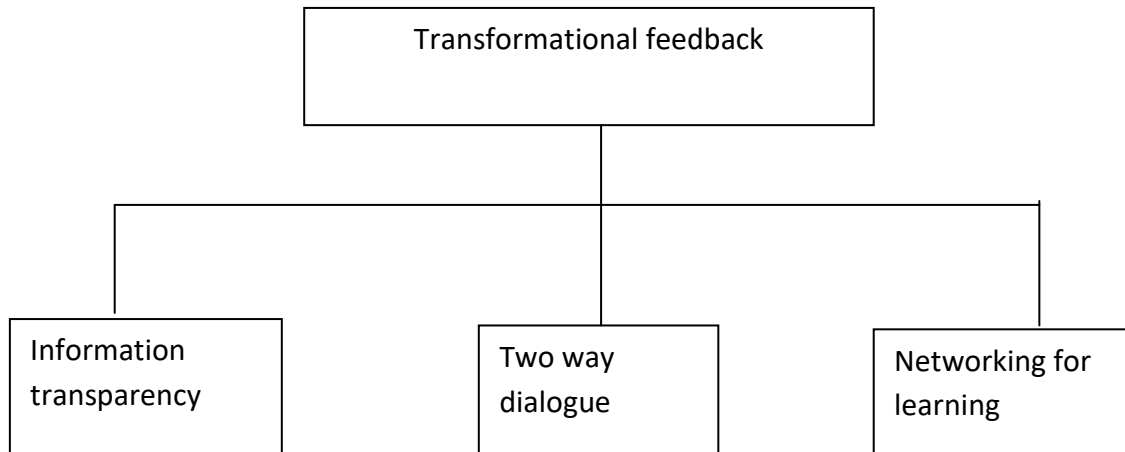


Figure 3.1: Conceptual Framework of Transformational Feedback



## **Chapter 4: Research Methodology**

This chapter presents the methodological approach and the empirical research process. The first section discusses the underlying philosophical perspective that guided the research. This is followed by a detailed description of the research strategy adopted. The third section describes the actions undertaken in each action research phase. Methods for data collection and analysis techniques used in the research are described in section four. Finally, the fifth section presents some reflections on the research methodology including limitations and ethical considerations.

### **4.1 Underlying philosophical perspective**

Based on Chua's (1986) classification of research, Orlikowski & Baroudi (1991) identified three approaches to studying information technology in organizations: positivist, interpretivist, and critical. The positivist approach assumes the existence of an objective physical and social world that is independent of humans; and that dependent and independent variables are predetermined (Orlikowski & Baroudi, 1991). The epistemological belief behind this perspective is that research is concerned about empirical testability of theories and adopts formal propositions and quantifiable measures of variables. The role of the researcher is to discover the objective physical and social reality and the researcher should not intervene in and is detached from the phenomenon of interest (Orlikowski & Baroudi, 1991).

The interpretivist approach assumes that reality and our knowledge are social products. In this regard the interpretive method of research starts from the position that our knowledge of the real world is socially constructed (Walsham, 2006). Research based on this perspective aims at increasing our understanding of the phenomenon within its natural settings and from the point of view of participants (Cavaye, 1991; Walsham, 2006). It attempts to explain and understand the social world from the point of view of those directly involved in it. The critical approach aims at critiquing existing social systems based on identifying inherent structural contradictions and conflicts (Orlikowski & Baroudi, 1991) and replacing them with practices or relations with other structures and norms (Falconer & Mackay, 1999).

This thesis is based in the interpretive approach as well as the critical tradition. My aim is to increase our understanding of the role of feedback in health information systems. From my point of view, this can best be achieved by studying feedback within the contextual setting and by implementing interventions to try improving the situation. This is the most appropriate approach to generate deeper knowledge on the different actors' understanding of information, their information use practices and how to change them through feedback. At the same time, the study has used a critical perspective when identifying weaknesses in the existing system and based on these implementing changes in feedback practices and processes at the district level. The aim of this thesis is not only to understand feedback practices but also how the practices can be used to break the vicious cycle of limited information use.

#### **4.2 Research Strategy**

This thesis adopted an action research approach with the aim of increasing information use in health management with a particular focus on the district level. The choice of this approach was based on two main factors. First, action research is based on both practice and research. It is an iterative process actively involving researchers and practitioners acting together on a particular cycle of events where knowledge obtained can be immediately applied and the process linking theory and practice (Baskerville, 1999; Baskerville & Wood-Harper, 1996). It is a goal directed methodology where at the aim is to understand large social technical systems in order to change them (Baskerville & Wood-Harper, 1998). Second, the approach is well suited for the characteristics of my project: the researcher was actively involved; the knowledge obtained can be immediately applied; and the research process linked theory and practice (Baskerville & Wood-Harper, 1996). The strength of action research approach lies in its focus on generating solutions to practical problems; and at the same time engaging the practitioners with the research and the subsequent development and/or implementation of activities.

This study uses the pluralist action research approach, combining action research with other research methods (Chiasson et al., 2008; Mingers, 2001) including case studies and field experiments. These methods can be used in sequence, in parallel and at different levels of analysis in order to increase the understanding of the phenomenon



(Chiasson et al., 2008). Multi-method approaches typically adopt one dominant method which is supplemented by others (Mingers, 2001). This study adopted action research as the dominant method, supported by case study and field experiment methods. The case study method was used to provide additional data in the diagnosing phase of the action research. Similarly, the field experiment method was used to test the prototype league table and as a basis for collecting data during the implementation of the intervention phase of the action research. Each approach is discussed below and linked to the paper(s) using it.

#### **4.2.1 The dominant approach: Action Research**

In *action research*, the researcher is involved to improve a work practice *and* collect data for research purposes. The research in this thesis is guided by the principles of canonical action research (AR) which aims at “solving organizational problems through intervention while at the same time contributing to knowledge” (Davison et al., 2004, p.65). One of the unique characteristics of canonical AR is that it is iterative, rigorous and collaborative (Davison et al., 2004; Baskerville, 1999). The iterative method with one or more cycles of intervention is a contributing factor to the rigor of the method (Davison & Martinsons, 2007). As a collaborative and change process oriented model, researchers and practitioners actively work together on a particular cycle of events where knowledge obtained can be immediately applied and the process links theory and practice (Davison et al., 2004; Baskerville & Wood-Harper, 1998).

There are several forms of action research in information systems (Baskerville, 1999; Baskerville & Wood-Harper, 1998; Lau 1997; Susman & Evered, 1978) including canonical AR, participatory AR, IS prototyping, action science, action learning. Although there are various forms of action research they share some common characteristics including action-oriented; problem-focused; a cyclical or iterative process; and as a collaborative and participatory endeavor among participants (Baskerville, 1999; Peters & Robinson, 1984).

The dominant action research strategy used is canonical AR with a five phase cyclical process: diagnosing, action planning, action taking, evaluating and specifying learning (Davison et al., 2004). Each phase is described below following the phases as outlined in the action research framework in Figure 4.1.

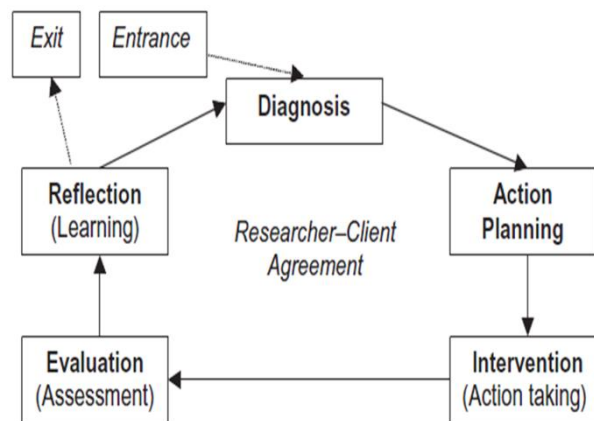


Figure 4.1: The action research framework (Davison & Martinsons, 2004)

Action research is based on a research-client agreement. The researcher-client agreement (Davison & Martinsons, 2007) or client-system infrastructure (Susman & Evered, 1978) forms the central foundation for action research process. Research should take place within a mutually acceptable ethical framework that governs data collection, management and release of data (Peters & Robinson, 1984). The agreement spells out the roles and responsibilities, and expectations on the both the researcher and client side. Furthermore, it promotes a spirit of shared inquiry where the researcher and the client are involved (Davison & Martinsons, 2007). In this thesis, the Ministry of Health was the client. Official approval was obtained from the Ministry of Health National Health Sciences Research Committee and this was considered an agreement between the researcher and the client that guided the conduct of the research. Apart from having an approval from the Ministry, the researcher also obtained consent from the individuals who participated in the research.

There are five action research phases. The first phase is *diagnosing* which raises questions and specifies the problem area to be researched. This phase is undertaken in order to have a detailed understanding of the problems and the underlying causes (Baskerville, 1999).

The *action planning* phase is based on the results of the diagnosis. Alternatives to solving the problems are generated and the best solution and intervention are chosen by the collaborative researchers and practitioners. The *intervention* phase implements interventions identified in the action planning stage. Once the planned interventions

are implemented, *evaluation* follows to assess whether the outcomes of the interventions have been achieved or not. The fifth phase of the action research involves *reflection* on learning. The principle of learning through reflection is a critical activity of action research (Davison et al., 2004; Lau, 1997) as it has implications for both practice and research. It also helps to establish what the client and the researcher have learnt in the course of implementing the intervention. Reflections fall in two categories: reflections on practices which are the practical solutions for the client and reflections on theory regarding knowledge for the research community (Davison & Martinsons, 2007). Furthermore, as action research is an iterative process, the outputs generated in this action research cycle can be inputs to the next.

#### **4.2.2 Case study**

Yin (1994) defines the *case study* as a research strategy that is used to investigate a phenomenon within its real life context. It is aimed at gaining an in-depth understanding of a phenomenon. Case studies can combine various data collection methods including interviews, questionnaires and observations (Eisenhardt, 1989). In this thesis, paper 1 and 2 adopt the *case study approach* to provide a description of the peer based reviews and DHIS2 mobile reporting as strategies for providing feedback to improve data quality and information use in health management (see Table 4.1).

#### **4.2.3 Field Experiment**

Braa & Vidgen (1999) describe *field experiments* as an extension of experiments that are done in laboratories into a real world context. The purpose of the field experiments “is to construct an experiment in a more realistic environment than is possible in a laboratory setting” (Braa & Vidgen, 1999, p.31). In this thesis, two different prototype league tables in DHIS2 were developed by students at the University of Oslo and tested in the real life setting in Malawi. Testing in different districts also provided interesting opportunities to be able to compare and contrast different contexts of league table use. In the experiments, the league table was demonstrated to the district health managers (Paper 4). Table 4.1 is a summary of the research approaches used in each paper.

Table 4.1: Summary of research approaches used in each paper

Paper	Research approach
<p><b>Paper 1:</b> Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi</p>	<p>This paper adopted a <i>case study approach</i> in studying the implementation of peer based reviews in Malawi for improving data quality and promoting information use. Data for this paper was collected through participant observation; semi-structured interviews; focused group discussion; field notes and official documents.</p>
<p><b>Paper 2:</b> Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi</p>	<p>This paper adopted a <i>case study approach</i> in assessing how DHIS2 mobile reporting can contribute to improved data quality in terms of timeliness of HMIS reports. The study adopted a mixed qualitative and quantitative approach with an interpretive perspective. Quantitative data on timeliness of reports was obtained from the DHIS2 database. Qualitative data was collected using open ended questions; audio taped the discussions; participant observations and document review.</p>
<p><b>Paper 3:</b> Using performance league tables to promote accountability and feedback in health management in Malawi</p>	<p>This paper was a result of an <i>action research</i> project on league tables. The paper adopted a qualitative approach with an interpretive perspective. The study used the following data collection methods: semi-structured interviews guided by open ended questions; audio taped the discussions; participant observations of work practices and document review.</p>
<p><b>Paper 4:</b> The information transparency effects of introducing league tables in the health system in Malawi</p>	<p>This paper was based on a <i>field experiment research approach</i> for testing prototype league tables to improve information transparency. Empirical data for the study were collected through semi structured interviews; audio taped the discussions; field notes and observations.</p>
<p><b>Paper 5:</b> Promoting transparency and accountability with district league tables in Sierra Leone and Malawi</p>	<p>This paper drew data from the on-going long-term <i>action research</i> in Sierra Leone and Malawi that has supported the development of league tables at district levels. Empirical data for the study were collected using semi-structured interviews guided by open ended questions; participant observations and document reviews.</p>

### 4.3 Action research phases

This study was based on a full action research cycle. In the diagnosing phase, I undertook a number of activities including a situation analysis. This phase was done in the pilot districts in several rounds. I conducted the first situation analysis in Mchinji district in July 2014. The second round was conducted by a four member research team from end of September to mid October 2014. The objectives of the diagnosing phase were to: assess the implementation status of DHIS2 in the districts; conduct a situation analysis on the dimensions of feedback at district level; identify challenges and feedback issues to be addressed during subsequent phases; assess how the district health managers were using the data; and introduce the league table concept at the

district level. The research team visited the district health offices of Karonga, Rumphi, Mzimba North and Mzimba South in the Northern zone and Kasungu in the Central east zone; health centers of Nyungwe in Karonga, Bolero in Rumphi and Mzuzu urban in the Northern zone; and the Northern and Central west health zonal offices. Using open-ended topics and questions, the research team organized focus group discussions and individual meetings with the district health management teams (DMHT) and district programme coordinators (Paper 3).

In the action planning phase, with the support from the software programmers, we designed and customized the prototype league tables in DHIS2 in two rounds. The first round was the use of the league table in pivot table and the second round involved the use of a web based league table application in DHIS2. In addition, I held a series of meetings with staff at the Central Monitoring and Evaluation Division (CMED) of the Ministry of Health; the district health management team members; Zonal health office; national programme managers; and Non-governmental organizations (NGOs) supporting HMIS strengthening in Malawi to identify interventions that needed to be implemented and to solicit their support. The research team in collaboration with the practitioners decided to implement the league tables for providing feedback at the district level. It was also agreed to implement the intervention in selected districts. A list of planned activities was jointly developed for the introduction of the prototype league table in four pilot districts.

Based on the results of the diagnosing and action planning phases, I introduced the league tables to the district health management teams through demonstrations and trainings. Action taking was done in two cycles. The first cycle of the field intervention involved testing the prototype league table in pivot table in Mchinji district from November 2014. An orientation training (intervention) on the league table concept and a demonstration of the prototype league table using the data in DHIS2 was done at the HMIS review workshop for district health managers. Following this, training on the league table specifically for HMIS officers took place in Mchinji district. This was a more detailed training on the development of the league table. The HMIS officers were selected to undergo such training because of their role in providing support to others in the district in the league table development process. The research team comprising myself and a student intern from the University of Malawi conducted the training.

The second cycle of the field intervention was as a result of the experiences of testing the league tables in the first round. This necessitated migrating from pivot table to web based application in DHIS2. The design of the web based league table application in DHIS2 was undertaken by two Master students from the University of Oslo as part of the course and project work. The design stage started in January 2015 and it culminated into the testing of the solution in November 2015 (see Paper 4).

The fifth phase of this action research involved reflection (Davison et al., 2004) on what we have learnt. Reflection was done with the users (health managers and other health workers) of the league tables throughout the implementation process. Lessons learnt from the implementation resulted in changes in the design of the league table in pivot table to web based in DHIS2. Reflection also took place through the writing of papers. Conference and journal papers (see chapter 5) and this thesis are written as a reflection of and learning from this action research.

A summary of the activities undertaken during the action research phases are in Table 4.2 below.

Table 4.2: Summary of activities during action research phases, Malawi, 2014-2016

Action research phase	Period	Activity taken	Place
	July-Oct 2014	- Designing the league table in pivot table	- University of Oslo
Diagnosing	July 2014	- Conducting situation analysis - Demonstrating the prototype league table in pivot table - Training health workers on the league table	- Mchinji district
	Oct-Nov 2014	- Conducting situation analysis - Demonstrating the prototype league table - Training health workers on the league table	- Karonga, Rumphi, Mzimba north, Mzimba south, Kasungu districts, Northern health zonal office
Action planning	July 2014	- Discussing with CMED and districts	- Ministry of Health headquarters, Mchinji district
	July-Oct 2014	- Designing the league table in pivot table	- University of Oslo
	Jan-Oct 2015	- Designing the league table app in DHIS2	- University of Oslo
Action taking	Nov 2014	- Testing the prototype league table app in DHIS2 - Introducing the league table concept to health workers. - Demonstrating the league table app in DHIS2 to health workers in districts, zonal	- Mchinji district - Central West and Central East zonal health offices

		<p>health offices, and national health programmes; development partners and NGOs.</p> <ul style="list-style-type: none"> <li>- Training the health managers, NGOs on league table app.</li> <li>- Feedback and follow up activities</li> </ul>	
	Nov-Dec 2015	<ul style="list-style-type: none"> <li>- Introducing the league table concept</li> <li>- Demonstrating the league table app</li> <li>- Testing the league table app in DHIS2</li> <li>- Training health workers on league table app</li> <li>- Feedback and follow up activities</li> </ul>	<ul style="list-style-type: none"> <li>- Dedza, Mchinji, Dowa, Kasungu districts</li> <li>- Central East and Central West zonal offices</li> <li>- National Control Programmes</li> <li>- EPOS an NGO</li> <li>- UNICEF</li> </ul>
Evaluating	Nov-2014-June 2016	<ul style="list-style-type: none"> <li>- Evaluating the prototype league table in pivot table</li> <li>- Evaluating the prototype league table app in DHIS2</li> <li>- Feedback and follow up</li> </ul>	<ul style="list-style-type: none"> <li>- Mchinji district</li> <li>- Dedza, Mchinji, Dowa, Kasungu districts</li> </ul>
Learning	Jan 2014-Dec 2016	<ul style="list-style-type: none"> <li>- Discussions with other researchers and practitioners</li> <li>- Participated in workshops and conferences</li> <li>- Reflections on the design and implementation of the intervention</li> <li>- Empirical data analyzed based on the conceptual framework</li> <li>- Writing conference and journal papers</li> <li>- Writing this thesis</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Health</li> <li>- Workshop and conference venues</li> <li>- University of Oslo</li> </ul>

#### 4.4 Data collection methods and analysis

Cavaye (1996) refers to methods as the type of research tools and techniques which may be used to collect empirical evidence. Basically, there are two types of data collection methods: qualitative and quantitative methods. Qualitative data collection method is useful for understanding the meaning and context of the phenomenon studied in natural settings. One of the advantages of using qualitative research method is the flexibility of the method during data collection and analysis. In qualitative research study, the data collection and analysis form an iterative process as they occur concurrently. Further data collection is dependent on the results of the previous analysis. However, one of the weaknesses of the qualitative methods is that collecting and analyzing data is not only time consuming but also demanding. The amount and variety of data collected may overwhelm the researcher and may inhibit data analysis (Cavaye, 1996). However this weakness does not invalidate the data or the conclusions drawn from them.

Quantitative research methods are used to quantify the problem by generating numerical data. The methods are more structured than the qualitative data collection methods. They involve a greater number of subjects and enhance the generalization of results. One of the weaknesses is that quantitative methods may miss contextual details.

In this interpretive research study, a variety of qualitative data collection methods was used during the different approaches. The data collection methods used in each research approach is summarized in Table 4.1. In one paper, the study adopted a mixed qualitative and quantitative approach with an interpretive perspective (paper 2) in which quantitative data on timeliness of reports was obtained from the DHIS2 database.

#### **4.4.1 Interviews and group discussions**

Interviewing was the dominant data collection method in this action research. The interviews were conducted at the interviewee’s work places. During diagnosing phase, the research team conducted semi structured interviews and covered a number of areas including feedback practices, information flow within the district health office and between different levels, HMIS/DHIS2 implementation status at district, zonal (sub-national) and national levels, data quality, information use, access to data in DHIS2 and collaboration with partners. I had discussions with health staff at district health offices, Central Monitoring and Evaluation Division (CMED) at Ministry of Health headquarters, zonal health offices, national programme managers and NGOs supporting HMIS strengthening (see Table 4.3). The interviews were both individual and group discussions using an interview guide. The interviews and group discussions were audio taped and later transcribed. An example of the transcribed notes is shown in Table 4.5.

Table 4.3: Number of people contacted during each action research phase, Malawi, 2014-2015

<b>Number interviewed/ oriented</b>	<b>Diagnosing (Jul 14)</b>	<b>Action planning (Jul 14)</b>	<b>Re- diagnosing (Oct-Nov 14)</b>	<b>Re- diagnosing (Sept 15)</b>	<b>Action taking (Nov-Dec15)</b>
District Health Officers	1		3	1	4
District Programme Coordinators	10	3	18	7	53
District HMIS officers	2	1	5	1	
Zonal Officers	1		4	2	7
Student intern	1		1		



Health center in-charges			3		
CMED staff		5			
Technical advisors in NGOs/projects	2				5
Data clerks at health facility			3	1	
<b>Total</b>	<b>17</b>	<b>9</b>	<b>37</b>	<b>12</b>	<b>69</b>

#### **4.4.2 Participant observation**

Qualitative data was also collected based on field notes describing observed events. For example, using a projector, the research team demonstrated the prototype league table to the participants in plenary in three districts (Figure 4.2 left photo). In one district the research team could not use a projector because there was no power during the time of the visit. The research team then grouped the participants into four groups and used laptops to demonstrate the league tables (Figure 4.2 right photo).



Figure 4.2: Demonstrating the league table in plenary (left) and in small groups (right)

After the demonstration, participants were given the opportunity to practice and generate the league tables using their on selected indicators. Through the discussions participants provided valuable inputs on the usefulness and usability of the league table application. During the discussions the research team observed and noted down the comments from the participants which were incorporated in the subsequent versions of the application.

#### **4.4.3 Document analysis**

My data collection method included document collection and analysis. The documents included policies and plans, guidelines, bulletins, reports at district and national levels listed in table 4.4 below.

Table 4.4: List of documents collected and analyzed

1	Health information system strategic plan (2011-2016), (Ministry of Health, 2013)
2	National eHealth policy and strategy-Malawi, (Ministry of Health, 2015)
3	Malawi: Health sector strategic plan, 2011-2016: Moving towards equity and quality, June 2011, (Ministry of Health, 2011)
4	Malawi service provision assessment 2013-14, (Ministry of Health and ICF International, 2014)
5	Mchinji DHO HMIS bulletin, Fiscal year 2013/2014, (Ministry of Health, 2015)
6	Dedza biannual HMIS bulletin, July 2014-December 2014 (Ministry of Health, 2015)
7	Malawi Health sector strategic plan 2011-2016: Midterm review draft report, (Ministry of Health, 2014)
8	Malawi: Health information system assessment report, 2009, (Ministry of Health & Health Metrics Network, 2009)
9	Guidelines for the management of devolved health service delivery by district assemblies, (Ministry of Health, 2005)
10	National health information system policy, (Ministry of Health, 2015)
11	Zonal Annual Report, 2012-2013: Central west zone, (Ministry of Health, 2014)
12	External assessment of health management information system at facility and community level. Final report, (Calcon, 2008)
13	Situation analysis of the health information systems in Malawi, (Health Management Support Team, 2013)

#### **4.4.4 Data analysis**

Miles & Huberman (1994) recommend an early data analysis as it helps to think about existing data and generate strategies for collecting new data. In addition, data analysis is ongoing as data collection and analysis are intertwined processes.

In this thesis, data analysis took place at three stages: during field work; writing papers; and thesis writing. During field work data collection and analysis processes were done concurrently. Part of the field work was conducted by a research team composed of myself, master students, one of my supervisors and another researcher, all from the University of Oslo. At the end of each day, the research team would have preliminary discussions on the data collected that day and try to come up with broad areas or categories and themes from the discussions and field notes. Preliminary data analysis during data collection helped to shape the data collection exercise, identify the general themes such as *information transparency* and *dialogue* among peers to emphasize on and change areas of focus in asking the questions for further investigation.

The data collected from interviews and participant observations provided a sense of how things were on the ground. Apart from primary data collected during fieldwork, secondary data sources were also analyzed to understand the environmental contexts. The second stage of data analysis was done during my writing of individual papers

which were presented in conferences and journals and form part of this thesis. Thirdly, further data analysis was done as I was writing this thesis taking into account the analyses previously done in the two stages.

Data analysis was manually done by sorting and organizing the data to thematic similarities and differences. This means that I had to read and re-read my transcribed notes several times during analysis and interpretation to get understanding of meaning and actions. I used data display and data summary, and paraphrasing (Miles & Huberman, 1994) in order to see patterns and develop themes. Examples of the thematic areas are shown in Table 4.5 below. Data analysis took into account the following thematic areas: feedback practices, data availability and accessibility, data sharing, data quality and information use.

Table 4.5: Organizing data according to thematic areas

Interview transcribed notes	Thematic areas
<p>District conducts <i>quarterly review meetings</i> at district and health facility levels where feedback is given. Facilities and programmes are given feedback in relation to other facilities and programmes. <i>Facilities are compared</i> on individual programme indicator. During the reviews, facility performance is presented and compared with other facilities within the district using HMIS data. This has been done for community based maternal and newborn health. In last financial year three reviews were conducted with support from an NGO.</p> <p>A thematic area is selected for a particular facility review meeting. The district HMIS officer and concerned programme coordinators participate in the facility review meeting. During the review, ranking of performance of the facilities on specific indicator is done. However overall ranking of facilities based on composite indicators is not done.</p> <p>Used to get <i>HMIS bulletins</i> until two/three years ago when the practice was stopped. This was a way of providing feedback to the districts. The district gets phone calls from headquarters reminding the district to provide data on specific data elements. Not all programmes have access to DHIS2 to access programme level data. HMIS officer generates data for the programme coordinators. For new comers the district intends to orient them on DHIS2. An NGO working in the district on strengthening HMIS has promised to provide logistical support for the activity. Different officers are given different rights. HMIS officers are given more right than programme coordinators. HMIS officers can access data of other districts. Coordinators only access data of their district. The meeting suggested extending accessibility rights so that they are able to access and compare data of other districts.</p>	<p>Existing feedback practices</p> <p>Facility comparison</p> <p>Ranking facility performance</p> <p>HMIS bulletins for data dissemination</p> <p>Data accessibility in DHIS2</p> <p>Access to data of other districts</p> <p>Data comparison of other districts</p>
<p>Sometimes the district provides feedback to facilities. Validation rules in DHIS2 help to feedback on data that is not good enough. DHIS2 does not accept data that has errors. Provide feedback when there are data gaps.</p>	<p>Existing feedback practices</p> <p>Review meetings</p>

<p>Provide feedback during quarterly review meetings. Process of review meetings involve selection of indicators to be presented at the meeting. Invite in- charges and coordinators to the meeting. Performance data is compared. Ranked facility performance based on indicators. Graphs are produced at district level and shared at the review meetings. Facility review meetings are done with logistical support from an NGO working in the district. Health facility teams are established to provide support to facilities on their performance. Zones provide feedback to districts through <i>zonal review meetings</i>. Zones also provide feedback during supervisory visits to the districts From MoH headquarters. Since DHIS2 is web based, the district gets queries if the reports are not up to date. Feedback is also provided during specific <i>programme review meetings</i>. Previously the district used to receive <i>HMIS bulletins</i> as a way of feedback from headquarters. Last bulletin was 2010. Both soft and hard copies are needed.</p>	<p>Ranking facility performance</p> <p>Zonal review meetings</p> <p>HMIS bulletins</p>
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## 4.5. Reflections on research methodology

### 4.5.1 My role as researcher

Walsham identifies two types of researchers: outside researcher and inside researcher (Walsham, 2006; 1995). An outside researcher is one who conducts study through interviews and is not directly involved in action. An insider researcher, on the other hand is basically a participant observer who is not only doing research but also wants to change things.

My role in this action research was as an insider and interventionist (Baskerville, 1999) whereby I not only observed but also participated in the interventions with the aim of changing the situation. This means that as a researcher, I intervened and became part of the study (Baskerville, 1999). The research study was undertaken in the health sector in Malawi where I had been responsible for the design and managing the implementation of the health management information system using DHIS2 for more than fifteen years. As an insider, I had the advantage of having easy access to the organization, people, issues and data (Walsham, 2006; Walsham & Sahay, 1999).

My presence as a member of the research team had an impact on the subjects of study in a number of ways. The subjects in the districts discussed issues freely with the research team since there was a familiar face from the Ministry headquarters. However, my presence may have posed ethical and technical problems. The informants at the district level might have looked at me as their 'boss' from

headquarters and that might have influenced the way they behaved and gave the responses. This relationship between the researcher and the respondents may also influence the interaction and may result in bias. This was dealt with in two ways. First the informants were informed of the nature and scope of the intervention. Second triangulation of data sources was done through pattern matching from different districts and data from documents.

#### ***4.5.2 Ethical considerations***

A number of ethical principles were taken into account when conducting this research. These principles of research ethics included obtaining consent from participants, giving them the right to withdraw from the research and protecting their confidentiality.

Before the study was undertaken, an approval was obtained from the National Health Sciences Research Committee (NHSC) of the Ministry of Health. The approval to conduct research in Malawi was granted in October 2014 (see Appendix 2). The approval specified the conditions for conducting the research; the procedures for making modifications in the protocols; and submitting a report at the end of the study.

Once the client granted the approval, a number of ethical issues had to be considered. During data collection, the district health officers where data was collected were informed of the nature and scope of the study. In addition, consent was sought from the research participants before interviews and discussions started. Participants were informed that they were free to withdraw at any time in the research process. None of the participants objected to participation in the intervention and the research. Permission was also obtained from informants and participants to audio tape the interviews and discussions.

The ethical principles of confidentiality and the protection of respondents were also taken into consideration. In order to protect their anonymity and confidentiality, the data collected was handled with caution to protect the disclosure of participants' identity during storage, analysis and publication. For instance, the quotations in the publications reveal the title of the participant and not the actual name and the place of residence. Furthermore, the field notes and recorded tapes are securely kept and accessed by the researcher only.



## **Chapter 5: Research Context and Setting**

This chapter presents an overview of the research context and setting of this study. The first section describes the geographical location of Malawi which has, to some extent, an effect on the implementation of transformational feedback for breaking the vicious cycle of information use. Section 2 presents the health care delivery system. Section 3 describes the governance structure in the health sector. A description of the design and implementation of the health management information system in Malawi is in section 4. This is followed, in section 5, by a description of the district setting where the study was conducted.

### **5.1 Malawi: Geographical location**

The empirical setting of the study is Malawi, a small, narrow and landlocked country in sub-Saharan Africa. The country shares boundaries with Tanzania in the north and north east, Mozambique in the east, south and south-west and Zambia in the west and northwest. It has an area of 118,484 km<sup>2</sup> of which 94,276 km<sup>2</sup> is land area and the rest is covered with water. The major water body in the country is Lake Malawi, which has a total surface area of more than 30,000 km<sup>2</sup>. The country is divided into three administrative regions: Northern, Central and Southern regions. These regions are subdivided into 28 districts: 6 districts are in the Northern, 9 are in the Central and 13 are in the Southern (Figure 5.1). The country, with a projected population of 16.3 million in 2015, is predominantly rural as 85 percent of the population reside in the rural areas (National Statistical Office, 2008).

### **5.2 Health care delivery system**

The administrative districts are the basic management structure for health delivery in the country. Following the Decentralization Act of 1997, the provision and management of health services has been devolved to Local governments. As a result, the provision of health services to the districts and lower levels is the responsibility of the Ministry of Local Government and Rural Development (MLG&RD) (Ministry of Local Government & Rural Development, 1997). There are guidelines defining the roles of

District Councils in the decentralization process including their functions and activities (Ministry of Health, 2005).



Figure 5.1: Map of Malawi showing research sites

There are implementation challenges including weak coordination of decentralization functions at national level. Furthermore, there is limited integration of planning and implementation of activities at district level between the district councils and the District Health Management Teams (DHMTs) in the health sector.

Both national policies and strategies such as Vision 2020 (Ministry of Health & Population, 1999), National Health Policy (Ministry of Health, 2010), Health Sector Strategic Plan (HSSP) (Ministry of Health, 2011) and international declarations such as the Alma-Ata (WHO, 1978) and United Nations Millennium Development Goals (MDGs), (UN, 2000) (now Sustainable Development Goals, 2015) provide enabling environment for implementing the primary health care strategy for delivering health services. The national health policy has guided the development and implementation of health sector strategy and cost effective interventions that promote health and reduce the disease burden (Ministry of Health, 2010). The national HSSP operationalizes the national health policy and the health sector reform programme.



The health care delivery system in Malawi is organized at three levels: primary, secondary and tertiary. These different levels are linked to each other through a referral system that has been established within the health system. The Primary Health Care (PHC) strategy (WHO, 1978) for health care delivery considers a district as a focus for its implementation. The Ministry of Health is the main health service provider in the country. However, other organizations involved in the provision of health and social services include the Ministry of Local Government and Rural Development and the private sector. The private sector consists of private-for-profit and non-profit providers. The biggest partner of the Ministry of Health in the delivery of health services based on non-profit is Christian Health Association of Malawi (CHAM) as it provides services mainly in the rural areas as well as trains health workers in its health training institutions.

Basic infrastructure in the health facilities such as electricity, communication equipment and computer with Internet is inadequately available. On average, 59 percent of the health facilities have regular electricity (connected to a central power grid, or has a functioning generator or has back up solar power); 76 percent have communication equipment (including a functioning facility owned cellular phone or a private cellular phone) and 35 percent have a computer with Internet access (Ministry of Health & ICF International, 2014). Inadequate basic infrastructure affects the delivery of health services including, among others, drugs and supplies, supportive supervision, referral system, reporting of health data and feedback provision.

### **5.3 Governance structures in the health sector**

The Ministry of Health headquarters is responsible for the development, review and enforcement of health and related policies for the health sector; spearheading sector reforms; regulating the health sector including the private sector; developing and reviewing standards, norms and management protocols for service delivery; planning and mobilizing health resources for the sector including allocation and management; advising other ministries, departments and agencies on health related issues; providing technical support supervision; coordinating research; and monitoring and evaluation (Ministry of Health, 2011).

A governance structure has been established to coordinate decentralization at national level; collaborate joint planning of health interventions; collaborate monitoring the implementation of district implementation plans; and harmonize health planning activities of Ministry of Health and Ministry of Local Government and Rural Development (Ministry of Health, 2011).

At sub-national level, health support offices have been established to provide technical and supervision support to the district health office in the planning, delivery and monitoring of health services. The health zones also facilitate central hospitals' supervision to district hospitals. Each zonal health office is responsible for four to six districts.

## **5.4 Health Management Information Systems in Malawi**

### ***5.4.1 HMIS Design***

The process of strengthening the Malawi health management information system (HMIS) started in 1999 with an inventory and situation analysis to determine the strengths and weaknesses of the existing information systems. This was followed by a conceptualization, system design and strategy development process. The process culminated in launching the decentralized health management information system nationwide in 2002 (Chaulagai et al., 2005) and the revised HIS strategic plan (Ministry of Health, 2013). The system design was guided by the principles of integration of all routine information systems; decentralization in information generation and use, and collection data for action; paper and pen based system at facility level but computerized at district and national levels. This decentralized HMIS emphasized on local analysis and use as the primary purpose of collecting data while reporting was considered secondary. Despite this emphasis on maximizing the use of data for local action, the traditional thinking of collecting data for upward reporting is still deeply rooted (Chaulagai et al., 2005). The HMIS restructuring process started simultaneously with other health sector reform initiatives including decentralization of health management to local government; hospital autonomy; and health sector wide approach (Chaulagai et al., 2005).

The routine HMIS is paper based at facility level but computerised at district, zonal and national levels. The HIS assessment conducted in 2009 revealed that HIS infrastructure,

such as hardware, software and M&E tools needed for data recording, collection, processing and reporting were found to be present but not adequate (Ministry of Health & Health Metrics Network, 2009). Paper recording forms and other supplies are available for recording health information, although there are occasionally stock-outs of supplies. The situation has not improved much and this may contribute to poor data quality in terms of incompleteness of data.

#### ***5.4.2 Organization of health information system at district health office***

Districts have established decentralised organizational structures for routine health information system from the community, health facility up to the district level. The health management information system is paper based at facility level but computerised at district and national levels, using a web based DHIS2.

Districts have a filled position of health information officer located at the district health office with a dedicated computer for data management. There is an established dedicated cadre for information recording and compiling at health facility level. More than half of the public health facilities in the district have a statistical/data clerk to assist in data compiling, report generation and reporting.

#### ***5.4.3 Data collection and reporting***

Health facilities in the districts are using HMIS and programme specific data collection and reporting tools for data collection. The service providers at health facility use HMIS registers to record data as they provide health services to the population. All health facilities use standardized HMIS registers to record data as they provide services. Data compilation at facility level is done by a statistical clerk, where he/she is available, or a health surveillance assistant (HSA). Health facilities send HMIS and programme specific reports monthly to the district health office. A paper based HMIS 15 summary monthly report is sent to the district health information officer. Once the report has reached the district health office, the health information officer processes it and monthly reports are generated and disseminated to all district managers in the district. Health facilities also compile paper based programme specific reports which are submitted to the district programme manager at the district health office. The district programme manager either enters the data in DHIS2 or files away the reports.

#### **5.4.4 Data flow**

Ideally, a health facility generates monthly reports on predefined indicators for use by the concerned health programmes. Each facility compiles data from its catchment area and organizes review meetings with all health managers. The district health officer (DHO) compiles data from all health facilities, performs comparative analyses and sends feedback to each facility. CMED at the Ministry headquarters compiles data from all districts and central hospitals, performs necessary analysis, sends reports to programme managers and provides feedback to the district health offices. Program managers respond to the district health office on the report received. In this way, technical feedback by higher levels becomes as important as the bottom-up reporting.

The governance structure at each level provides an opportunity to ensure that there is both vertical and horizontal flow of HMIS data from health facilities to the district health office and between health managers at the same level respectively. At the district level, local actions and/or decisions are made within the established governance structures. In some cases, the data flows from health facilities directly to programmes managers at district or national level.

There are no structured or systematic ways of sending paper based reports from the health facility to the district level. Health facilities use any available means to get the reports to the district level. These include public transport using own money, bicycle, walk, use ambulance drivers, give to supervisors during the supervision visits. Sometimes health information officers from the district level go the facilities to collect the reports. Some facilities are however using mobile technology for sending data into DHIS2 central server.

#### **5.4.5 Data processing**

District health information officers are required to process monthly data and produce and disseminate reports to district programme managers for their use in the districts including providing feedback to the health facilities. While the procedures are available in the districts, compliance is very low. Health facility staff rarely reviews the data before it is sent to the next level. Timeliness of reports is also a challenge as most of the reports are received after the deadline. Most health facilities do not receive feedback from the districts after submitting their reports.

Electronic transfer of raw programme data are sent monthly to the DHIS2 database at Ministry of Health headquarters at Central Monitoring Evaluation Division (CMED) for further analysis and use. District health managers can access the data from the database. Districts produce HMIS biannual and annual bulletins in order to facilitate the use of information in review and planning processes.

HMIS has focused on technical aspects of data storage and analysis, rather than focusing on the more fundamental issues of making sure the data is correct in the first place. While computerisation of data storage and analysis has speeded up data handling considerably at the district level, there is limited data analysis and use of information in the management of health services especially at district and facility levels. Efforts to orient and motivate health workers who are collecting data to use it locally for planning and management purposes have been inadequate. Facilitating greater local use of data could improve data quality overall, as those doing the data collection could be more motivated.

All the four pilot district health offices are using DHIS2 for data management. DHIS2 (see [www.dhis2.org](http://www.dhis2.org)) is a web-based, free and open source data management platform running in more than 50 countries globally. The software is used for data entry, analysis, presentation and storage. The districts are using DHIS2 as a national data repository and it is supporting ways of providing feedback through the collection, processing, displaying and accessing data for use decision making.

DHIS2 orientation for the district health managers was conducted in 2012 with the view to provide the skills and knowledge for the managers to enter data, generate report, analyse data and send the report to the central server. Some district health managers are entering data in DHIS2 while others are not due to heavy workload. Data accessibility in DHIS2 by the district health managers is hampered by unreliable Internet connectivity at the district health offices. While some partners and NGOs are supporting the provision of Internet services at the district hospitals, each one tends to bring its preferred system to the district, making it difficult for the district to coordinate and manage these various systems.

DHIS2 implementation has emphasized in getting data in DHIS2 for reporting to the next level than ensuring that data is used at district and lower levels. In addition, while DHIS2 implementation might have improved the vertical flow of data from the district to the national level, it has not significantly improved the horizontal flow of data among health workers especially at district level. Until 2012, only the district health information officer was familiar with the system and therefore accessibility and sharing of data by the health workers and other stakeholders was very limited. Furthermore, the district health information officer is not part of the extended district health management team as such he may not have the clout to influence matters. Internet connectivity at the district health office is slow and unreliable as such health workers have problems in accessing health data in DHIS2.

Despite data availability at national level, the quality of data in terms of completeness, reliability and timeliness is low. Production of 6-monthly bulletins is delayed essentially due to delays in receipt of reports from districts and central hospitals. There are weak linkages between various data sources. There is limited data analysis and use of information in the management of health services especially at facility and district levels. Efforts to orient and motivate health workers who are collecting data to use it locally for planning and management purposes have been inadequate. Facilitating greater local use of data could improve data quality overall, as those doing the data collection should be motivated.

#### **5.4.6 Feedback**

Health data is disseminated and accessed in different ways. The Ministry of Health headquarters maintains a central database for routine data received monthly from all districts and produces HMIS bulletins and reports for use by different national programmes and other stakeholders. The central DHIS2 database is accessible at national, sub national, district, and health programme managers provided one has access rights. Data is also being shared during quarterly review meetings at district and zonal levels. The district uses the core health performance indicators in the health sector strategic plan to monitor its performance.

The production and dissemination of district HMIS bulletins, as one way of disseminating data and providing feedback to health facilities, has not been done at

district level because of the skills limitations of the assistant statisticians. The DHMT provides feedback to health facilities mainly through the district HMIS reviews. Feedback is also provided to health facilities during supervision by district health managers. Districts produce and disseminate HMIS annual bulletins, as a means of providing feedback. Table 5.1 below shows the various feedback practices taking place at the district level.

Table 5.1: Feedback Practices at District Health Offices, Malawi, 2015

Level	Feedback practices	Frequency	Attendees/ participants
District	Review meetings	Quarterly	DHMT members District programme coordinators Health facility in-charges NGOs working in the districts
	Supervision visits	Monthly, Quarterly	DHMT members District programme coordinators
Cluster of facilities in the district	Review meetings	Quarterly	Health facility in-charges within a cluster
Health facility	Review meetings	Monthly	Facility management meetings

Health facilities send several reports to the district health office. A paper based HMIS 15 summary report is sent to the district health information officer. Once the report has reached the district health office, the health information officer processes it and monthly reports are generated and disseminated to the district health managers. The district is supposed to provide feedback to where data is coming from. Once the data has been entered in DHIS2, electronic raw data are updated in the national central server which is housed at Central Monitoring Evaluation Division (CMED) for further analysis and use at the national level. The production and dissemination of district HMIS bulletins, as one way of providing feedback to health facilities, has not been done at district level because of the skills limitations of the assistant statisticians. The health facilities also compile paper based programme level disease specific reports which are submitted to the district disease control programme officers at the DHO.

#### **5.4.7 Review meetings**

Concerns have been raised during the various HMIS review meetings at district and national levels about the completeness and timeliness of data, limited use of data to guide implementation decisions. Districts and facilities continue to submit delayed and

incomplete HMIS reports. The establishment of a system of regular HMIS review meetings at the district level involving other key stakeholders has been proposed as a strategy to improve the accuracy, completeness, and timeliness of HMIS data. The review meetings are aimed at: increasing the number of districts reporting timely, complete, and accurate data; validating data collected and compiled by the districts and health facilities and provide appropriate feedback to the districts; increasing the capacity and skills of district HMIS officers and health managers to analyze, present, and use data; improving the overall timeliness, completeness, accuracy and consistency of HMIS data; providing an opportunity for sharing experiences in HMIS implementation.

#### ***5.5.8 Assessments of HMIS data quality and information use***

Between 2008 and 2013, three key HMIS assessments had been conducted to examine the status of HMIS data quality and information use in Malawi. In collaboration with the Health Metrics Network, Malawi conducted the Health Information System (HIS) assessment in 2009 using the Health Metrics Network Framework (Ministry of Health & Health Metrics Network, 2009). The exercise assessed, among others, the extent to which data and information on health is used by planners and policymakers in the health sector especially at national level. Specifically the assessment covered the areas of demand and analysis; policy and advocacy; planning and priority setting; resource allocation; and finally implementation and action. The results of the assessment show that health information is commonly and adequately used for diagnostic purposes to describe health problems and or challenges. However, health information is not consistently used in planning frameworks and resource allocation processes. The outcome of the assessment indicates that health information is adequately used in targeting and budgeting. Additionally, equitable and increased resource allocation to disadvantaged groups and communities is to some extent backed by the health information. The assessment suggests that health managers and care providers are adequately using health information for health service delivery management, monitoring and periodic evaluation. However, the use of data in decision making is generally limited at national and sub-national levels.



Calcon (2008) conducted an assessment of health management information system data quality and information use at health facility and community levels with focus on recording and reporting; data analysis, presentation and communication; and using data for decision making and action. The assessment shows that data accuracy (comparing data recorded in registers and data reported) was very low. This discrepancy goes unnoticed at the facility level where data is captured and compiled and may suggest that data is not being used at facility level. While communication channels for data reporting from health facility to district health offices are established, feedback from districts to health facilities is irregular or non-existent. The assessment found that at most feedback from the districts to the health facilities is provided not as a regular practice but only when data is questioned. This irregular feedback impacts upon data quality, information use and understanding of HMIS in general. This finding is in line with what the research team found out during the field visits to the districts.

Health Management Support Team (2013) conducted an assessment of health management information system as a basis for external support to HMIS strengthening in Malawi. This assessment, like other assessments cited above, revealed poor quality of HMIS data. As part of the assessment, a data quality audit exercise was conducted at health facility level. The audit shows data discrepancy between what is recorded in the source documents (registers) at facility level and what is reported to district level. The assessment further showed a lack of feedback from the district office on data quality and performance. At facility level, health facility staffs do not provide any feedback to the statistical clerk who prepared the HMIS facility report which was sent to the DHO. The health facility staffs do not meet regularly as a unit to review the data of the health facility. This tended to contribute to the low motivation levels among the statistical clerks who felt that their work was not been recognized by the health facility management (Health Management Support Team, 2013).

These assessments point to the same facts that data quality and information use are major challenges in HMIS implementation in Malawi and they tend to reinforce each other. Lack of feedback from the health managers to the data collectors contributes to the low data quality in terms of completeness, accuracy and timeliness. Furthermore,

there is limited use of information by health managers and therefore they are unable to provide feedback on the data that health facilities generate.

### 5.5 The Study Setting: District Health Offices

The District Health Officer (DHO) is the overall manager of the health sector at the district level. There are four departments under the DHO: Curative health services, Promotive and Preventive services, Nursing services and Administration services. There is an established District Health Management Team (DHMT) comprising of the District Health officer, District Nursing officer, District Health Administrator and District Human Resource officer.

The district health offices have established structures at district and health center levels to facilitate planning, implementation and monitoring; and community ownership and participation respectively. The district health management committee is the main structure for managing district health services and it is responsible for, among others, taking planning and resource allocation decisions, and monitoring the implementation of these decisions. The district disease control programme managers are members of the extended DHMT. Although the district health information officer is a key position in the district setting, the officer is not a member of the extended DHMT. Table 5.2 below summarises the governance structures at district and health centre levels.

Table 5.2: Governance Structure at District and Health Center Levels, 2014

District Health Management Committee	<ul style="list-style-type: none"> <li>• Develops annual district implementation plans</li> <li>• Monitors implementation of plans and programmes in the district</li> <li>• Mobilizes resources for the district level activities</li> <li>• Allocates resources for implementation of district activities</li> <li>• Coordinates partners working in the health sector within the district</li> <li>• Provides feedback to health facilities</li> </ul>
Health Centre Management Committee	<ul style="list-style-type: none"> <li>• Oversees planning and implementation of health services at facility level</li> <li>• Mobilizes resources for facility and community activities</li> </ul>
Health Centre Advisory Committee	<ul style="list-style-type: none"> <li>• Monitors drug delivery at the facility</li> <li>• Facilitates user and provider interaction</li> </ul>

The research study was conducted in 4 districts in the Central region: Dedza, Mchinji, Dowa and Kasungu with a combined total population of 2.92 million served by 111 health facilities: 98 at primary level (dispensary, health centers and community hospitals) and 4 at secondary level (district hospitals) (see Table 5.3).

Table 5.3: Health facilities in four pilot district health offices, 2015

District	Dispensary	Health center	Hospital	Total
Mchinji	13	10	3	26
Dedza	7	25	2	34
Dowa	1	17	4	22
Kasungu	2	23	4	29
Total	23	75	13	111

Source: DHIS2 database, Ministry of Health

The selection of the districts in Malawi for testing the prototype league table was based on availability of data in DHIS2 central server; accessibility and proximity of the districts to the capital where the research team was based; and availability on NGOs supporting data management in the districts. Testing in different districts also provided interesting opportunities to be able to compare and contrast different contexts of league table use. In the experiments, the league table was demonstrated to the following groups of users: District Health Management Teams including district programme coordinators; district health management information system officers; zonal health officers; national programme managers and NGOs and development partners.

The league tables were tested within a set of already existing district management structures, infrastructure and practices. The District Health Management Team (DHMT) is the main structure for managing health services at the district level. The DHMT is responsible for planning, resource allocation decisions, monitoring the implementation of these decisions, resource mobilization for the district level activities and coordination of partners working in the health sector (Ministry of Health, 2005). There are more than twenty health managers in each district.

The district HMIS officers could take a leading role in the production of league tables for the district as they have the necessary resources at their disposal. These officers are responsible for managing the district routine data and have computers and are

also supposed to have internet connectivity. The district HMIS office also provides data to the District Health Management Team and district programme coordinators.

The routine health management information system is paper based at health facility level and computerised at district and national levels. The health management information system, based on the DHIS2 software, is used for collecting data routinely as health workers provide the services. It has been operational in all the districts since 2012 and is used for data entry, processing, generating reports and analyzing data and is familiar to the district health managers.

## Chapter 6: Findings

This chapter presents findings of the research study based on the five papers which form part of this thesis. The main findings of the individual papers are highlighted in the first section. This is followed by a summary of how each paper has addressed the research questions.

### 6.1 Papers and findings from each paper

**Paper 1:** Moyo, C., Manda, T. & Nielsen, P. (2015). Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi, *Proceedings of the 9th HELINA conference 2014, 2(2), Ghana, March 2015, 89-95*

**Paper 2:** Moyo, C., Nkhonjera, T. & Kaasbøll, J. (2015). Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi, *Proceedings of the IST-Africa 2015 Conference, Malawi, 6-8 May 2015*

**Paper 3:** Moyo, C. M., Frøyen, M. H., Sæbø J. I. & Kaasbøll, J. J. (2015). Using performance league tables to promote accountability and feedback in health management in Malawi, *Proceedings of the ifip9.4 Conference, Negombo, Sri Lanka, 20-22 May 2015, 265-276*

**Paper 4:** Moyo, C., Kaasbøll, J., Nielsen, P. & Sæbø, J. (2016). The Information transparency effects of introducing league tables in the health system in Malawi, *Electronic Journal of Information Systems in Developing Countries, 75(2), 1-16*

**Paper 5:** Sæbø, J., Moyo, C. & Nielsen, P. (2016). Promoting transparency and accountability with district league tables in Sierra Leone and Malawi, Submitted to *Health Policy and Technology*

The following is a summary of the papers that are part of the thesis. As the first and corresponding author in four of the papers, I was involved in the design, data collection, data analysis and writing. Various co-authors have contributed in the writing of papers. Table 6.1 presents the role of the co-authors in the development process of the various papers which form part of this thesis.

Table 6.1: Role of co-authors

Paper	Co-authors	Their role
1	Christon Moyo	Study design, data collection and data analysis. Took the leading role in drafting the initial paper. Responded to the reviewers comments.
	Tiwonge Manda	Data analysis. Drafted some sections of the paper.
	Petter Nielsen	Data analysis. Reviewed the earlier drafts and made valuable contribution in the numerous discussion meetings.
2	Christon Moyo	Study design, data collection and data analysis. Took the leading role in drafting the initial paper. Responded to the reviewers comments. Presented the paper at the conference
	Tasokwa Nkhonjera	Data collection and data analysis. Drafted a section of the paper.
	Jens Kaasbøll	Reviewed the earlier drafts and made valuable contribution in the numerous discussion meetings
3	Christon Moyo	Study design, data collection and data analysis. Took the leading role in drafting the initial paper. Responded to the reviewers comments. Presented the paper at the conference.
	Marte Frøyen	Designed the league tables in DHIS2. Tested the league tables. Data collection and data analysis and contributed to writing all parts of the paper
	Johan Sæbø	Participated in data collection, data analysis and contributed to writing all parts of the paper.
	Jens Kaasbøll	Participated in data collection and contributed to writing all parts of the paper. Provided invaluable inputs in reviewing the paper development process.
4	Christon Moyo	Provided inputs in the design of the league table application in DHIS2. Involved in data collection, data analysis. Took the leading role in drafting the initial paper. Responded to the reviewers comments.
	Jens Kaasbøll	Study design, data collection and analysis and contributed to writing all parts of the paper.
	Petter Nielsen	Reviewed the earlier drafts and made valuable contribution in the numerous discussion meetings
	Johan Sæbø	Study design, data collection and analysis. Drafted some sections of the document
5	Johan Sæbø	Study design, data collection in Sierra Leone and Malawi, data analysis and contributed to writing all parts of the paper. Corresponding author
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	Petter Nielsen	Study design, data analysis and contributed to writing all parts of the paper

**Paper 1: Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi.**

Moyo, C., Manda, T. & Nielsen, P. Proceedings of the 9th HELINA Conference 2014, 2(2), Ghana, March 2015

**Purpose:** This paper investigates the potential in a peer based review strategy to break the vicious circle of information use and contribute to strengthening health management information systems in developing countries. The paper describes how peer based reviews can contribute to improved data quality and use and offers practical guidelines for policy makers and health managers to strengthen health information systems.

**Research method:** This is a *case study* based on the implementation of peer based reviews at sub-national level in Malawi aimed at strengthening health management information system. The first author was at the helm of the office responsible for the design and implementation of HMIS in Malawi for more than fifteen years. Data were collected through participant observations, semi- structured interviews, focus group discussions, field notes and official documents.

**Findings:** The implementation of peer based reviews provides an opportunity for: skills development of health workers; establishment of *learning networks* among peers, sharing of experiences and strengthening of collaboration among health managers; and improved data quality and promotion of its use in health management. One of the challenges of this strategy is that some peers were not comfortable to review the work of their colleagues.

**Contribution:** The paper aims at providing practical guidelines for policy makers in their effort to strengthen HIS. It offers lessons learnt based on implementation of peer based reviews including the building and promotion of *learning networks*; how peer based reviews can contribute to skills transfer; the adoption of an incremental approach in implementing the reviews; institutionalizing the peer reviews to cover all the levels of the health system; and involvement of different partners in order to buy-in and support the initiative.

**Conclusions:** Peer based reviews can contribute to strengthening HIS in developing countries through: establishing *learning networks* and sharing of experiences and

enhancing collaboration among health managers; providing feedback by identifying gaps and discrepancies to ensure *completeness and accuracy* of data; and providing analytical and presentation *skills* and practices for improving information use. The peer based review intervention has the potential to break the vicious circle of information use and thus contribute to strengthening the health information systems in developing countries.

**Paper 2: Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi.**

Moyo, C., Nkhonjera, T. & Kaasbøll, J. Proceedings of the IST-Africa 2015 Conference, Malawi, 6-8 May 2015

**Purpose:** This paper focuses on the use of technology in addressing low reporting rates of routine HMIS reports in a resource constraint developing country. Specifically the paper assesses the use of DHIS2 mobile reporting for improving timely *availability* of health management information system data and reports sent by health facilities to the district level.

**Research method:** This paper adopted a *case study approach* in assessing how DHIS2 mobile technology can contribute to improved data quality in terms of timeliness of reports. The study was conducted in selected health facilities in one district that had introduced DHIS2 mobile for transmitting monthly HMIS reports to the central server at national level. The study adopted a mixed quantitative and qualitative approach with an interpretive perspective. Quantitative data on timeliness of reports was obtained from the DHIS2 database. Qualitative data were collected using open ended questions; audio taped the discussions; participant observations; and policy documents methods were used.

**Findings:** The DHIS2 mobile initiative implemented the following interventions: customization of HMIS and programme level reporting forms; procurement of low end mobile phones and provision of airtime for the users, data entry clerks, supervisors at health facility level and district programme coordinators; and training of users and follow up with the users. The paper highlights some of the positive results relating to DHIS2 mobile implementation including, among others, improved *availability and accessibility* of data in DHIS2; skills development of users at health facility through training and user support of the use of mobile technology; positive attitudes and



motivation resulting in general acceptability among the data clerks in the use of the technology and reduced the cost of sending such reports to district level (behavioural). DHIS2 mobile technology has facilitated a re-organization of data entry work previously done at the district level to health facility level (organizational).

The paper also highlights some challenges in the implementation of DHIS2 mobile including the re-organization of work which has not been accompanied by making resources available at the facility level; non availability of airtime on a sustainable basis; and non-involvement of the data managers at district level.

**Contribution:** The paper provides practical contribution in the deployment of innovative technology in order to contribute to improvements in *availability and accessibility* of data and the overall health system performance.

**Conclusion:** The use of the mobile reporting in the Malawi HMIS can contribute to the improved data *availability and accessibility* in DHIS2 by health managers.

### **Paper 3: Using performance league tables to promote accountability and feedback in health management in Malawi.**

Moyo, C. M., Frøyen, M. H., Sæbø J. I. & Kaasbøll, J. J. Proceedings of the ifip9.4 Conference, Negombo, Sri Lanka, 20-22 May 2015

**Purpose:** This paper assesses the conditions for introducing performance league tables for promoting accountability and feedback in health management at the district level.

**Research method:** Using a *qualitative approach* and drawing data from the assessment done in Malawi. Data was collected using interviews, prototyping, observations and document analysis.

**Findings:** The study revealed the importance of *availability and accessibility* of data necessary for providing feedback in health management. It also revealed the importance of using a participatory process in the design and implementation of league tables within the existing management practices. There are high awareness levels, required skills, and experience in managing and using DHIS2 among health managers in the districts. Furthermore, the assessment revealed that the DHIS2 technology was already in use for data entry, analysis, presentation and storage in all

the districts. However its use was constrained by lack of reliable Internet connectivity and subscription. Furthermore the assessment revealed the importance of collaboration among district health managers within the district health office to ensure that all programme level data were available in DHIS2 data base.

**Contribution:** This paper contributes to the design and implementation of interventions to suit local needs. A decentralized and participatory approach to the league table definition based on relevance and local choices leads to broader acceptance and use of the performance league tables.

**Conclusion:** There is general interest and attitude among district health managers on the importance of comparing performance with other districts. The paper also revealed the importance of using a participatory process in the design and implementation of league tables within the existing management practices. The need to involve the users in the process of indicator identification based on *relevance* for local use. Performance league tables should be flexible so that districts can select relevant indicators in order to promote *information transparency* and *accountability*.

#### **Paper 4: The information transparency effects of introducing league tables in the health system in Malawi**

Moyo, C., Kaasbøll, J., Nielsen, P. & Sæbø, J. Electronic Journal of Information Systems in Developing Countries, 2016, 75(2)

**Purpose:** This paper focuses on the implementation process of the league tables and its information transparency effects on health management. The aim of the paper is to study the implementation process of developing and introducing a computerized league table and how it improves information transparency for health managers at the district level in Malawi. The focus on the health district as an organizational entity within the public health sector is motivated by its role as the first administrative level for the vast majority of public health services, as per international recommendations (WHO, 1978). The districts are responsible for planning, monitoring, evaluating, and giving feedback to health posts, clinics, health centers and district hospitals.

**Research method:** This paper is based on a *field experiment* research approach (Braa & Vidgen, 1999) and tested prototype league tables to improve information transparency

in pilot districts in Malawi. The paper describes the phased approach of the design process and the field experiments of the league tables conducted in the country.

**Findings:** The study shows that the league table has effects on *information transparency* in relation to data quality and use through data sharing and *availability* to district health management team members; triggered *dialogue* among district health management teams and increased understanding of operational definitions of indicators which help in their interpretation. The league table experiments also show visibility on data quality issues by exposing the missing data or data gaps in the data base. The potential of the league tables is shown through the effects on improved *availability* and *accessibility* of information by the health managers. Another effect of introducing the league table is that the district management teams acquired *knowledge* and *skills* in computing and information use in the process of navigating through the league tables.

**Contribution:** The paper makes both conceptual and practical contributions. The paper articulates and extends the use of the concept of information transparency in HIS. Practically, the study contributes to the initial steps of the performance league table for ensuring data *availability, accuracy and relevance* for health managers.

**Conclusion:** The introduction of the league table in the districts can foster horizontal communication and sharing of information among the users; increase awareness of indicators; improve visibility on data quality issues and can help to build capacity of the users in understanding the league table concept, computing and information use skills. The importance of *information transparency* is the first step for ensuring that health managers use information.

### **Paper 5: Promoting transparency and accountability with district league tables in Sierra Leone and Malawi**

Sæbø, J., Moyo, C. & Nielsen, P. Submitted to Health Policy and Technology, 2016

**Purpose:** This paper looks at how transparency and accountability can be promoted at the district level. It is based on studies undertaken in two developing countries, Sierra Leone and Malawi. The paper evaluates the introduction of the league tables at district level of the health systems and the implications for transparency and accountability.

**Research method:** The paper draws data from the on-going long-term *action research* in the two countries that has supported the development of league tables at district levels. The practical aim of this work has been to design and develop a tool that helps districts create and change league tables as they please, based on indicators relevant for them. The development process of the league tables has been done in a bottom-up and participative manner so that they are relevant at district level

**Findings:** The study shows that the league tables have positive immediate effects in providing information about relative performance, and improving data quality. They contribute to understanding of health indicators, their applicability, reliability, and *relevance* at various levels of the health sector. League tables are also suitable for communicating priorities, giving higher levels a way to signal what health facilities are held accountable.

**Contribution:** The main practical contribution of the league tables towards *information transparency* is that districts are able to visualize the relative performance as well as communicate what the entities are accountable. In addition, the league tables are potentially useful tools in the district management meetings.

**Conclusion:** In conclusion league tables are a promising tool for advancing transparency and accountability at district levels. An implication for policy is that access to peer data is necessary to evaluate district performance. The real benefits of league tables at district level can only be realized when the districts can easily customize the league tables using *relevant* indicators to meet the needs at the local level and eventually become an integral part of routine district monitoring and evaluation.

## **6.2 Summary of papers and their links to the research questions**

This section presents the summary of findings in relation to the research questions.

RQ1: *How can transformational feedback be conceptualized in the context of HMIS in developing countries?*

RQ2: *What approaches can be used to implement transformational feedback to break the vicious cycle of limited information use in the context of HMIS in developing countries?*

Table 6.2: Summary of findings and their links to the dimensions of transformational feedback

Approach	Dimensions of TF	Findings
Peer based reviews (Paper 1)	Networking and learning	Peer based reviews provide an opportunity for promoting learning networks aimed at building relationships, knowledge and sharing experience, and learning among peers. The approach supports the process of interaction and networking among peers to foster learning, provides feedback on the work of peers and is a platform for knowledge sharing.
Mobile reporting (Paper 2)	Information transparency	Mobile reporting has improved data collection and timeliness of reporting, and information accessibility in DHIS2 data base.
Performance league tables (Papers 3, 4 & 5)	Information transparency	Performance league tables in DHIS2 have improved information <i>accessibility</i> to district health managers to measure and compare district and facility performance.
		There was general interest expressed among district health managers on the importance of comparing performance with other districts using <i>relevant</i> selected indicators. There is also interest to use performance league tables for proving feedback to the districts and use indicators to compare facility performance
		A participatory bottom up process in the design and implementation of the performance league tables within the existing management practices ensures flexibility and <i>relevance</i> of the league table for local action.
		Improved information accessibility for health managers
		A flexible and interactive tool that allows users at different levels to use based on <i>relevant</i> indicators that reflect their needs
		The league table exposed data quality issues such as missing and/or incorrect data. It showed how information accessibility can help to improve <i>accuracy</i> of data.
		Leading to <i>accessibility</i> of information about relative performance of districts and facilities.
		Contributed to understanding and interpretation of health indicators including their <i>relevance</i> at various levels of the health system
	Dialogue	The league table has helped to trigger <i>dialogue</i> among different management teams, improved interaction and exchange of ideas among the stakeholders



## Chapter 7: Discussion

This chapter presents a discussion responding to the research questions.

### 7.1 Responding to the first research question

Transformational feedback is introduced in this thesis in order to contribute to our understanding of the feedback concept from the health information systems perspective. This is discussed in response to the first research question:

*RQ1: How can transformational feedback be conceptualized in the context of HMIS in developing countries?*

This thesis develops a conceptual framework for transformational feedback by extending the conventional feedback model. It considers the dimensions of transformational feedback that can be used to break the vicious cycle of limited information use in health management. The introduction of this emergent concept of transformational feedback in this thesis started with the identification of the traditional feedback and its limitations and the need to open up feedback in order to increase our understanding of the concept. Refer to chapter 3 in this thesis for the detailed discussion on the concept of transformational feedback.

There is no single functional view on feedback. The traditional feedback approach is characterized by information transmission whereby the sender deposits information to the receiver. This is defined by an expert-non-expert dichotomy (Johnson, 2007) as well as being hierarchal. The transformational feedback approach takes a multi-dimensional perspective. The thesis builds on the limitations of the conventional feedback based on information transmission model by introducing the dimensions of *information transparency*, *two-way dialogue* and *networking for learning*. The framework focuses not only on information transmission, but also identifies information in a transparent manner, promotes data sharing and gives an opportunity to encourage dialogue in the context of networking for learning among users. These dimensions are the building blocks of transformational feedback and they support each other and will be elaborated on below. To operationalize the concept, the thesis

identified the dimensions based on their potential in making changes to improve performance as well as their usefulness in addressing the needs of district health managers within the existing management policies, practices and activities of the health system.

### ***7.1.1 Information transparency***

Studies in various disciplines have pointed to the importance of information transparency (Schnackenberg & Tomlinson, 2014; Vaccaro & Madsen, 2009; Ball, 2006). Transparency is a process that goes beyond sharing information that is useful to the stakeholders. In this regard, it is not just making availability of information but also the active participation or involvement in generating and distributing that information (Rawlins, 2006; Cotterrell, 2000). This thesis takes a multi-dimensional view of *information transparency* having three key dimensions of *relevance*, *accessibility* and *accuracy* (Schnackenberg & Tomlinson, 2014).

#### *Relevance*

In information systems literature, relevance is a key attribute of information. It refers to whether the information addresses the needs of users (Miller, 1996). It is the extent to which information is applicable and useful for the task at hand (Wang & Strong, 1996). The dimension covers aspects of information that meets the expectations of the users of information (Lee et al., 2002). Schnackenberg & Tomlinson (2014) observed that despite its importance, information relevance is a neglected aspect in many conceptualizations of transparency. However, information relevance is closely related to accessibility and can be used to describe transparency. Relevance is a key dimension and if the information does not address its user needs, the user will find the data inadequate (Miller, 1996; Wang & Strong, 1996). Information relevance as an important data quality dimension is concerned with the applicability of information to the task at hand.

Relevance in information transparency has other aspects as well. Apart from usefulness of information to stakeholders, the involvement of such stakeholders in a participative process in information identification is equally important. This dimension concerns the participation of stakeholders in identifying the information and how to find it. For instance, empirical data from Malawi (Paper 4 and 5) shows how the



participatory implementation process of the league tables at the district level impacted on information transparency.

### *Accessibility*

Accessibility is an important dimension of information transparency. It reflects the extent to which information is readily available or easily retrievable by the users (Pipino, et al. 2002; Miller, 1996; Wang & Strong, 1996). Completeness is part of the accessibility of the data quality attributes and should be interpreted within the context of the task of the users (Wang & Strong, 1996). Completeness means that all the requisite data are available so that there are no missing values or data gaps in the database. It also means that all the expected reports are available. Timeliness of data is an important part of data management and is defined as the availability of data on time to the users and which is regularly updated. Like completeness, timeliness is a contextual data quality attribute that is considered within the users' tasks. Both completeness and timeliness are contextual data quality attributes related to accessibility as they have to be considered within the context of the users' task at hand (Wang & Strong, 1996).

Both the information systems professionals and the information consumers (users) recognize the importance of the accessibility dimension of information quality (Wang & Strong, 1996) which can be viewed in terms of ease of use and flexibility (Culnan, 1984) as well as understanding the meaning and interpretation of the information. It also concerns the openness in sharing the information among stakeholders. This has been the understanding of this thesis that accessibility is one of the important dimensions of information transparency.

### *Accuracy*

Data accuracy literature provides several definitions for the notion of *accuracy*, a component of the data quality dimensions (Strong et al. 1997; Fox, et al. 1994). According to Wang & Strong (1996) accuracy refers to the extent to which data are correct. Accuracy is concerned with conformity between recorded and actual values and also between recorded and reported values, implying that is correct, reliable and free of error (Miller, 1996; Wang & Strong, 1996). The thesis considers data accuracy

as a pivotal component of information transparency as it is about the reliability of information.

### **7.1.2 Two way dialogue**

*Two-way dialogue* is one of the dimensions of transformational feedback which is characterized by interaction and exchange between stakeholders to solve problems; openness and sharing to facilitate participation and skills development. The two-way dialogue dimension focuses on the need for productive conversation and wide participation in the exchange of ideas among peers.

Feedback as a dialogic process helps to develop strategies for supporting interaction and identify areas that need improvement. The *two-way dialogue* is adopted as an attempt to deal with the limitations of the one-way transmission of the feedback model as discussed in chapter 3 (Sadler, 2010; Nicol, 2010; Carless et al., 2010; Johnson, 2007; Greller, 2003; Nadler, 1979). Researchers discuss dialogue as a process rather than a task or isolated events (Yang & Carless, 2013; Nicol, 2010; Carless et al., 2010). Nicol & Milligan (2006) have suggested conceptualizing feedback as a dialogue. Nicol's recent work on feedback (Nicol, 2010; Nicol & Milligan, 2006) is to some extent an improvement on the simple feedback model and proposed a dialogic feedback model that views feedback as an interactive, participative process (Nicol, 2010).

### **7.1.3 Networking for learning**

*Networking for learning* is about building relationships among organizations and individuals to share knowledge and experiences through dialogue and exchange around a common concern (Cummings & van Zee, 2005). It provides an opportunity for enhancing interaction among peers. Networking for learning is characterized by an atmosphere of openness among participants (Cummings & van Zee, 2005). Other researchers support networking for learning relationship within organizations (Shute, 2008; Mory, 2004; Kluger & DeNisi, 1996).

This thesis has taken a multi-dimensional perspective in conceptualizing information transparency. This view supports the proponents of information transparency (Schnackenberg & Tomlinson, 2014) that promotes a participatory approach that is interactive, open and sharing of data among users (Nicol, 2010) and establishes

networks for learning among organizations and individuals (Shute, 2008; Cummings & Zee, 2005).

## **7.2 Responding to the second research question**

The second aspect of the thesis relates to the development of practical approaches to implement transformational feedback in HMIS. This is addressed by responding to the second research question:

*RQ2: What approaches can be used to implement transformational feedback practices to break the vicious cycle of limited information use in the context of HMIS in developing countries?*

No single strategy can deal with transformational feedback to break the vicious cycle of limited information use. Some approaches have been suggested to address the challenges of limited data use in HMIS (Heywood & Rohde, 2002; Lippeveld et al., 2000). However, these approaches have not been very effective as they lacked specificity. In response to the second research question, the thesis discusses three promising practical approaches that can be used to implement transformational feedback: Performance league tables; peer based reviews; and mobile reporting. Each approach is discussed below.

### **7.2.1 Performance league tables**

#### *Information transparency*

The use of performance league tables in the implementation process of transformational feedback in the health sector at the district level is a relatively new phenomenon. It has been introduced, among others, as a management tool that can promote *information transparency* among the health managers. The focus on the health district as an organizational entity within the public health sector is motivated by its role as the first administrative level for the vast majority of public health services. The district health offices are responsible for planning, service provision, monitoring, evaluating, and giving feedback to health facilities within the district.

During the study in Malawi, several prototypes of digital league tables were developed and implemented based on the Health Management Information System DHIS2. The

motivation behind this approach is the availability of routine data in the DHIS2 database which is already in use the country; and to benefit from the expertise many health workers have with DHIS2. The web-based prototypes, designed to be flexible for creating and editing simple league tables, allow health managers to visualize health indicators collected in and managed by DHIS2.

The league table in Malawi was seen as a way of using routine HMIS data providing motivation to improve data collection and use. As a tool for promoting *information transparency*, the league table can make information available and accessible among the district health managers for purposes of improving the quality of data and information use. It provided information customized to the needs of users for purposes of exchanging, sharing and comparison. Furthermore, the league table has created new forms of action and interaction that promote data visibility. The strengths of the league table have been in its implementation process through promoting user involvement in a participative and interactive manner.

The users share a common platform where interaction takes place among health managers who might have their own set of interests and positions. Using the league table health managers can see the performance of health facilities and compare their performance within their district. In addition, districts are able to see, rank and compare the performance of other districts. As one district health manager observed that the league table was:

*“a good tool for making comparison between districts or facilities on various programs or interventions, and that such comparisons can motivate organizational units to perform better.”*

The findings of the study on the implementation of performance league tables (Papers 3 and 4) have highlighted *information transparency* as one of the key dimensions of transformational feedback for promoting openness and sharing information strategies for transforming individual or organizational behaviour. Other studies have also found positive aspects of the league tables including perceived information transparency and explicitness (Tashobya et al. 2016; Adab et al. 2002; Freeman, 2002). There are other positive aspects of the league tables as they can be used to compare or benchmark performance between organizational units within the districts and between districts. In

addition, they can be used as a screening system to identify organizational entities that may require attention and support. As one of the district programme managers indicated that *“the league table can help to identify areas where capacity building is needed especially of the programme coordinators.”* League tables can also be used for performance monitoring, review and responsiveness as they can provide critical information that can help health managers to make management decisions and give advice. One district health officer observed that *“the league table can help to identify areas that need support and able to advise partners where to go with their support in the district, where it is needed most.”* These observations are similar to what other researchers on performance league tables in other sectors have found (Goldstein & Leckie, 2008). In the education sector for instance, Goldstein and Leckie (2008) noted that the school league tables as screening system can be one source of evidence to be used to identify those outlying schools that may require further attention or investigation. The league tables can, therefore, be used by managers as a screening tool to identify those organizational units or individuals that may require attention or support.

Performance league tables can be used for data compilation and help in the interpretation of data. The practice of compiling league tables encouraged participation in the development and use of the league tables, promoted understanding, built consensus and ownership among the district health managers. Going through the process of developing the league table has helped the district health staff to appreciate the importance of understanding the meaning and interpretation of the health indicators. This triggered some discussion among district health management team members on the importance of increased understanding of operational definition of indicators which can help to understand its meaning and interpretation. This was rightly put by a district health officer:

*“Good indicator definition and calculation is required for the league table to be meaningful. Indicator definitions need to be revisited. The numerator and denominator should be for the same period for the indicator to be meaningful. For example the deliveries by skilled health worker: numerator was for a quarter while the denominator was for the whole year. The value of the*

*indicator is therefore a quarter than what the actual one should be. In addition it is necessary to have accurate formulae of the indicators”.*

### *Relevance*

The importance of information relevance can be seen in the practical application in papers 3 and 4. The design and implementation of the league tables at the district level has not only enhanced availability and accessibility of information. It has included an element of participation of district managers in identifying the information they need to make management decisions. This supports the views of Rawlins (2006) who extended the definition of transparency to include active participation of stakeholders in generating the information that they need.

The thesis reveals the importance of the league tables in ensuring *information transparency* in terms of relevance of information to the health managers necessary for providing feedback in health management. *Information transparency* is concerned about the participation of people involved in the selection of the health indicators in the league table and the relevant information for comparing the performance between organizational units. Performance league tables also reveal the significance of using a participatory process in the selection of the indicators in the league tables to fit in the existing management practices.

The league tables have positive immediate effects in providing information about relative performance, and improving data quality (Paper 5). They contribute to understanding the meaning of health indicators, their applicability and *relevance* at various levels of the health sector. League tables are also suitable for communicating priorities, giving higher levels a way to signal what health facilities are held accountable.

In Malawi the league tables are developed by the district health managers themselves based on the selection of the relevant health indicators for their use (Paper 3). Thus some health managers are familiar with the process of developing the league table, and ensuring that they access the information that is of interest to them. Through the use of the league tables there is flexibility in the use of information as the health managers can have a combination of indicators of their choice. It enables the health managers to customize the league tables to meet their information needs, providing a

means for exchanging and comparing information among organizational units; and a medium of interaction and dialogue among the health managers.

Other practice oriented literature highlight the importance of information relevance for consideration and inclusion of performance indicators in the design, development and use of the league tables through participatory approaches (Kossi et al. 2013; Smith, 1990). Kossi et al. (2013) noted that although the development process of the league table was initiated at the national level, a decentralized community based participatory approach was eventually started to make league tables more relevant at the district and sub-district levels. Due to its flexible design, the league table makes it possible to have relevant information for use at any level of the health system. The generation of relevant information is key to the usefulness of the league tables in transformational feedback in health management.

Another implementation effect of introducing the league table is that the district management teams acquired relevant knowledge and skills in computing and information use in the process of navigating through the league tables. The league tables were designed in a way that the users can generate and use it for their own management purposes. The district management team generated customized league tables through a consultative and participatory process in selecting the health indicators as well as used the league table themselves. The effect of introducing the league table was that the district management teams acquired the knowledge and computing skills in the process of navigating through the league table in DHIS2. In addition, the district management teams acquired skills on how to use the league table and interpret the indicators.

### *Accessibility*

Performance league tables have immediate effects on promoting transformational feedback in information use (Paper 3). First the league tables make *relevant* data available and accessible to the health managers. Making data accessible is the first step towards promoting transformational feedback in health information systems. The introduction of the league tables has effects on improving information *accessibility*. The potential of the league tables is shown through the effects on improved visibility and accessibility of information to the health managers and other stakeholders. Other

studies found similar findings. For instance, Tashobya et al., (2016) observed that the district league table in Uganda made it possible to document the performance of each individual district against several indicators which can be accessed by a number of stakeholders and at various levels.

#### *Data accuracy*

Data accuracy is part of the data quality dimension as it is about the reliability of data. It is also a pivotal component of information transparency (Schnackenberg & Tomlinson, 2014). The league table experiments have been able to show data accuracy issues by exposing the missing data and/or data gaps in the DHIS2 data base (Paper 4). This was used as a focus for feedback and learning as it encouraged discussion among the health managers and the need for improvement. However, missing data can make benchmarking difficult since inaccurate data are used.

#### *Two-way dialogue*

In addition and in the context of transformational feedback, performance league tables can be viewed as a strategy for promoting feedback *dialogue* amongst the users (health managers) (Carless et al., 2010; Nicol & Milligan, 2006) rather than just for transmitting information to the next level. In such feedback dialogue, interactive exchanges between health managers start with the identification of indicators to be included in the league table, interpretation of the league table scores and the actions to be taken to address the problems. Furthermore, the league tables can become a tool for information presentation in review meetings where health managers examine their performance. These review meetings are used to provide feedback through, among others, open sharing of information among the health managers. This approach is therefore in contrast with the traditional feedback in practice which has basically been one-way information transmission (Greller, 2003).

Additionally, as evidenced in Paper 4, the use of league tables enables the health managers to monitor district performance as well as engage in *dialogue* and build understanding among them. Furthermore, the league table has created new forms of action and interaction that promote dialogue. The users share a common platform where interaction takes place among health managers who might have their own set of interests and positions. Tashobya et al. (2016) made similar observations in that the



district league tables “made it easy to grasp for the district and national managers including political, administrative and technical managers, and increased their interest in sector performance dialogue” (p.223).

Such interaction is dialogical and this involves a two-way flow of information. Using the league table health managers can see the performance of health facilities and compare their performance within their district. In addition, districts are able to see and compare performance of other districts.

### **7.2.2 Peer based reviews**

#### *Information transparency*

Peer based reviews display key dimensions of transformational feedback. They facilitate *information transparency* by improving data accessibility and accuracy and establishing *networking for learning*.

Peer based reviews at all levels of the health system is a strategy for improving accuracy, completeness and timeliness of routine HMIS data. The importance of these review meetings is summarized by a participant at the review meeting who observed that:

*“HMIS reviews are a practical strategy for addressing some of the problems associated with completeness, adequacy, timeliness and accuracy of data collected as well as building capacity in HMIS.”*

#### *Networking for learning*

Paper 1 discusses the potential of implementing peer based reviews strategy for improving data quality and information use in the health system based on implementation of quarterly zonal reviews in Malawi. The ministry of health has conducted peer based reviews at the district and sub national (zonal) levels since 2005. The implementation of these reviews has led to the development of different skills of participants and practices necessary for improving data quality and use. The reviews have also established *networking for learning* for sharing experiences and strengthening collaboration among health managers. This finding is consistent with the observations of Gabelina (2014) when she noted that learning processes include

information sharing and building understanding among the group members. However, one of the challenges of this strategy is that some peers were not comfortable to review the work of their colleagues especially in a bureaucratic public sector setting.

Peer based review approaches are increasingly used to strengthen health information systems. The reviews are used to provide feedback, increase interaction between peers and improve team performance. In addition there is joint learning among participants through improved interaction and coordination.

The implementation of peer based reviews has resulted in having a number of effects in strengthening health management. One of the effects of such reviews is the establishment of *networks for learning* among the peers who have been participating in the reviews for strengthening health information systems. The reviews have facilitated increased interaction and sharing of experiences and lessons learnt among the health managers (Paper 1). Peer based reviews also promote information transparency among health managers by making performance data of districts available and accessible for peers to review. They have established *networks for learning* among peers aimed at joint learning and sharing knowledge and experiences, and building skills among peers. These findings are similar to the work drawn from studies on building and promoting *learning networks* (Cummings & van Zee, 2004) and the effects of peer reviews in improving data quality and use (Braa et al., 2012; Srinivasan, 1989), and improving quality in primary health care (Grol, 1994). For instance, Cummings & van Zee (2004) identified certain characteristics of networking including, among others, as a platform for joint learning; an atmosphere for openness among participants and having a shared problem or goal.

Taking a broader perspective, peer based reviews are aimed at assessing each other's work, exchanging experiences, solving practical problems and enhancing collaboration with a view to improve data quality and use for decision making. They can be seen as an evaluation by peers working together in a practice aimed at achieving continuous improvement. The approach provides a platform among peers to foster joint learning, delivery of feedback, and shared understanding of challenges.

### **7.2.3 Mobile reporting**

#### *Accessibility*

The Malawi HMIS has been experiencing challenges of accessibility of monthly reports from the health facilities within a specified deadline (Ministry of Health, 2009). Effective deployment of mobile reporting for improving data collection, accuracy and reporting is an emerging innovation that can make significant contributions to improving the accessibility of data. The country has been implementing mobile based applications to support data exchange between different levels of the health system. The web based District Health Information Software version 2 (DHIS2) mobile is used for collecting and reporting routine facility based health information data from the facility to the national DHIS2 central server.

Some positive results relating to DHIS2 mobile reporting implementation have been registered including, among others, customization of reporting forms; skills development of users at health facility through training and user support of the use of mobile technology; positive attitudes and motivation resulting in general acceptability among the data clerks in the use of the technology. It has reduced the cost of sending HMIS monthly reports to district level. DHIS2 mobile reporting has facilitated a re-organization of data entry work previously done at the district level to health facility level (Paper 2). However, there are some challenges in the implementation of mobile reporting in DHIS2 including the use of low end phones which are not user friendly due to their small screens; the re-organization of work should be accompanied by making resources available at the facility level; non availability of airtime on a sustainable basis; non-involvement of the data managers at district level.

The use of mobile reporting in health service delivery and information is increasingly gaining ground especially in developing countries. In health information systems in particular, mobile phone reporting solutions are supporting various health data management routines at different levels. Data collection mobile reporting is used for collecting, transmitting and accessing health data and information in a timely manner (Manda & Herstad, 2014; Asangansi et al., 2013; Pascoe et al., 2012; Asangansi & Braa, 2010; Blaschke et al, 2009). Asangansi et al. (2013) applied a mobile-based community data collection solution in Nigeria to improve the quality of data in terms of timeliness,

completeness and consistency. In another study conducted in two districts in Tanzania, Pascoe et al., (2012) found that the use of mobile phone application for reporting significantly improved the completeness and timeliness of integrated disease surveillance and response data reporting from the health facilities to the district level. In the study done in Malawi, Manda & Herstad (2014) used the mobile phone solutions to support and improve timeliness of routine health data reporting from health facilities to DHIS2 server at national level and which can be remotely accessible.

As a practical approach, mobile reporting results can be applied to improve data *accessibility* by the health managers at all levels (Paper 2). The use of mobile reporting ensures that the *accessibility* dimension of information transparency can be improved. The DHIS2 mobile reporting intervention in Malawi has been implemented for data entry and transmission of reports from the health facilities to the central server database at national level. Findings from this study show that the intervention has facilitated improved information transparency by ensuring *accessibility* of monthly HMIS reports in DHIS2 at district level (Paper 2). Other studies on the use of mobile phone reporting solutions have found similar findings on improved accessibility of data (Brinkel et al., 2014; Pascoe et al., 2012; Asangansi & Braa, 2010; Blaschke et al., 2009). Brinkel et al (2014) conducted a systematic review of literature on the use of mobile phones applied for the collection of health surveillance data. The study noted that mobile technology is used for data collection and data transmission to a central server. Similarly, Blaschke et al (2009) study results on using mobile phones for data collection and reporting child nutrition information reporting showed improved timeliness by reducing the data transmission delays; increased two-way flow of information between stakeholders at the national level and health facility level; and increase in data quality reported by the health workers.

#### **7.2.4 Summary of the effects**

Table 7.1 below summarizes the effects of the practical approaches on the various dimensions of transformational feedback.

Table 7.1 Effects of the approaches on transformational feedback dimensions

Dimension \ Approach	League tables	Peer based reviews	Mobile reporting
Information transparency			
• Relevance	✓	✓	✓
• Accessibility	✓		✓
• Accuracy	✓	✓	✓
Two way dialogue	✓	✓	
Learning networks	✓	✓	

From the above table, the league tables approach has effects on all the information transparency attributes, dialogue and the learning networks. Mobile reporting on the other hand improved mainly information transparency.



## Chapter 8: Contributions and Conclusions

This chapter presents the contributions and conclusions of the thesis. The first section presents the contributions and this is followed by conclusions, study limitations and areas that require future research.

### 8.1 Contributions

This thesis contributes to feedback in health information systems strengthening in two ways: conceptual development and practical guidelines for policy and practice. It specifically contributes to setting guidelines in the design and implementation of feedback interventions at the local level.

#### 8.1.1 Conceptual Contributions

This thesis makes a contribution in conceptualizing *transformational feedback* in order to extend our understanding of the concept and its related dimensions in breaking the vicious cycle of information use. Theoretically, the thesis contributes to the concept of feedback for organizational change by introducing and discussing the concept of *transformational feedback*. The concept contributes to the understanding and further development of the role of feedback in health information systems, how feedback can be used to change practices and transform organizations and how transformational feedback can influence the vicious cycle of information use.

The concept builds on the traditional feedback studies which had treated feedback as information transmission (Sadler, 2013; Hattie & Timperley, 2007; Askew & Lodge, 2004; Sadler, 1989). The thesis has extended the feedback concept and has adopted a *transformational feedback* conceptual framework with its core dimensions: *information transparency* (Schnackenberg & Tomlinson, 2014; Rawlins, 2008), *two-way dialogue* (Kelly et al., 2013; Nicol, 2010; Nicol & Milligan, 2006) and *networking for learning* (Behn, 2003; Wenger 1998; Boud et al., 1999) for understanding the implementation of feedback in health information systems in developing countries. *Information transparency* is concerned with the openness not only in getting more people access to relevant and accurate health data that is reported and use for

comparing the performance of organizational units but also having a participatory bottom-up and decentralized development process. *Two-way dialogue* involves interactive engagement process among actors within a shared context understanding. *Networking for learning* is concerned with establishing and strengthening networks for building capacities for learning.

### **8.1.2 Practical contributions**

Practical contributions of the thesis highlight approaches that can be used to address transformational feedback and its dimensions in health information systems.

Feedback from the health managers to the data collectors is one of the fundamental components in health information systems. It contributes to improvements in data collection and reporting on the one hand and information use routines on the other. And yet there are weak and inconsistent feedback practices and strategies implemented in health information systems especially in developing countries. There is growing pressure among policy makers and practitioners to design and implement comprehensive feedback strategies that focus on providing information in a transparent manner, promoting two-way dialogue on the information and establishing learning networks among peers. This is the basis for introducing *transformational feedback* for addressing the vicious cycle of information use in health information systems.

Empirically the thesis has presented and discussed evidence from Malawi for understanding *transformational feedback* in information use. The approach identifies and combines the various dimensions of *transformational feedback* that can be implemented to address the vicious cycle of information use.

There are significant practical contributions coming out of this thesis. These contributions are in the areas of policy and practice. This thesis therefore makes practical contributions by developing guidelines in form of recommendations for policy and practice on how *transformational feedback* can be implemented at the district level (Table 8.1). Based on insights from Malawi the thesis develops guidelines that can promote transparency and enhance transformational feedback and provides normative standards for transparent practices in HMIS implementation. The guidelines



address information, participation and accountability transparency dimensions for transformational feedback.

Table 8.1: Practical Recommendations on Transformational Feedback

Area	Recommendations	Target audience
Information transparency	<ul style="list-style-type: none"> <li>• Introduce transformational feedback to fit and support the existing district management structures, practices and processes.</li> <li>• Promote information transparency practices that ensure:               <ol style="list-style-type: none"> <li>a) An open, participatory and bottom up approach in information identification and usefulness to the users (health managers);</li> <li>b) Availability of complete and accurate health data that are reported;</li> <li>c) Accessibility of relevant data for comparing the performance data within the organizational units.</li> </ol> </li> <li>• Maximize the use and re-use of existing data in DHIS2 data base.</li> <li>• Foster information sharing among the health managers to ensure that accurate and relevant data are available, visible and accessible for their use</li> <li>• Promote the use of mobile reporting to improve accessibility, accuracy and timeliness of data at the facility and district levels.</li> </ul>	<ul style="list-style-type: none"> <li>• District health management teams</li> </ul>
Two-way Dialogue	<ul style="list-style-type: none"> <li>• Establish forums to promote horizontal flow, interaction and dialogue on the health data among health managers</li> <li>• Explore opportunities to build in the feedback function in mobile reporting through text message alerts.</li> <li>• Promote two-way dialogue through on the job-supervision/coaching/mentoring.</li> </ul>	<ul style="list-style-type: none"> <li>• District health management teams</li> <li>• CMED Programmers/ HISP team</li> <li>• District health management teams</li> </ul>
Networking for learning	<ul style="list-style-type: none"> <li>• Develop guidelines for establishing networks for learning among peers.</li> <li>• Develop guidelines for promoting networking for learning in DHIS2 academies</li> </ul>	<ul style="list-style-type: none"> <li>• District health management teams</li> <li>• HISP team</li> </ul>

From a practical perspective, *transformational feedback* is an approach with three components: performance league tables; peer based reviews and mobile reporting. Information transparency ensures relevance of data, promotes accessibility of data by the data users, and data accuracy. As a strategy for interaction and dialogue,

transformational feedback allows data sharing and is a platform for fostering learning networks among peers. As it might take a long time before the full effects of transformational feedback on breaking the vicious cycle of information use can be realized, the focus of the study has been on the implementation process of transformational feedback in the short run.

## **8.2 Conclusions**

This thesis presents an interpretive research study in an effort to address the weak and inconsistent feedback practices in health information systems in developing countries. The particular challenges HIS is facing are low data quality and limited data use in health management. One of the major contributing factors is weak feedback practices. In addressing these challenges, the thesis explores transformational feedback as a concept and an approach to address the issues of low data quality, limited information use and improve competencies to improve the performance of HIS.

This thesis has synthesized literature from various disciplines that helped to conceptualize feedback and its related aspects comprising information transparency, two way dialogue and networking for learning. The proposed framework of transformational feedback is based on the iterative process between the analysis of the empirical data and the review of the literature. Empirical data has been influenced by the review of the literature. Similarly the literature has been influenced by the empirical data. The thesis has also identified practical approaches for implementing transformational feedback interventions within the contextual setting in order to break the vicious cycle of information use. These approaches have shown that they have the potential to transform the *focus* of feedback from one-way information transmission to openness and data sharing leading to two-way dialogue; enhance a more participative and interactive *structure* at the district level; and establish *processes* for networking for learning and building capacities among the health managers.

### ***Study limitations***

This research has identified some limitations which can be mentioned here. The first limitation of the study is on the short period of less than 24 months of implementing the feedback interventions. The focus was on the implementation effects of the interventions in the short term and not on long term impact of feedback

on service delivery. This is a short period to assess the long term impact of the intervention to better decision making processes and eventually to improve health service delivery.

The second limitation is that the thesis focused on the district level, a part of the overall health system. There are other levels that the transformational feedback can be applicable. This can be extended to other levels of the health system such as national, sub-national and facility levels, and partners/stakeholders in order to have a comprehensive view of transformational feedback in HMIS. These limitations are potential areas for further research in this field.

### ***Future research***

The thesis finds that there are gaps in our understanding of transformational feedback which need to be addressed especially in the long term. We need to examine how transformational feedback can eventually impact on improved health service delivery. Further research should explore other possible approaches to transformational feedback which has not been tested in this study. One possible approach is to explore opportunities to build in the feedback function in mobile reporting through text message alerts. Further research should be considered: examine the long term effects of transformational feedback on the health outcomes and how the league table can contribute to better decision making processes and improve the delivery of health services at all levels.



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## Appendix 1: List of papers

### Paper 1:

Moyo, C., Manda, T. & Nielsen, P. (2015). Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi, *Proceedings of the 9th HELINA conference 2014*, 2(2), Ghana, March 2015, 89-95

### Paper 2:

Moyo, C., Nkhonjera, T. & Kaasbøll, J. (2015). Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi, *Proceedings of the IST-Africa 2015 Conference, Malawi, 6-8 May 2015*

### Paper 3:

Moyo, C. M., Frøyen, M. H., Sæbø J. I. & Kaasbøll, J. J. (2015). Using performance league tables to promote accountability and feedback in health management in Malawi, *Proceedings of the ifip9.4 Conference, Negombo, Sri Lanka, 20-22 May 2015*, 265-276

### Paper 4:

Moyo, C., Kaasbøll, J., Nielsen, P. & Sæbø, J. (2016). The Information transparency effects of introducing league tables in the health system in Malawi, *Electronic Journal of Information Systems in Developing Countries*, 75(2), 1-16

### Paper 5:

Sæbø, J., Moyo, C. & Nielsen, P. (2016). Promoting transparency and accountability with district league tables in Sierra Leone and Malawi, Submitted to *Health Policy and Technology*

**Paper 1:**

Moyo, C., Manda, T. & Nielsen, P. (2015). Peer based reviews as a strategy for strengthening the health information systems: A case study from Malawi, *Proceedings of the 9th HELINA conference 2014*, 2(2), Ghana, March 2015, 89-95. Special Issue: "Informatics for Universal Health Coverage in Africa: From Point of Care Systems to National Strategies." DOI: <http://dx.doi.org/10.12856/JHIA-2014-v2-i2>

## Peer based reviews as a strategy for strengthening the health information systems: a case study from Malawi

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**Background and Purpose:** Many developing countries are implementing strategies to address the challenges of health management information systems in terms of low data quality and limited data use in decision making. Limited data use is both a cause and a result of poor data quality, a vicious circle that is hard to break. This paper investigates the potential in a peer based review strategy to break this vicious circle and contribute to strengthening health information systems (HIS).

**Methods:** This is a case study based on implementation of quarterly zonal reviews in Malawi aimed at strengthening HIS. Data were collected through participant observations, semi structured interviews, focus group discussions, field notes and official documents.

**Results:** The peer based reviews provided an opportunity for skills development of health workers, establishment of learning networks to improve coordination and collaboration among stakeholders and improved data quality and promotion of its use in decision making processes. One of the challenges was inadequate preparations of the districts teams due to lack of facilitators at district level. In addition, some peers were not comfortable to review the work of their colleagues.

**Conclusions:** Peer based reviews can contribute to strengthening HIS in developing countries through promoting learning networks, data quality checks, data use, and enhancing collaboration among managers. The intervention has the potential to break the vicious circle of poor data quality and limited data use and thus contribute to strengthening the health information systems. Further research areas are considered for enhancing the practice at the district level.

**Keywords:** Peer based review, health information systems, learning networks, skills development

### 1 Introduction

Health information systems (HIS) have been designed and implemented to provide information for use to inform programme planning and decision making [12, 24]. However, there are many challenges preventing HIS from effectively providing such data. One of the challenges is the limited use of data for decision making, resulting in low data quality in terms of completeness and timeliness. When HIS produce low quality data, it is not used in programme and policy development, planning and advocacy. Poor data use is both a cause and a result of poor data quality and results in a vicious circle that is hard to break.

Various strategies have been explored to strengthen HIS [16,3]. Most of these interventions have, however, focused on addressing technical aspects such as changing the system design or revamping the technology used, to improve data quality and availability. This approach has overlooked the behavioral or organizational issues which are equally critical in the efforts to strengthening HIS. This paper describes how peer based reviews, through the establishment of learning networks and skills development, can contribute to improving data quality and use for decision making. Learning networks are groups of people who share a common concern or a set of problems and who intend to deepen their knowledge and expertise in an area [29]. The paper aims at offering practical guidelines for policy makers in their efforts to strengthen HIS. Specifically, the paper focuses on the following questions:

1. How can peer based review processes contribute to improve data quality and data use?
2. How can learning networks be strengthened within the context of the Malawi health system?

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In order to answer these questions, a case study from Malawi forms the basis for the analysis.

### **Peer based reviews.**

The concept of peer based review has a multiplicity of definitions and functions and is applied in a variety of fields and studies [14,21,4,22,27,10]. Some studies have defined it as evaluation conducted by colleagues working together in a practice aimed at achieving continuous improvement [14]. In other studies, peer based reviews aim at maintaining and enhancing quality [22] or providing collaborative feedback, exchange of experiences, and joint problem solving [21,14].

This paper takes a broader view on peer based reviews; as a process undertaken by a group aimed at assessing each other's work, exchanging experiences, solving practical problems and enhancing collaboration with a view to improve data quality and use for decision making. Peer review is, therefore, seen as an evaluation by peers working together in a practice aimed at achieving continuous improvement [14]. The approach provides a platform among peers to foster learning, delivery of feedback on work, and shared understanding of challenges. The process is in line with the work drawn from studies on building and promoting learning networks [10].

In the health sector, different peer review models have been used for improving clinical performance, internal quality of care, and in standard setting [14]. Braa et. al. [4] have discussed peer review process in improving data quality and use in Zanzibar. Srinivasan [27] studied how primary health care performance data use at monthly review meetings of peers improved not only health workers' motivation and performance, but also their skills and professionalism in Maharashtra in India. Despite a multiplicity of models, peer based reviews are described with common characteristics: skills development, building collaborative learning among peers [8], exchange of experiences and problem solving [14].

### **Learning approaches.**

Different learning approaches have been used in providing opportunities for enhanced interaction between the facilitator and the learner: traditional face to face learning, peer based learning, communities of practice, and networks of learning. The traditional face to face learning model is centered on the facilitator [11,12], and typically based on teaching in a classroom setting [9]. The teacher or trainer passes on the information to the student or trainee. However, this approach can be ineffective in a number of ways. Training typically takes place within a short term period and there are inadequate follow up mechanisms. In addition, there are skill and knowledge asymmetries between facilitators and learners [12]. Consequently, peer based learning has been proposed to address these shortfalls. With peer based learning, members with similar roles provide guidance and assistance, and sharing of understanding of common challenges in a symmetrical fashion. While the model is also a form of face to face approach to learning, it brings in an aspect of collaborative learning [8]. The process combines learning from the facilitator but also focuses on peer feedback.

A large body of literature also exists elaborating the concept of Community of Practice (CoP) [28,29,1]. A community of practice has been defined as a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in a particular area [29]. CoPs are important forums for learning and negotiation [28]; they show modes of belonging including engagement and alignment [1]; and foster ties to share knowledge and solve problems [9]. CoP consists of three main dimensions: domain of common interest or need, community for building relationships, and learning and practicing what is learnt [28,29,10].

The learning networks model provides an opportunity for enhancing interaction between peers. The concept of learning networks is basically about individuals and organizations working around a common concern [10]. Learning networks are aimed at building relationships, knowledge and experience and learning from each other [10,29]. Peer based reviews are in line with the learning networks model principles. The next section describes the materials and methods on which the paper is based. Following this, the empirical case is described. The results are followed by the discussion and lessons learnt.

## 2 Materials and methods

Empirical data for this paper has been drawn from participant observations during the implementation of Health management information system (HMIS) quarterly zonal reviews in Malawi, aimed at strengthening data quality checks and use. Data were collected between 2005 and 2012. The first author was involved as a participant observer and has been connected with implementation of HMIS in Malawi for more than ten years, facilitating the planning and implementation of the peer based HMIS review processes at sub national level. The other authors have been involved with the HMIS in Malawi to varying degrees, but were mainly involved in data analysis for this paper. Empirical data were collected through observations, semi structured interviews, focus group discussions, field notes and official documents. In total, 39 interviews were conducted during the period including district health officers (7), zonal monitoring and evaluation officers (4), assistant statisticians (9), district programme managers of the Malaria programme, expanded programme of immunization, maternal and child health and integrated disease and surveillance and response (19). Interviews were used to explore interviewees' experiences from participating in peer review processes. Further analysis of official documents such as health information system policies and strategies, review guidelines, quarterly review reports was done in order to contribute to the interpretation and significance of the reviews.

## 3 Findings/Results

### 3.1 Empirical case

The Malawi Ministry of Health has established an integrated, comprehensive and decentralized routine HMIS. The system is mostly based on pen and paper at health facility level and is computerized at district and national levels using DHIS, software for data collection, analysis, and presentation and reporting. The system has been implemented in all the 28 districts and 4 central hospitals since January 2002. There are 5 health zones and each zone has between 5-7 districts. The HIS is facing a number of challenges including low data quality in terms of completeness, correctness, consistency and timeliness. And there is limited use of data to guide decision making. Districts and facilities continue to submit delayed and incomplete reports. In order to address these challenges, the Ministry of Health established regular HMIS quarterly review meetings at zonal level as one of the strategies for strengthening HIS. The results in each phase are described below.

### 3.2 The Pilot Phase (2005)

In November 2005, the Ministry of Health in collaboration with the Zonal Health Support Office organized the first quarterly peer based review meeting for HMIS at a sub national level, the South East Zone. This zone was selected because it was the only zone out of the five that was fully functional at that time. The two day review meeting was held in Zomba district and the overall objective was to improve accuracy, completeness and timeliness of HMIS data. Specific objectives were, among others, to: validate data collected and compiled by the districts and health facilities and provide appropriate feedback to the districts; increase the capacity and skills of district HMIS officers and other stakeholders (including central hospital staff) to analyze, present, and use data; provide opportunity for sharing experiences and lessons learnt and identifying implementable solutions and obtain suggestions on how the HMIS could be improved; and provide a learning opportunity for future zonal review meetings.

The review covered the following agenda: Presentations from Ministry of Health headquarters on inter-district comparisons on selected indicators; presentations from the districts focusing on selected key indicators; group exercises for review of registers and data where one group from a district reviewed the registers belonging to another district with a view to identify gaps, problems and discrepancies. This was followed by the development of action plans. The review drew participants from district health offices and district assemblies from the health zone. Each district team comprised of the District Health Officer or his representative, the District Nursing Officer, the Assistant Statistician/HMIS officer and a representative of the District Assembly. Facilitators were drawn from various stakeholders including the

Ministry of Health (Health Management Information Unit), Health Programmes, Management Sciences for Health (MSH), Christian Health Association of Malawi (CHAM) and two zonal health offices.

Some of the major issues discussed during the review included, among others, the variability on the way the districts present data. Some districts focused on the indicators identified in the guidelines for the review, others tried to present as much data as possible from their respective districts. While some districts used graphs and charts to good effect, others did not resort to graphical presentations or used them inaccurately. The majority of the districts lacked data interpretation skills. During group work, districts peer reviewed the data collection tools and the data from other districts. This involved a review of a sample of HMIS registers from two selected facilities within each district (one hospital and one health center). The aim of the exercise was to identify gaps, problems, and discrepancies and make recommendations on the way forward. The role of the pilot was to test the methodology of conducting the reviews; refine the objectives; prepare the facilitators in conducting such reviews, as it was the first time the Ministry of Health was doing it at the sub national level.

### **3.3 The roll out Phase (2006-2008)**

Following the pilot, the Ministry of Health decided to scale the review process by rolling out to all the five zones. Each quarterly review focused on a particular theme that was selected by the Ministry headquarters in consultation with the zonal offices.

#### **3.2.1 Peer review preparations**

Initially, district teams attending zonal peer reviews were not well prepared. District health information officers prepared presentations which were not shared with members of the district team. Some of the members were not even aware of their district data to be presented at the review meetings. Furthermore, the type, style and content of the presentations were not in line with the guidelines for preparation of review meetings, as provided by the Ministry of Health headquarters. During one review meeting, some districts were reportedly preparing their presentations during the meeting. All this contributed to lack of effective participation in the review process.

#### **3.2.2 Development and implementation action plans**

At the end of the reviews, districts prepared and discussed in plenary their respective action plans for implementation in the following quarter, to address identified gaps. The district action plans were then consolidated into a zonal action plan. The action plans identified HIS, and management and programme related issues/problems, including responsible entity for implementation and timeframe. The identification of issues for improving data quality and its utilization and the development of district and zonal action plans were the major outcomes of these review meetings. The Health Management Information Unit at Ministry of Health headquarters liaised and coordinated with concerned national and zonal players to ensure that action points were implemented and reported on at the subsequent quarterly zonal review meeting.

### **3.4 Maturity and Consolidation Phase (2009-2012)**

Earlier phases of the HMIS review process emphasized improving data collection to ensure completeness and accuracy. The maturity and consolidation phase focused on data processing and presentation and consolidated what had been learnt in the previous phases. The staff from headquarters provided facilitation to the zonal office in order to build capacity at that level. Subsequent facilitation was done by the zonal office with headquarters taking the back stage. Additional facilitators from the central level (including programme officers) were invited to participate in the reviews as per thematic need, relating to each particular meeting. The involvement of the programme coordinators and partners was not only necessary to secure buy-in, but also to provide technical inputs into the review process.

Various processes were going on in the three areas of networking, practice and skills development. The review meetings brought together health workers from different organizations with a common purpose of strengthening health information systems. A number of practices were introduced including the use of different thematic areas for each review; face to face meetings of peers; use of different methods during

review process such as presentations, discussions and group work; peer review of data collection tools (registers) and data; sharing of experiences; and development of action plans. In the area of skills development, participants gained knowledge and acquired skills in presentation, analysis and coordination and action plan development.

On the other hand, a number of challenges were encountered during the review process. For instance, one challenge was that the peers were not comfortable to question their colleagues work. However this was addressed by ensuring the availability and use of facilitators with good facilitation skills.

#### 4 Discussion

The Malawi Ministry of Health has conducted peer based reviews at sub national (zonal) level since 2005. The implementation of peer based reviews has had impacts in a number of areas. It has led to the development of different skills necessary for improving data quality and use. The reviews have also established networks for learning and sharing of experiences and strengthening collaboration with partners. The table below summarizes the key actions undertaken during the peer based review processes and the effects on strengthening the health information system.

Area	Actions	Effects
Peer based review as skills development	<ul style="list-style-type: none"> <li>-Peer reviewed data collection tools and data</li> <li>-Analyzed and presented data</li> <li>-Developed district and zonal action plans</li> <li>-Zonal offices coordinated the reviews processes</li> </ul>	<ul style="list-style-type: none"> <li>-Participants (district teams) acquired analytical skills</li> <li>-Participants (district teams) acquired presentation skills</li> <li>-Participants (district teams) skills in development of district and zonal action plans improved</li> <li>- Coordination skills for facilitators from the zones improved</li> <li>-Data quality and information use improved</li> </ul>
Peer based review as community of practice	<ul style="list-style-type: none"> <li>-Joint problem solving</li> <li>-Use of different methods (presentations, discussions, group work)</li> <li>-Development of district and zonal action plans</li> </ul>	<ul style="list-style-type: none"> <li>-Learning networks among stakeholders established</li> <li>-Sharing of experiences and lessons learnt among participants (district teams, zonal officers, partners, non-governmental organizations),</li> </ul>
Peer based review as problem solving	<ul style="list-style-type: none"> <li>-Problem identification and suggestion solutions</li> <li>Development of district and zonal action plans</li> </ul>	<ul style="list-style-type: none"> <li>-Problem solving capabilities of participants (district teams) improved</li> </ul>
Peer based review as evaluation	<ul style="list-style-type: none"> <li>-Presentation on progress on implementation of previous action plans</li> <li>-Performance evaluating among districts</li> <li>-Providing feedback on the district data</li> </ul>	<ul style="list-style-type: none"> <li>-Performance improvement</li> <li>-Action plans served as monitoring tools during follow up processes</li> </ul>
Peer based review as collaborative practice	<ul style="list-style-type: none"> <li>-Participation of district teams, development partners and non-governmental organization</li> <li>-Use of different thematic area for each review</li> </ul>	<ul style="list-style-type: none"> <li>-Co-operative practice among health workers from various backgrounds - Stakeholders (Ministry of Health departments and programmes, partners, non-governmental organizations) buy-in and support the implementation of zonal strategies</li> </ul>

The following lessons should be relevant in other developing countries based on implementation of peer based reviews for improving data quality and data use within the context of the Malawi health system:

1. Adoption of an incremental approach in implementing the peer based reviews. The use of a phased approach has assisted in consolidation the gains from each phase.
2. Institutionalizing the peer based reviews at all levels. There is need to strengthen the district level peer based review processes by ensuring the availability and use of trained district level officers who could facilitate district reviews. Related to that, a decentralized implementation of the peer based strategy should be accompanied by improved coordination and collaboration skills at that level.
3. Involvement of different partners and stakeholders in order to gain buy-in and support the initiative.
4. The development of concrete output of the reviews in terms of practical and implementable district and zonal action plans has strengthened monitoring aspects of the activities at district level.
5. Peer based reviews can be seen as a vehicle for skills transfer from one level to the other. Coordination skills being transferred from the national level to the sub national levels through peer based reviews.

Future research in this area should consider enhancing the practice at district level; use of technology to compensate for shortage in skills through auto generation of reports (can have different levels of skill across different levels - cascading); use of technology to promote online collaboration, considering that travel can be costly, but social media solutions have now gained ground.

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## **Paper 2:**

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# Assessing the Use of Mobile Technology to improve Timeliness of HMIS Reports in Malawi

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**Abstract:** Low timeliness of routine HMIS reports has been a major concern in many developing countries. The deployment and use of mobile technology in these countries offers an opportunity to use it to improve timeliness of report sent to the next level. The aim of this study is to assess the use of mobile technology for improving timeliness of reports in one district in Malawi. Data was collected using semi-structured interviews, observations, field notes and document review. DHIS2 mobile implementation has shown some positive results concerning knowledge and skills development; improved timeliness of reports; reduction in the cost of sending reports and delegation of responsibility in data entry from the district to the health facility. The deployment of mobile technology for reporting requires appropriate technical, behavioural and organizational factors to effectively contribute to improved timeliness of reports.

**Keywords:** Mobile technology, DHIS2 mobile, timeliness of data, health management information system.

## 1. Introduction

Low reporting rates of routine data from health management information system (HMIS) have been a major concern in many developing countries. This affects not only the dissemination of data but also the use of quality data in decision making processes. Paper based reports are sent from facilities to district level using expensive public transport due to the fact that poor road infrastructure especially in remote and hard to reach areas has contributed to the high costs of public transport in most developing countries. Meanwhile, the deployment and use of mobile technology and advances in ICT has significantly increased in developing countries [1][2]. With improved telecommunication network coverage and availability of affordable hand-sets at health facility level, there is potential to use mobile technology to improve timeliness of reports reaching the next levels. In addition, there is growing interest and acceptance in the use of mobile technology for improving health care service delivery for data collection [3][4][5], for data reporting and disease surveillance [5][6][7][8].

Malawi has been exploring ways of enhancing the use of mobile technology to improve delivery of health care services. A number of mobile interventions are being piloted or rolled out across the country [6][9][10]. Some of these interventions include the use of



mobile based applications to support data exchange between different levels of the health system. One such mobile technology is the web based District Health Information Software version 2 (DHIS2) mobile that is used for collecting and reporting routine facility based health information data from the facility to the national DHIS2 central server. The DHIS2 mobile has been introduced in Lilongwe district in the central region of the country.

The use of DHIS2 mobile has been necessitated by various factors. The existing health information system is paper based at facility level and computerized at district and national levels. The system has been experiencing challenges in reporting data timely from the health facilities [14]. Timeliness of reports is defined here as the availability and accessibility of monthly reports at each level within a specified deadline. Effective deployment of mobile technology for improving data collection and reporting is recognised as an emerging innovation that has significant positive contributions to timeliness of data [1].

Before the introduction of the DHIS2 mobile in the district, health facilities were sending their monthly paper reports to the district health office where the district HMIS officer would then enter the data into DHIS2. Facilities used any available means to send the paper reports to the district level. These include the use of public transport using their own money, bicycle, walking, use ambulance drivers, give to specific program supervisors during the supervision visits, while sometimes HMIS officers from the district level go to the facilities to collect such reports. Poor road infrastructure especially in hard to reach areas makes it impassable during the rainy season. This contributes to high cost of public transport in the country and has resulted in inefficiency in data transmission from primary level to the other. Under these circumstances, paper reports have missed or delays in transporting process have been experienced. Therefore the introduction of mobile technology is addressing health systems, information and communication needs of health personnel [1] as well as transport challenges in relation to moving paper reports [5][9]. A number of technical, behavioural and organizational issues [11][12][13] need to be taken into account if the mobile technology is to contribute to improvement in timeliness and overall health information system performance in developing countries.

## **2. Objectives**

The aim of this study is to assess how mobile technology has contributed to improved timeliness of HMIS reports in a resource constrained developing country. The paper intends to identify key contributing factors and strategies for addressing the challenges of mobile technology in improving timeliness of reports. This is a case study from Malawi where health facilities in one district are using DHIS2 mobile technology for data collection and transmission to the central server at national level. The study has implications for practice and research.

The paper is structured as follows. The methodology section is presented in section 3. This is followed in section 4 by technology description. Section 5 presents the developments that have taken place since the implementation of the intervention and this is followed by section 6 on results. Section 7 looks at the business benefits. Conclusions, summary of achievements and recommendations are drawn in section 8.

## **3. Methodology**

The case study on DHIS2 mobile implementation has adopted a mixed quantitative and qualitative approach with an interpretive perspective. Quantitative data was retrieved from the DHIS2 database. There is a tool in DHIS2 that is used for analyzing timeliness of report submissions and it displays the number and percentage of facilities that have reported on time. The summary shows each report by month the actual number of reports; expected

number of reports; number of reports on time and percent of reports sent on time. Table 1 shows an example of the district report rate summary for selected reports.

*Table 1: Reporting rate summary of HMIS reports in DHIS2 database, Lilongwe DHO, Malawi, September 2014*

Name of report	Expected # of reports (N)	# of reports received timely	% reports received timely
HMIS15	45	38	84
Antenatal care	51	42	82
Family planning	46	36	78
Maternity	45	31	69
HIV counselling and testing	66	40	61

Different methods were used for collecting qualitative data including the use of open ended questions that guided discussions with various participants; audio taped the discussions, observations and document review. Data collection took place in selected health facilities using DHIS2 mobile to send monthly reports to Lilongwe district health office between November and December 2014. Lilongwe district has a total projected population of 2.4 million in 2014 [15]. The district is divided into 6 health areas: Area 25, Bwaila, Chileka, Kabudula, Mitundu and Nathenje. Each health area has between 6-9 health facilities. Out of the six health areas, data collection was undertaken in selected health facilities in the first three health areas. A total of 12 people were interviewed: 9 facility statistical clerks, 1 district HMIS officer, and 2 software programmers at national level.

At each health facility level, the first author met with statistical/data clerk responsible for data management who showed the reporting forms that were customized in the system. During the visits to the facilities, the data clerks briefed the research team how data flows at facility level and how DHIS2 mobile was used for data entry and reporting. The team also observed how the data clerks were using DHIS2 mobile to enter data and send the report.

A review of documents also provided a source of data for the study. A summary of the activities under each data source is presented in Table 2.

*Table 2: Summary of Activities Under Each Data Source*

	Data Source	Activities
1	Participant observation	Observed data clerks at facility level using paper register for data collection. Data clerks at facility level demonstrated the use of DHIS2 mobile for data entry and reporting
2	Semi structured interviews	At facility level: Interviewed data clerks focusing on orientation training; type of forms customized in DHIS2 mobile; process of data entry; deadline for sending reports to district office; cost of sending reports; any feedback received from district health office. At district health office: Interviewed the district HMIS officers on using DHIS2 mobile; competency in using the mobile; support supervision to health facilities; provision of feedback to health facilities At national level: Interviewed programmers who customized reporting forms in DHIS2 mobile and manage central server.
3	Document analysis	Documents reviewed included policy documents (Health information system (HIS) policy, HIS strategy, eHealth strategy, HIS Assessment report); project documents; monthly progress reports; paper monthly reporting forms and customized monthly reporting forms in DHIS2 mobile, and monthly DHIS2 aggregate reports.

The first author has been connected with the implementation of DHIS2 in Malawi since its inception in 2002. He has coordinated the design and implementation of not only HMIS but also DHIS2 at both policy and operational levels. The second author is one of the

software programmers at the Ministry of Health headquarters responsible for managing DHIS2 mobile. She has been involved in the customization of reporting forms in DHIS2 mobile, training the users and providing user support. The third author has been associated with the development of health information systems in Malawi for the past 12 years. He has provided technical support to the ministry of health for HMIS and DHIS2 implementation.

#### **4. Technology Description**

The technology under discussion uses a simple mobile phone based application, DHIS2, free and open source software package, for the transfer of data on basic handset that facilitates electronic data entry and receipt using electronic forms. DHIS2 mobile is a module within DHIS2 that utilizes mobile technology to expand the reach of the health information system in line with various policies and strategies [14][16][17][18][19]. This application can either be deployed as a standalone mobile reporting system or it can work together with the web interface to support an integrated HIS system that reaches all levels of the health service, including community health workers. DHIS2 mobile has key functionalities that:

- Ensure seamlessly integration with DHIS2 backbone, and data once received can be analysed and visualized;

- Support aggregate facility reporting modalities;

- Support the registering and transmitting of data to the DHIS2 server, either through SMS or GPRS network, to help support reporting, communication and coordination of activities. This enables data to be sent without the burden of travelling long distances, thus reducing reporting load and time.

- Support various messaging facilities such as bulk massaging, two-way channels, provision of automatic reminders, acknowledgement of reports received.

The Malawi Ministry of Health has been using DHIS2 mobile for data reporting in two health areas of Lilongwe district since 2012. It is aimed at curbing late data entry into DHIS2, reduce cost, time and work load of health workers when sending monthly reports from the facility to district level.

The data reporting forms have been customized in DHIS2 mobile. They are used at health facility level where data is collected using paper registers and summarized in paper reporting forms. The data is then entered in DHIS2 mobile and sent to the district health office via the national DHIS2 central server located at the ministry of health headquarters. Users can access the data provided they have DHIS2 credentials and user rights.

The majority of the health facilities have statistical/data clerks, a dedicated cadre, responsible for data management at facility level. This cadre is responsible for compiling facility level reports, ensuring data verification by facility management and entering data using DHIS2 mobile and sending the monthly reports to district health office. Apart from sending data electronically, the clerks also send paper reports to the district health office (DHO) as back-up since the system, according to the users, was not stabilized.

#### **5. Developments**

##### *1. Customization of Reporting Forms in DHIS2 Mobile*

A total of 16 reporting forms have been customized in DHIS2 mobile by the local programmers (Table 3). These forms are used for reporting aggregate data (HMIS15 summary report) and programme level data. The customization process has contributed to the skills development of the software programmers.

Table 3: Customized Reporting Forms in DHIS2 Mobile, Malawi, 2014

1	HMIS-15 summary report
2	Antenatal care (ANC) facility monthly report
3	Family Planning report
4	Community Based Maternal and New-born Health (CBMNH) report
5	Sexual Transmitted Infections (STI) report
6	HIV Testing and Counselling (HTC) report
7	Exposed Children under 24 Months report
8	Maternal and Neonatal Health report
9	Outpatient Therapeutic Programme (OTP) report
10	Supplementary Feeding Programme (SFP) report
11	Nutrition Rehabilitation Unit (NRU) report
12	Monthly Integrated Disease Surveillance & Response Reporting form
13	Village Clinics Facility Consolidated monthly report Form B
14	Maternal and Neonatal Death report
15	Maternity Health Facility report
16	Expanded Programme on Immunization (EPI) report

### 3. Procurement of Mobile Phones and Airtime

Low end mobile phones were procured for the data clerks, who are the users. Initially, 25 Nokia C101 mobile phones were procured and distributed in 16 health facilities in two health areas. Some health facilities had been given two mobile phones whilst others only one depending on the catchment area of the health facility. In the second phase, 30 Nokia Asha 206 mobile phones were procured for the remaining 29 health facilities. In addition, 6 dongles were procured and distributed to health area supervisors to use when making follow ups on reports sent to the system by the health personnel using mobile phones. Following the training, each mobile phone was given a provision of MK500 (USD1.1) of airtime per month for the first three months. However, this arrangement was done for only one month and the data clerks are now using their own financial resources from the meagre salary to buy airtime.

### 4. Training of Users

There are three types of DHIS2 mobile users: data clerks, health area supervisors and district programme coordinators. The one day training which provided the knowledge and skills to the users covered an overview of DHIS2 mobile application, electronic data entry and sending reports. During the training, 96 health personnel have been trained in the district comprising 2 data/statistical clerks from each health facility, 6 health area supervisors and 2 officers from the district health office. Training for the health area supervisors covered configuration of the network, installation of the DHIS2 mobile application, trouble shooting and checking reports on the desktop. It was observed during data collection that some data clerks had taken an initiative to train additional personnel at their facility.

### 5. Follow Up with Users

A number of avenues have been created for follow ups with the users. Health area supervisors check if facilities within his/her catchment area have submitted their monthly reports and if they have not he/she must follow up with the facility. If users have any problems with the system the health area supervisor becomes the first contact person to fix it. A social media page, Repoti Mufoni, has been created on Facebook that allows the DHIS2 mobile users interact with each other and with the support team. It allows the users to share experiences and help each other in case one needed to be assisted.

Three months after the trainings, a review meeting was conducted aimed at assessing how the users were using the system. The meeting was aimed at providing support and get feedback from the users as well as suggestions on what needed to change/improve in the system.

## 6. Results

### 5.1 Technical Results

One of the technical results of the DHIS2 mobile intervention is the customization of the data reporting forms. A total of 16 reporting forms have been customized in DHIS2 mobile. The technology has been rolled out to all public and Christian Health Association of Malawi (CHAM) health facilities in the district. The DHIS2 is able to generate reporting statistics, including timeliness and completeness of reports for each organizational unit for any specified period. There have been some improvements in the timeliness of reporting by health facilities in the district. For instance, overall timeliness of all data sets has improved, although there are variations in the timeliness of various dataset reports. The timeliness of HMIS 15 summary report has increased from 56 percent in May to 84 percent in September (Figure 1).

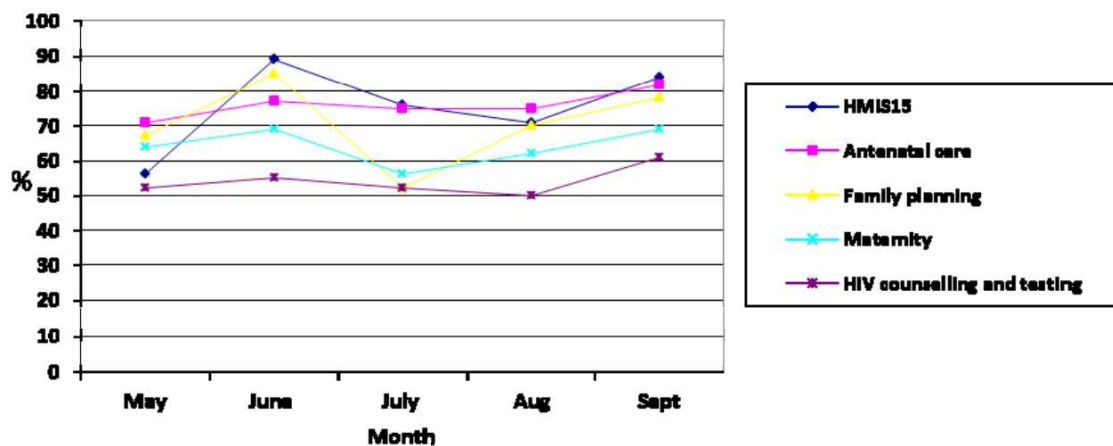


Figure 1: Percent of Timeliness of Reporting on Selected Datasets in DHIS2, Lilongwe District, 2014

Despite this improvement, there have been some challenges. These challenges relate to the hand sets, customized forms in DHIS2 mobile, non-provision of airtime by the district office and data clerks heavy work load. The low end hand mobile phones with small screen are not user friendly considering the number and complexity of some reporting forms. The use of different versions of the reporting forms in the mobile and the hard copy complicated matters further. For instance, the age groups in the family planning reporting form were different in the customised form (<18 years) compared with that in the hard copy (<20 years). When asked about their experiences in using the mobile phone, one of the statistical/data clerks observed: 'The electronic family planning reporting form is long and complicated to be used in a mobile phone that has a small screen. This is not only tiresome but also prone to making errors when entering the data'. Health facility data clerk

### 6. Skills, Attitudes and Motivation of Users

Behavioural issues relate mainly to skills, attitudes and motivation of the users. The number of users of the mobile technology has grown during the implementation of the intervention. There are at least two health personnel at each facility who are using the technology. In some facilities, those who underwent orientation training are now training other facility staff in the respective facilities as seed coaches. Statistical clerks have expressed concern

over high workload as they expected to fill and submit both an electronic report to the central server and a hard copy to the district health office. This affects timeliness of reports as they have to prepare and submit two reports containing the same data.

During the orientation the statistical clerks were promised that the district health office would be giving airtime monthly for sending reports. However, this was done only once. Since then, that promise was never honoured. The statistical clerks have to use their own financial resources to buy airtime to send the reports electronically and transport fare to deliver hard copies. This organizational arrangement has affected the motivation of using DHIS2 mobile to send reports on time.

### *6.1 Sustainability*

Users have expressed concern regarding the amount of support they get from the district health office. While the health facilities have been given mobile phones, they are not using it to send reports because of non-availability of monthly airtime from the district health office. Initially, the ministry of health headquarters provided each phone with airtime for report submission on the understanding that the district health office would take over after three months. The issue of sustainability is a major concern that needs to be considered in undertakings of this nature and magnitude in resource constrained developing countries. This issue was emphasized by the district HMIS officer who echoed: ‘The system should have come with full support, for instance, an appropriate hand set with big screen and airtime for it to be useful’.

Other concerns the users raised relate to the misunderstandings in the use of the mobile phone between the facility in-charges and the statistical clerks who manage data at facility level. This has created some tension between the in-charges and the data clerks as observed by an officer at the district level: ‘Phones have brought some conflicts or misunderstanding between those that manage the facility and those responsible for data management. In some cases the facility in- charges have snatched the phones from the statistical clerks on the pretext that it should be kept by the in-charge since he/she is the boss at the facility and not the statistical clerk’ District HMIS office.

Some of the key personnel who are supposed to provide support to the users seem not to be part of the implementation process. As the district HMIS officer put it: ‘I was not part of the orientation training team as such I am not very conversant with the system. I do not feel comfortable to provide user support to the data clerks who are using the mobile phones. Furthermore I do not know the implementation arrangements of the programme’. Such attitudes whether they reflect reality on the ground or misconception can to some extent undermine the effectiveness of mobile technology.

## **7. Business Benefits**

The DHIS2 mobile intervention has brought a number of benefits. One of the tangible outcomes of the intervention has been the improvement in timely reporting of monthly HMIS and programme level reports in DHIS2 at district level. The intervention has facilitated data entry and transmission of reports from the health facilities to the central server database at national level. Other benefits include capacity building through training of users in electronic data reporting, programming and server management. Due to poor road infrastructure, transporting paper report is problematic [7]. In light of these challenges, the use of mobile technology has potential to improve the efficiency of submitting reports, by reducing the cost of sending reports to the next level. Other benefits are associated with the use of mobile technology in improving timeliness of data can be realised at facility, district and national levels (Table 4).

Table 4: Benefits of Using DHIS2 Mobile for Data Reporting by Level

Potential benefits	Facility	District	National
Skills development in mobile phones for data reporting	✓		
Skills development in programming and server management			✓
Timely reporting of data	✓	✓	✓
Reduced costs of sending reports by facility	✓		
Timely availability of data in DHIS2	✓	✓	✓
Timely access to data in DHIS2	✓	✓	✓
Reduced workload for data entry		✓	
Timely data validation		✓	✓
Improved data quality	✓	✓	✓
Empowerment of users	✓		

## 8. Conclusions

Timeliness of reports from the health facilities to district level is a challenge and this affects the usefulness of the data. There are a number of strategies that are for addressing timeliness of reporting and use of mobile technology is one of the strategies that can be implemented to address this challenge especially in resource constrained settings. While mobile technology can enhance efficiency of an information system, it is by no means a sufficient factor. Technical, social and organizational factors also play a significant role in the whole process, especially for the sustainability concern. Mobile technology depends on the availability and reliability of a national telecommunication backbone to provide a robust and affordable Internet services especially in rural areas. This is one of the critical prerequisite for using mobile technology nationwide and yet well addressed. More effort is therefore needs to be done in this area in order. There is need to enhance collaboration between the public and private sectors in order to develop a reliable and affordable infrastructure.

DHIS2 mobile implementation in Malawi has seen a number of positive results ranging from customization of reporting forms; knowledge and skills development through training and user support on the use of mobile technology; improved timeliness of reports. There is general acceptability among the data clerks in the use of mobile phone for reporting as it reduces the cost of sending such reports to the district. Other mobile phone reporting solutions have found similar findings on the use of mobile technology for data collection and reporting [3][4][5][6][8].

By using DHIS2 mobile, data entry activities have been delegated to health facility level. Mobile technology has therefore facilitated a re-organization of data entry work at district level as it is now done at the facility level. This gives more time for the district to validate the data, prepare reports and provide feedback to the facilities. This delegation should, however, be accompanied by making resources available at facility level so that they do a commendable job. The sending of both an electronic and paper reports to the district health office should be discouraged as it may contribute to the increased workload at facility level.

The involvement of the users and having positive attitudes are some of the behavioural issues that need to be addressed in building an effective and sustainable mobile technology for data reporting. A forum was been created in DHIS2 mobile for exchanging experiences and sharing notes amongst the users. Data clerks are currently using the Repoti Mufoni Facebook page to check if their colleagues have received airtime from the district health office. The users of the page may go beyond this and explore how it can be used as a discussion forum for improving data quality.

The study recommends that further research can be done in a number of areas: how mobile technology can be used to enhance feedback practices to health facilities; how mobile technology can promote information sharing among health workers at different

levels of health system. The use of mobile technology should have an impact on the health of the people and measuring the outcomes of mobile technology applied in health development should go beyond the users of such technology. Research should, therefore, be undertaken to assess the impact of mobile technology on the health of the people in line with the suggestion of Keeton [20].

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### **Paper 3:**

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# USING PERFORMANCE LEAGUE TABLES TO PROMOTE ACCOUNTABILITY AND FEEDBACK IN HEALTH MANAGEMENT IN MALAWI

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**Abstract:** One of the challenges of health management in developing countries is the existence of weak accountability and feedback practices. This paper assesses the conditions for introducing performance league tables for promoting accountability and feedback in health management. A qualitative approach with an interpretive perspective has been adopted in this study. Data was collected using interviews, prototyping, observations and document analysis. The assessment revealed the importance of having a participatory process in the design and implementation of league tables used within the existing management practices. This ensures flexibility in the use of performance league tables. In addition, appropriate technology should facilitate availability and accessibility of data to stakeholders so that they manipulate it to suit their needs. Collaboration among stakeholders is a critical condition for ensuring access to additional resources for the implementation of performance league tables. A decentralized approach to league table definition allows districts to choose and weight indicators according to their own goals. Relevance, local choices through a participatory bottom up design process leads to broader acceptance and use of the performance league tables.

**Keywords:** Feedback practices, performance league tables, health management, participatory approach, accountability

## 1. INTRODUCTION

Ranking systems have been developed to measure the performance of institutions in various sectors such as sports, education, banking and finance, and health to achieve accountability and comparative evaluation (Kossi, Sæbo, Braa, Jalloh, & Many, 2013; ALMA, 2013; Edward, Kumar, Salehi, Burnham & Peters, 2011; Republic of Uganda, (undated); Peters, Noor, Singh, Kakar, Hansen, & Burnham, 2007); Adab, Rouse, Mohammed, & Marshall, 2002). One such mechanism is the league table which can be used as an internal tool to improve performance of the institutions (Foley & Goldstein, 2012). A league table can be defined as a *'technique for displaying comparative rankings of performance indicator scores of several similar providers'* (Adab, et al., 2002, p96). Roberts & Thompson (2007) have defined it as *a set of quantitative data designed to present comparative evidence regarding the quality and performance of organizations*. The criteria used in determining these rankings are based on a particular standardized set of performance indicators so that institutions are compared.

While the policy on performance measurement sounds good and easy to implement, it is complex and problematic in practice. Providers may have difficulties agreeing on suitable performance measures to use (McGinnes & Elandy, 2012), on alignment of performance measures (Micheli & Neely, 2010) and may not represent the whole performance picture of an organization. National rankings are based on the availability of existing data from sources such as routine HMIS data, survey data from national statistics offices or other surveys by

stakeholders. In most cases, the selection of indicators is based on data availability that can measure change over time and not necessarily on relevance of the indicators for health service goals. In such cases, ranking is largely based on what can be measured and not what is relevant and important (Stella & Woodhouse, 2006). As Harvey noted 'the construction of indices by which institutions or departments are ranked is arbitrary, inconsistent and based on convenience measures' (Harvey, 2008, p189). While league tables have been popular in recent years, no single model has been accepted as such there is no one size fits all approach.

League tables for performance monitoring were first used in the Malawi joint annual health sector review in 2006, using selected health sector indicators (Ministry of Health, 2006). The district performance league table was presented at the national SWAp review meeting and received mixed reaction. Some of the stakeholders welcomed the concept as it would promote behavioural change and encourage teamwork. In some cases the league table attracted resistance, criticism and anxiety especially from those districts that were at the bottom of the table. Furthermore, the use of the league table to measure district performance was criticized because of its methodological shortfalls including the selection process of indicators and weights. Some participants wondered what criteria were used for assigning weighting to the selected indicators. Participants expressed concern that the weighting was arbitrary and therefore there was no transparency regarding the methodology used for coming up with the rankings. The data used was from the routine health information system which at that time was considered of poor quality in terms of completeness and timeliness. In addition, others participants reacted by saying that the data used was not audited and verified.

The concept was then used for a couple of years before it was discontinued. However, there has been growing impetus among various stakeholders to revive the use of the league table for comparing district performance. This has resulted in the launching of the African Leaders Malaria Alliance (ALMA) scorecard in Malawi in 2013 (ALMA, 2013). While these efforts are using the scorecard to measure and compare district performance at national level, without an explicit ranking, this paper looks at the ranked performance of health facilities at district level. It identifies parameters that the district considers most important, appropriate and relevant for local action.

The aim of this paper is to assess the conditions for introducing league tables in health management. In this paper, we discuss the current status, challenges and prospects of the scorecard in the form of league table used for promoting accountability and feedback at district level. In particular, the paper draws data from the assessment that was conducted in Malawi.

The paper is structured as follows. The next section presents the relevant literature on the concepts of scorecards and league tables, feedback and open data. Section 3 presents the research setting and this is followed by section 4 on methods. Findings and analysis are presented in section 5 and finally is the discussion and concluding remarks section.

## **2. LITERATURE REVIEW**

### **2.1. Scorecard and League Table**

Ranking systems has a long history and presently, it is generating a lot of interest in many fields. A performance league table is one of the tools used in ranking systems. Arguments for and against performance league tables have been advanced in literature. Proponents of league tables argue that they may stimulate competition among service providers (Adab, et al, 2002), help monitoring and ensure accountability of providers (Smith, 1990). On the other hand, league tables have been criticized in a number of ways. While it may have been used in other sectors without many problems, the use of the league tables in the health sector has 'attracted resistance, criticism and anxiety' (Adab, et al, 2002, p95).

The use of performance league tables has been necessitated by the introduction of health reforms based on the notion of transparency and institutional accountability (Goldstein & Leckie, 2008). League tables show not only that the institutions are held accountable for their performance but also provide an incentive to improve their performance. In addition, performance league tables can be used as a screening system to identify those institutions that may require attention (Goldstein & Leckie, 2008). As such league tables would promote performance monitoring, review and responsiveness. In some instances, the league tables may foster a competitive culture among institutions (Hallgarten, 2001). Performance rankings can provide critical information to help make management decisions by a variety of audience (Hazelkorn, 2007); can stimulate competition among institutions (Harvey, 2008); and promote transparency and accountability (Smith, 1990). These comparative rankings can also be viewed as devices used as part of an institutional improvement programme. This would encourage service providers to review and seek to improve their performance. They can be used for providing feedback regarding their performance. In addition, league tables can enhance learning as institutions and individuals can learn from each other.

Many countries and organizations have used one form of league tables - the scorecard - in the health sector. Scorecards contain the same indicators and calculations as the league tables, but they are not ranked according to the total scores. League tables are used for comparative performance in Sierra Leone (Kossi, et al, 2013), in Uganda, (Republic of Uganda (undated); and in Malawi (Ministry of Health 2006); managing the delivery of primary health care services in Afghanistan (Edward, et al, 2011; Peters et al, 2007); comparing National Health Services (NHS) performance in the United Kingdom (Adab, et al, 2002); monitoring performance for Reproductive, Maternal, Newborn and Child Health (RMNCH) (ALMA, 2013).

## 2.2. Feedback

The concept of feedback is from the learning theories. It is multi-dimensional and plays a variety of functions including as a provider of information (Kulhavy & Wager, 1993). The role of feedback and the effects of different types on performance and learning have generated a lot of interest of researchers for a long time (Lam, DeRue, Karam, & Hollenbeck, 2011; Lurie & Swaminathan, 2009). Organizations are using feedback for not only motivation but also as a mechanism for both individual and organizational performance improvement (Thurlings, Vermeulen, Bastiaens, & Stijnem, 2012).

## 2.3. Open Data

Open data efforts are gaining momentum worldwide. These efforts are intended to make data widely available and accessible so that it can be reused and redistributed by stakeholders. The open data solutions fit very well into the domain of transparency and create an environment for providing feedback and ensuring accountability. There are many benefits of open data which include user adaptation, feedback and promotes interaction between data producers and users (Zuiderwijk, Janssen, Davis, 2014; Janssen, Charalabidis & Zuiderwijk, 2012). In order for open data efforts to be useful they require infrastructure that can be used for accessing the data, discussion and feedback (Alexopoulos, Loukis & Charalabidis, 2014). However, institutional and technical barriers in many poor resourced settings are some of the major barriers to realizing the benefits of open data (Janssen, Charalabidis & Zuiderwijk, 2012).

## 2.4. Implications for Our Study

Based on the above literature review, we summarize some key concepts that seem relevant to guide our research. First, and absolute key for league tables, is *availability of and access to data*. This is dependent not only on data being open, but on the *awareness and skills* of health workers related to properly make benefit of it, and the enabling or constraining effects of *technology*. Previous experience with league tables in Malawi has shown that *interest and attitudes* are important, and that league tables need to *fit in existing management practices*. In addition, we

see that *institutional collaboration* is important, given that league tables should include indicators across health programs. Lastly, the design process of the league table, both related to the layout and content, will be examined.

### 3. RESEARCH SETTING

The organizational structure of the Ministry of Health (MoH) in Malawi has four levels: national, zone, district and facility. The country has a network of health facilities managed by different organizations and delivered at primary, secondary and tertiary levels. In 2014, there were 977 health facilities providing health services in the country (Ministry of Health & ICF International, 2014). Of these, Government manages the largest number of facilities (48%), followed by private for profit (22%). The Christian Health Association of Malawi (CHAM), which is made up of independent church related health facilities, manages 17% of the facilities. The rest (13%) is managed by non-governmental organizations (NGOs) and companies.

The Ministry has a decentralised organizational structure for health information from the health facility level up to headquarters. The Ministry has established a dedicated cadre for information recording and compiling at health facility level. There is the health information officer located at the district health office with a dedicated computer for data management. At each facility there is a statistical/data clerk to assist in data processing and report generation and reporting.

The routine health information system is paper based at health facility level and is computerised at district and national levels, using a web based District Health Information System version 2 (DHIS2.0) since 2012. The Ministry maintains DHIS2 central database for routine data received monthly from all districts and central hospitals. It produces comparative reports for use by different national programmes and other stakeholders, and users can also define their requirements and generate reports according to need.

Since 2004, Malawi has been implementing a health service delivery strategy based on the Essential Health Package (EHP) (Ministry of Health, 2011; Ministry of Health, 2004) under the SWAp implementation framework. The ministry of health compiled the first national league table for the period 2004-05 in 2006 (Ministry of Health, 2006). The league table presented a comparative performance analysis of districts on selected indicators drawn from the national SWAp core indicators matrix. The aim of the league table was to assess district performance; compare performance among districts; provide information to facilitate analysis of circumstances behind performance; form a basis for rewarding better performing districts and develop appropriate corrective measures for poor performers (Ministry of Health, 2006). The indicators used in the league table were selected based on data availability; alignment with health sector goals and other strategic documents such as the Millennium Development Goals and the Malawi Growth and Development Strategy; and weight assigned to each indicators. The weighting was done centrally based on the importance of the indicator and linked to the priorities in the national SWAp programme of work (Ministry of Health, 2006).

### 4. METHODS

#### 4.1. Overall Approach

The research presented in this paper comes out of an action research project on health information systems in Malawi. Specifically, the project aims at strengthening local use of information, by improving local access and knowledge on how to analyse relevant data. A qualitative approach with an interpretive perspective has been adopted in this study.

The research was carried out in Malawi through two main work streams; situational analysis of feedback routines and level of information use, and prototyping of a league table with testing

and input from district and zonal levels (Table 1). The league table was based upon findings from former document analysis, experiences from other countries and practices, and implemented in the DHIS2 software. The goal was to present it as simple as possible to let the users/health workers influence its functionality and design during the data collection period.

	Measles coverage rate †	Deliveries by skilled health personnel †	Antenatal care during first trimester †	OPD utilization rate †	Total Score League Table V2 †
North Zone	115.9	99.8	17	248.8	120.4
South East Zone	79	66.5	10.2	106.4	65.5
South West Zone	65.1	44	7.2	104.5	55.2
Central West Zone	75.2	63.8	6.8	97	60.7
Central East Zone	64.8	51.6	8.4	122.3	61.8

**Table 1: A prototype league table at zonal level, Malawi**

## 4.2. Data Collection

Data collection for the study took place in 6 districts health offices, 4 health facilities, 3 zonal health offices, and at the Ministry of health headquarters between July and November 2014. During the meetings, the assessment team was briefed on how data flows from the lowest level to the highest, the feedback practices and flows at district level. The teams also observed how the DHIS2 was functioning, and presented the prototype league table. In addition, focused training sessions on the league table prototype were conducted.

The following methods were used for data collection: semi structured interviews, observations and document analysis. At district level, discussions, with district programme coordinators, health facility in-charges and other informants were guided by open-ended questions. The discussions were audio taped. Participant observations of work practices around health management information system processing were done; and document reviews at both national and district levels.

Using open-ended questions, the study team had face-to-face group discussions with the district health management teams (DHMTs), HMIS officers and district programme coordinators. At the health centre level, the team met with the facility in-charges and facility members.

A total of 69 health personnel, the majority were district programme officers (29), were interviewed or participated during the data collection as summarized in Table 2 below.

Persons consulted or participated	Number
Central Monitoring and Evaluation Division (CMED) (MoH)	5
District health officers	4
District programme coordinators	29
District HMIS officers	7
Officers at zonal health office	14
Health facility in charges	3
Data clerks at health facility	3

Student interns at district level	2
M&E Technical advisors in projects	2
<b>Total</b>	<b>69</b>

**Table 2: Individuals interviewed or participated in the discussions**

Another data source for the study was document review, including the national SWAp semi-annual and annual review reports. Analysis of official documents such as health information system policies, strategies, procedures and guidelines was done in order to contribute to the interpretation of the significance of the SWAp reviews.

### 4.3. Data Analysis

Data analysis has been conducted through two stages; one in direct relation to daily work in Malawi, and the second more specifically in the development of this paper. First, at the end of the workday in Malawi, after visiting a clinic, district or zonal office, the authors would have a brief discussion about the findings, and usually carry out some work related to updating the league table design. This forms the basis for the situational report in general. Second, we have had more focused discussion around the experiences of the league table in the process of writing this paper, which has been centred on topics as presented in section 2.4.

## 5. FINDINGS AND ANALYSIS

### 5.1. Availability and Accessibility of Data

The Malawi Ministry of Health has been implementing DHIS2, a web based system aimed at supporting an integrated Health Information System (HIS) at district and national levels since 2012. It is aimed at improving data capture and analysis for programmes, data flows at facility and district and national levels, and establishing a national data repository for indicator data. Aggregate raw summary and programme level health data is available in DHIS2 by different organization unit levels. Available catchment population data by facility can also be incorporated in DHIS2 making it possible to calculate indicators at health facility level. This would make it possible to compare facility performance over time and also do facility or district comparison. Accessibility of data in DHIS2 is possible if one has appropriate users rights. Many district programme coordinators have user rights to view data of their district obtained during initial orientation on the software. However they expressed the need to view data from other districts in order to compare performance. The district programme coordinators had user rights to access such but they were not aware of it. Due to high staff turnover, many new district programme coordinators do not have user rights to access and manipulate data in DHIS2. The districts suggested decentralizing the issuing of user rights to the districts improve timely issuing of user rights at district level.

### 5.2. Skills Levels and Awareness

There is a dedicated cadre of HMIS officer at the district level responsible for managing HMIS and DHIS2. The district HMIS officer is responsible for data entry in DHIS2, data analysis, report generation and sending data to the central server. These officers have acquired the necessary skills and experience in using DHIS2. While the district programme coordinators are aware of the DHIS2, most of them have not been oriented on the system. For those that had been trained some were not using the system because of intermittent internet connectivity or had forgotten their usernames and/or passwords.

### 5.3. Availability of Technology

The assessment revealed that there is an integrated DHIS2 that has been rolled out in all the districts throughout Malawi. The software is used for data entry, analysis, presentation and storage. DHIS2 central server for data storage is located at ministry of health headquarters. The use of DHIS2 web based software at district level is constrained by lack of reliable Internet connectivity and subscription.

### 5.4. Fit in Management Practices

Although the league tables were not continued, the team observed that there are ways in which feedback was provided, including quarterly reviews, supervision and HMIS bulletins (Table 3). Most of the feedback is provided through reviews, which are aimed at providing information as well as motivating the health workers. Ideally, league tables should be used within the existing management practices such as quarterly reviews. Having the league tables in DHIS2 would help to improve management practices.

The assessment team also noted that facilities get feedback from the districts when there are errors and not as a routine practice. As observed by one district programme coordinator, *'Feedback from national programme managers is given when there are errors. Otherwise there is no feedback given'*. The coordinator suggested the need to be given feedback frequently or when a report is submitted.

	Channels of feedback	Frequency	Level	Function
1	Joint Health Sector reviews	Semi-annually, Annually	National	Information, Motivation
2	Programme Specific reviews	Quarterly, Annually	Zonal, District	Motivation, Information
3	Individual Performance reviews	Annually	Individual	Information, Motivation
4	District Implementation Plan (DIP)/HMIS reviews	Quarterly	Zonal, District	Information, Motivation
5	Health Facility HMIS reviews	Monthly	Facility	Information
6	HMIS bulletins	Semi-annually, Annually	National, District	Information
7	Supervision	Quarterly	District, Facility	Reinforcement, Motivation
8	Messaging using mobile phones	Immediately	District, Programme	Reinforcement, Information
9	Data Quality Audits	Quarterly, Immediately	Zonal, District, Facility	Reinforcement, Information
10	Messaging in DHIS2	Immediately, Monthly	Zonal, District	Information, Reinforcement

**Table 3: Typology of feedback practices in health management in Malawi**



On the other hand, districts expressed the lack of feedback on data sent to higher levels. As one district programme coordinator commented, *'There is no feedback from the zonal officers. The zonal officers come every quarter during supervision to collect the data and they do not provide any feedback. They ask us if there are any challenges, which we mention, and we do not see any changes in the challenges. Every day they ask us the same things'*.

The majority of the informants expressed that the feedback they received from the national level was inadequate or non-existing. Feedback mostly took the shape of corrections on the data quality and completeness, rather on the performance of the health services. However, contrary to the earlier experiences, most were positive to be compared through performance league tables. The authors were thus able to pilot and get reactions on a new league table, set up inside the DHIS2 application which they were already using for data collection and processing.

### 5.5. Interests and Attitudes

The assessment revealed that there is general interest expressed among the district programme coordinators on the importance of comparing performance with other districts. The districts and the zones are also interested using a ranking system for comparing district performance. The assessment team noted that one of the five health zones was using a performance league table for ranking the districts using selected indicators. The district performance is linked to the reward or recognition scheme where the best performing district is given a reward. Although the use of performance league table has been discontinued, it is interesting to note that the health zones are reviving the use of the concept for providing feedback to the districts and therefore motivate the health workers. Feedback is important as it motivates the health workers as well as use indicators to compare facility performance. As one district programme coordinator indicated:

*'District programme officers feel that feedback is important in the sense that it is a way of acknowledging the role of those collecting the data play. It also helps to correct some of the deficiencies in the systems in terms of data collection, analysis and reporting'*.

When questioned about their opinion on acceptability and usefulness of scorecards and league tables, the responses from the district, zonal and ministry of health levels were encouraging. While some of the zones are not using the league table during review meetings, discussions have been going on, regarding the importance of introducing the league table at zonal level. As observed by one of the zonal health officers: *'A league table has not been produced in the zone, but it is being discussed on how best it can be done...we find it to be good, it also encourages the districts, when the districts that seem to be performing are praised in front of their peers, they feel good and encouraged to do even more'*. The districts also made suggestions to extend feedback to the community and the general public. This was emphasized by one of the district environmental health programme coordinator who proposed that: *'when giving feedback, even the community members need to know what is happening in their health facilities...like for example immunizations if we can display the data to the general public so that they can know how their facility is performing, as they have direct impact on the indicators'*.

### 5.6 Collaborations

Collaboration among stakeholders within the district was observed at two levels. For instance, within the district health offices there was close collaboration between district HMIS officers and the programme coordinators in the production of district HMIS reports. The programme coordinators ensured that all programme level data was available for the production of the bulletin. On the other level, collaboration between the district health offices and NGOs working in the health sector to strengthen health management. One of the NGOs was invited and participated in the meetings we had with the district health management team. It was observed that various NGOs were supporting districts in DHIS2 implementation in the provision of internet connectivity and subscription, support district and facility review meetings and providing logistics for support supervision to health facilities. However, these activities have

huge cost implications districts are unable to sustain from their own budget. Through this close collaboration, districts have mobilized and accessed additional financial and technical resources for managing their districts.

### 5.7 Process of Designing Layout and Technology

The assessment revealed that the majority of the health workers were interested in utilizing league tables in their management, however they had some concerns regarding the implementation, and it was therefore crucial to involve them in the further development. One of the major concerns was that they wanted to be a part of choosing the indicators to be presented in the league table, to make sure that they would be appropriate. During the discussions we therefore invited the participants to suggest indicators. Many of the indicators mentioned were already included in the league table. However as a result of the discussion one additional indicator was added.

Further on trainings were conducted at two zonal offices and one district office. The trainings were held to teach the participants how they could create the league tables themselves, but also to invite them to discuss further improvements. Both during the trainings and the assessment interest was shown upon having a coloured league table easing the readability for the users. The second version of the league table (Table 4) therefore included colours, as well as a new indicator.

Organisation unit	Measles coverage rate	Deliveries by SHP	ANC visit 1st trimester	OPD utilization rate	Neonatal death rate	Total score
St Gabriels Hospital	51	346.7	18.8	549.8	0	193.26
Chilobwe Majiga Health Centre	51.9	0	30	214.7		59.32
Mc Quire Wellness Health Centre	55.6	0	0	179.7		47.06
Area 25 Urban Health Centre	80.7	80.9	17.1	172.5		70.24
Kang'oma Health Centre	84.1	27.9	3.4	139.5		50.98
Diamphwe Health Centre	84.8	45.1	6.6	130.1		53.32
Kabudula Rural Hospital	63	143	7.7	124.2	15.8	70.7
Mlale Hospital	50.6	28.7	2	131.5		42.56
Bwaila Hospital	21.7	101.9	4.7	107.1		47.08
Matapila Health Centre	46.8	48.5	7.2	104.5		41.4
Mbang'ombe 1 Health Centre	67.9	67.6	11.1	97.3		48.78
Lumbadzi Health Centre	47.7	29.2	5.8	88.6		34.26

**Table 4: A district league table for selected facilities and indicators, Lilongwe district, Malawi**

### 5.8 Process of Selecting Indicators and Weights

Concerning the selection of indicators, districts suggested a participatory bottom up and decentralized process of selecting the indicators in the performance league table as this would ensure flexibility and usefulness of the league table. Districts and health zonal offices suggested that they should propose the indicators while the central office should provide advice on the suitability of such indicators. The assessment team observed that since there are common data elements in the districts and facilities, it is easy for the zonal offices and districts to identify indicators for comparing performance across districts. What was needed was to select a minimum set of indicators to be used for providing feedback in the performance league table. The zonal offices, and districts have suggested potential indicators that could be in the league table including the ones on: Management (Reporting status); Reproductive health (Antenatal coverage, Deliveries by skilled health personnel, Family planning coverage); Immunization (measles); and diseases specific indicators (TB cure rate, HIV/AIDS). The selection of the indicators was based on their linkages. As one District Reproductive Health Programme Coordinator noted, *'These indicators are selected because they are interrelated and reinforce each other. The performance of one indicator will affect or impact on the performance of the other'*.

## 6. DISCUSSION AND CONCLUDING REMARKS

The feedback practice of using performance league tables at national level is not new in Malawi. It was introduced some ten years ago. However, it was quickly discontinued due to methodological challenges. The stakeholders were minimally involved in the process of indicator selection and weighting in the league table. Some stakeholders interpreted it as an assessment of individual heads of the districts and not the performance of the district as an organization. In order to gain acceptance, stakeholder involvement in the development process of the league tables is crucial. Unless the stakeholders are engaged from the beginning, they may not appreciate the concept of league tables and use it for providing feedback..

Both the facility staff and the health managers at district, zonal and national levels were surprisingly positive towards the re-introduction of league tables. Health workers in the districts have expressed the need to have rights to access data from other districts so that they can compare their performance with other districts in order to stimulate competition among service providers which is line with the findings of Adab et al (2002). The league table can establish trend analysis and compare performance of a facility or district itself over a period of time; or compare a facility or district with other facilities or districts. It is able to align with the district and national review processes as it provides an input to the reviews. Furthermore, it complements accountability and management processes at all levels. By focusing on few selected indicators at a time, the league table can promote the use of information for local action. The league table can empower the health facility staff to have rights to make changes in the indicators for their use. The DHIS2 web based software makes the health data to be easily available and accessible to users, can be re-used and distributed at various levels thereby improving openness and accountability (Zuiderwijk et al, 2014; Janssen et al, 2012).

In order to counter the previous resistance in the use of the league table, there is need to address institutional, technical and methodological challenges that were encountered. Stakeholders should be involved in the process of indicator identification in the league table in order to appreciate and buy in the concept. The need for greater district and zonal involvement in the selection of indicators for inclusion in the league table to build consensus among the health workers should be encouraged (McGinnes & Elandy, 2011). There is need to identify indicators based on relevance for local use and aligned with health sector goals rather than on data availability. Furthermore, the performance league table should be flexible enough so that districts can select indicators that are relevant for local use. This can promote accountability and transparency as highlighted in other studies (Kossi, et al, 2013; Goldstein & Leckie, 2008), ownership and local participation in the feedback processes.

The three criteria for selection of indicators were data availability, alignment with goals and weight. The Malawi DHIS2 contains a large number of health and service indicators, while financial data are not included. On the national level, indicators can be selected according to health plans, while a decentralized approach to league table definition allows districts choosing and weighing according to their own goals. Availability and use of technology combined with appropriate skills and attitudes of the users would make data easily accessible for the development of the league tables. The importance of collaboration among stakeholders is also a critical condition that enables the mobilization of additional resources for implementing the league tables. More relevant, local choices through a bottom-up design may lead to broader acceptance and use of league tables in local health management.

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## **Paper 4:**

Moyo, C., Kaasbøll, J., Nielsen, P. & Sæbø, J. (2016). The information transparency effects of introducing league tables in the health system in Malawi. *Electronic Journal of Information Systems in Developing Countries*, 75(2), 1-16

## THE INFORMATION TRANSPARENCY EFFECTS OF INTRODUCING LEAGUE TABLES IN THE HEALTH SYSTEM IN MALAWI

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### ABSTRACT

League tables are used to compare the performance of different entities in the health systems in developing countries. The aim of this paper is to study the implementation process and its effects related to a computerized league table application in Malawi. Focusing on the health district and using a field experiment research approach, the focus is on the implementation process and how it improves information transparency for health managers. Based on routine health data recording in the health management information system DHIS2, the introduced league table was used by the district health management teams in the pilot districts to rank and compare performance among their health facilities. While the introduction of the league tables was challenging, it also showed its potential through effects including improved visibility of information and accessibility for managers, better understanding of indicators, the identification of data quality issues, skills acquisition in computing and information use and improved communication and collaboration among stakeholders.

**Keywords:** League tables, information transparency, feedback, health management information system

### 1. INTRODUCTION

Existing literature describes league tables being applied at various levels of health systems: at the national (ten Asbroek et al., 2004); at the sub-national (Peters et al., 2007); at the provisional (Edward et al., 2011); at the district (Kossi et al., 2013); at the facility (Adab et al., 2002); and at the programme level (African Leaders Malaria Alliance (ALMA), 2013). However, the effects of introducing and implementing league tables on the health information systems as a whole remain relatively unexplored.

League tables can consist of many things, reflected in a number of different definitions and implementations. For example, a league table has been defined as a ‘technique for displaying comparative rankings of performance indicator scores of several similar providers’ (Adab et al., 2002, p.96) ordered according to a defined algorithm (McGinnes & Elandy, 2012). Others have defined league tables as a set of quantitative data designed to present comparative evidence regarding the quality and performance of organizations (Roberts & Thompson, 2007). A league table is different from the concept of scorecards, where there is more emphasis on the indicator values and not the aspect of ranking (ALMA, 2013). A league table as we define it in this paper encompasses: *a defined set of indicators that together is used to give feedback on the relative performance of various actors through a ranking system*. It is a tool used for comparative presentation of sensibly selected data elements to assist interpretations and trigger

actions. As a communication tool, it can help managers to monitor the performance of the organizational units they manage, and units being managed are enabled to position and reposition themselves relatively to other units. League tables can further help to improve data quality related to data completeness and correctness and to identify organizational units and areas that need support and coordination. A league table can potentially improve information transparency which may further lead to improved data, better decisions and contribute to improved health service provision.

League tables have been used for performance monitoring of health services, along with other monitoring tools such as control charts (Woodall 2006; Marshall et al., 2004; Tekkis et al., 2003; Adab et al., 2002), scorecards (Peters et al., 2007; ten Asbroek et al., 2004) and dashboards (Ghazisaeidi et al., 2015; Purbey et al., 2007; Yigitbasioglu & Velcu, 2012). While all tools are used for visual presentation of performance measures of organizations, the league table has an added function in that it makes a comparative ranking of indicator scores of organizations units. In addition, the study by Marshall et al. (2004) regarding the use of league table and control charts found that the users not only found the league tables easier to interpret than the control charts but it also increased the tendency to identify outliers for action.

In this paper, we look at the effects of introducing league tables in terms of improving information transparency in the health sector in Malawi. Our focus is not primarily on the effects of the use of the league tables, but the implementation effects when introducing and implementing it. The league table in this paper was developed and introduced with the aim to assist health management, which is primarily done at district level in Malawi. Our focus on the health district as an organizational entity within the public health sector is motivated by its role as the first administrative level for the vast majority of public health services, as per international recommendations (WHO, 1978). The districts are responsible for planning, monitoring, evaluating, and giving feedback to health posts, clinics, health centers and district hospitals. Districts provide essential services related to mother and child health, common diseases and conditions requiring standardized and non-specialized treatment.

League tables have been useful in a number of areas within health care. They constitute a form of data presentation and help interpretation of data (Marshall, Mohammed & Rouse, 2004). They also have the potential to provide critical information to help make management decisions by a variety of audiences (Hazelkorn, 2007; Peters et al., 2007). League tables provide a way of displaying comparative rankings of performance indicators of similar providers (Marshall et al., 2004) and are powerful means for providing feedback regarding the performance of organizations and providers (Moyo et al., 2015b). Other studies identify league tables as means of identifying areas of weaknesses that require attention and support (ten Asbroek et al., 2004; Goldstein & Leckie, 2008); as tools that empower the users to bargain for more resources (Edward et al., 2011) and as vehicles to promote local participation (Kossi et al., 2013). Finally, league tables also have potential in ensuring the accountability and transparency of health care providers (Adab et al., 2002; Kossi et al., 2013). The latter will be addressed here in particular.

This paper, which relates to the broader research area of feedback strategies for strengthening health management information systems to improve data quality and information use, addresses the following research question: *What are the effects on information transparency when introducing league tables as part of a district health management information system?* To analyze and discuss our data, we have used a framework of information transparency (Schnackenberg et al., 2014) and focused on the effects on information disclosure, clarity and accuracy.



For this study, several prototypes of digital league tables were developed based on the Health Management Information System DHIS2. The motivation behind this approach was the experiences from league tables for ranking performance of organizations in other countries (Kossi et al., 2013; Edward et al., 2011; Peters, et al., 2007; ten Asbroek et al., 2004; Adab et al., 2002); the availability of routine data in the DHIS2 database which is already in use in Malawi; and to benefit from the expertise many health workers have with DHIS2. The prototypes developed are web-based and allow health managers to visualize health indicators collected in and managed by DHIS2. They were designed specifically for creating and editing simple league tables. An example of the design and presentation of a digital league table is shown in Figure 1 below, showing the relative performance of districts in one health zone for the period July to September 2015. DHIS2 (see [www.dhis2.org](http://www.dhis2.org)) is web-based, free and open source software implemented in more than 50 developing countries globally and provides a wide range of possibilities for building integrated yet customized health management information systems. DHIS2 is implemented as a national data repository in Malawi, supporting monitoring and evaluation through the collection, processing, and visualization of routine health indicators.

Name	NMCP Malaria Case Fatality Rate (Below 5)	NUT Under 5 Severe Acute Malnutrition (SAM) Case Fatality Rate	RHD Antenatal Care Coverage (At least 4 Visits)	RHD Antenatal Visits in 1st Trimester	RHD Births Attended By Skilled Health Personnel	Rank	Score
Ntcheu DHO	3.1	2.4	32.5	2.4	76.4	1	42.4
Cassawa DHO	1.2	2.6	32.9	2.8	76.9	2	42.2
Ntirma DHO	3.4	2.2	26.7	1	65.4	3	38.9
Yam DHO	2.9	0.5	29			4	26.3

**Figure 1: Example of a Digital League Table**

The rest of the paper is organized as follows. The next section presents a discussion on feedback and information transparency in information systems in general and related to health management information systems in particular. Section 3 describes the research setting and this is followed, in section 4, by a description of the method used in the study. Section 5 describes the design of the league tables and the field experiments. Findings and discussions are in section 6. Finally conclusions are drawn in section 7.

## 2. FEEDBACK AND INFORMATION TRANSPARENCY

Providing feedback to health district management teams can be a central component in strategies for strengthening health management. It can be used to identify problems that need to be resolved and improve performance at group and organizational levels and for identifying opportunities for learning between those entities performing well and those that do not (Aqil et al., 2009). Available literature shows that implementation of feedback strategies and practices are weak in many developing countries (Nsubuga et al., 2002; Aqil et al., 2005) and therefore needs strengthening.

Feedback is a multi-dimensional concept as it can be viewed from many perspectives. From an information perspective, Hattie & Timperley (2007) conceptualize feedback as information regarding aspects of one's performance and understanding. Mory (2004) views feedback as information aimed to correct errors. This perspective is supported by many studies (Anderson et al., 1971; Tait et al., 1973). Ramaprasad (1983) also defines feedback as information about the gap between performance and a standard. Others have defined feedback as motivation in respect to goal driven efforts (Shute, 2007; Ilgen et al., 1979). The significance of feedback has been highlighted in research and practice not only in learning and instruction (Mory, 2004) but also in information systems (Bradley et al., 2004). Feedback is one of the elements of a health information system aimed at improving data quality and decision making.

Feedback can also be related to information transparency, a framework we have found helpful when working with league tables. The notion of information transparency can be conceptualized from several perspectives. Schnackenberg & Tomlinson (2014) have made a fertile synthesis of the literature on the definition and dimensions of the transparency concept. First, the synthesis shows that there is no single definition of the concept and that the literature relates to different domains (Schnackenberg et al., 2014) ranging from sharing data, (Akkermans et al., 2004) to degree of availability and accessibility of information to interested parties (Granados et al., 2010; Zhu, 2002) and seeking clarity of data. Second, the synthesis also shows that there are three predominant dimensions across the literature including *information disclosure*, *clarity* and *accuracy* (Schnackenberg et al., 2014). The first dimension of *information disclosure* involves aspects of sharing data and information (Akkermans et al., 2004) in order to increase awareness and coherence between different parties. It emphasizes availability of information to stakeholders (Akkermans et al., 2004; Bushman et al., 2004; Flood et al., 1999). Others have looked at this dimension as ensuring enhanced visibility and accessibility of information to users within an organization (Flyverbom et al., 2016; Zhu, 2002). The second dimension focuses on increased *clarity* to facilitate the understanding of information (Potosky, 2008; Flood et al, 1999). Clarity refers to providing information that is coherent and understandable. Schnackenberg et al. (2014) define the third dimension of *accuracy* as the perception that information is correct to the extent possible. It plays a pivotal component of transparency in terms of the reliability of information. These dimensions of transparency suggest that there are many applications of the concept across contexts and domains (Schnackenberg et al., 2014). At the same time, the dimensions should not be looked at in isolation as they co-exist.

The discussion of the league tables in this paper articulates these three aspects of information transparency. We will show how the design and implementation of the league tables are a transparency technique that facilitates sharing of information among stakeholders. As a presentation tool, the league table makes information visible and accessible as well as helps to clarify, and thus supports the understanding and interpretation of the meaning of the information. Finally, we will discuss how the visibility and accessibility of information helps to improve the accuracy of information.

### **3. RESEARCH SETTING: MALAWI**

This research was conducted in Malawi, a small, narrow and landlocked country in sub-Saharan Africa. The country is divided into three administrative regions: Northern, Central and Southern regions. These regions are divided into 29 health districts. Each district has a network of health facilities managed by different organizations such as Ministry of Health, private for profit and private not for profit. The research reported here was conducted in 4 districts in the Central region: Dedza, Mchinji, Dowa and Kasungu. As summarized in Table 1 below, the districts have a combined total population of 2.92 million served by 102 health facilities: 98 at primary

level (dispensary, health centers and community hospitals) and 4 at secondary level (district hospitals).

**Table 1: Number of Health Facilities by Level and District**

District	Estimated population 2015	Primary level health facilities	Secondary level health facilities	Total number of health facilities
Dedza	735,411	33	1	34
Mchinji	589,572	16	1	17
Dowa	764,414	21	1	22
Kasungu	826,285	28	1	29
<b>Total</b>	<b>2,915,682</b>	<b>98</b>	<b>4</b>	<b>102</b>

The league tables were tested within a set of already existing district management structures, infrastructure and practices. The District Health Management Team (DHMT) is the main structure for managing health services at the district level. The DHMT is responsible for planning, resource allocation decisions, monitoring the implementation of these decisions, resource mobilization for the district level activities and coordination of partners working in the health sector (Ministry of Health, 2005). There are more than twenty health managers in each district.

The district HMIS officers could take a leading role in the production of league tables for the district as they have the necessary resources at their disposal. These officers are responsible for managing the district routine data and have computers and are also supposed to have internet connectivity. The district HMIS office also provides data to the District Health Management Team and district programme coordinators.

The routine health management information system is paper based at health facility level and computerised at district and national levels. The health management information system, based on the DHIS2 software, is used for collecting data routinely as health workers provide the services. It has been operational in all the districts since 2012 and is used for data entry, processing, generating reports and analyzing data and is familiar to the district health managers.

Feedback practices such as review meetings have been taking place at all levels for a long time in Malawi (Moyo et al. 2015a; 2015b). The review meetings bring together various stakeholders such as district health managers and NGOs, to examine performance data, provide feedback and develop action plans to improve the data. Feedback is also provided to health facilities during supervision by teams from the district. Districts produce and disseminate HMIS annual bulletins, as a means of providing feedback. Table 2 below shows the various feedback practices taking place at the district level.

**Table 2: Existing Feedback Practices at District Level, Malawi**

Level	Feedback practices	Frequency	Participants
District	Review meetings	Quarterly	DHMT members District programme coordinators Health facility in-charges NGOs working in a district
	District HMIS bulletins	Biannually; Annually	Zonal, district and facility levels
	Supervision visits	Monthly; Quarterly	DHMT members District programme coordinators
Health area	Review meetings	Quarterly	Health facility in-charges from within a health area
Health facility	Review meetings	Monthly	Facility management meetings

The league tables are tested within this existing management structures, existing technology for data management and feedback practices currently in use at district level in Malawi. League tables add a key dimension to feedback practices by ranking organizational units according to their performance. As an internal decision support tool, the league table can be developed and used by the district health management teams themselves. The league tables can also be presented in the district HMIS bulletins to a wider group of users.

#### 4. METHOD

This paper is based on a field experiment research approach (Braa & Vidgen, 1999) and tested prototype league tables to improve information transparency in pilot districts in Malawi. Braa & Vidgen (1999) describe field experiments as an extension of experiments that are done in laboratories into a real world context. The purpose of the field experiments ‘is to construct an experiment in a more realistic environment than is possible in a laboratory setting’ (Braa & Vidgen, 1999, p. 31).

The research team consisted researchers and research students from the University of Oslo, one of whom was on leave from the position as head of the Central Monitoring and Evaluation Division in the Ministry of Health responsible for data management and DHIS2 in Malawi. The field experiments were designed to test two different prototype league tables in DHIS2 that were developed by students at the University of Oslo. The main purpose of the experiments was to test the league table in the real life setting in a developing country setting. The selection of the districts in Malawi for testing the prototype league table was based on availability of data in DHIS2 central server; accessibility and proximity of the districts to the capital where the research team was based; and availability on NGOs supporting data management in the districts. Testing in different districts also provided interesting opportunities to be able to compare and contrast different contexts of league table use. In the experiments, the league table was demonstrated to the following groups of users: District Health Management Teams including district programme coordinators; district health management information system officers; zonal health officers; national programme managers and NGOs and development partners.

The prototypes were customized to Malawi starting with the identification of indicators and data elements already used in the Malawi DHIS2. Both prototypes were developed based on DHIS2 as a software platform. The prototypes could thus take advantage of the existing DHIS2 implementation and available data in DHIS2 which is used at district level and accessible by the majority of the district health management team members. The first prototype, the *pivot league table*, was based on existing pivot table functionality in the DHIS2 software, while the second prototype, the *league table app*, was built as a separate app using the DHIS2 web API to access the data from DHIS2. The pivot league table was used to give the users an example of a league table so that they could understand the league table concept better. In addition, it was used as a basis for discussion on the league table. This helped the users to understand the league table concept and also to engage them in the discussions on the concept and contribute to the development process of the full league table prototype.

Empirical data were collected through semi structured interviews, focus group discussions, field notes and observations. Demonstration sessions of the league table were carried out in the selected districts, health zones and Community Health Sciences Unit (the public health institute) in Malawi in 2014 and 2015. The research teams undertook the field experiments. The first author introduced the league table concept to the district health management teams and also facilitated the discussions after. The demonstrations of the league table were conducted by master students.

Using open ended questions, the research teams organized focus group discussions as well as individual meetings with the district health management teams (DHMT) and district programme coordinators in their respective workplaces. The research team undertook the field experiment in Mchinji district and 2 health zones in 2014. In 2015 the research team conducted field experiment in 4 district health offices of Dedza, Dowa, Mchinji and Kasungu; 2 Health zone offices of Central east and Central west; and the Community Health Sciences Unit (CHSU) where they met the national programme managers. Meetings were also held with other stakeholders including EPOS, a non-governmental organization (NGO) working in HMIS strengthening and UNICEF, a development partner. Table 3 shows the activities undertaken and the number of participants during the field experiments in 2014 and 2015.

**Table 3: Design and Field Experiments of the League Table in 2014 and 2015**

Phase	Period	Activity	Place	No of participants
1	July-Oct 2014	□ Designing the pivot league table	□ University of Oslo	
	Oct2014	□ Introducing the league table concept □ Demonstrating the pivot league table	□ Karonga, Rumphi, Mzimba north, Kasungu districts, Northern health zonal office	37
	Nov-Dec 2014	□ Introducing the league table concept □ Demonstrating the pivot league table □ Testing the pivot league table	□ Mchinji district □ Central West and Central East zonal health offices	25

		<input type="checkbox"/> Training health workers on pivot league table		
2	Jan-Oct 2015	<input type="checkbox"/> Designing the league table App	<input type="checkbox"/> University of Oslo	
	Nov-Dec 2015	<input type="checkbox"/> Introducing the league table concept <input type="checkbox"/> Demonstrating the league table app <input type="checkbox"/> Testing the league table app <input type="checkbox"/> Training health workers on league table app	<input type="checkbox"/> Dedza, Mchinji, Dowa, Kasungu districts <input type="checkbox"/> Central East and Central West zonal offices <input type="checkbox"/> National Control Programmes <input type="checkbox"/> EPOS an NGO <input type="checkbox"/> UNICEF	60

The league table testing process covered three areas: an overview; demonstration and practice. Firstly, an overview of the league table concept and its principles were presented to the participants in order for them to have conceptual understanding of it. This included the introduction of the league table concept to the users: what it can be used for, where it has been used, who can use it. Secondly, there were demonstrations of the prototype league table and training using a step by step process of developing a league table. During the demonstration, the league table product was presented first. This was then followed by demonstrating step-by-step process of producing the league table. Thirdly, participants were given the opportunity to practice on how to generate league tables using their own indicators. During the discussion session, participants asked questions for clarification and also provided inputs on the design of the league table. All the discussions were audio taped and later transcribed. Data was also drawn from participant observations during testing of the league table.

During the training and implementation of the field experiments, the first author observed and actively participated in discussions between the different participants. On the one hand, he had a focus on how the league tables were perceived and ways in which they could be improved. On the other hand, he also focused on identifying the different themes and topics discussed and how the experiments as processes influenced the relationship between the different participants and their understanding of the information conveyed through the league table.

## 5. FIELD EXPERIMENTS

This section describes the design of the league tables and the field experiments conducted in Malawi in two phases. The *pivot league table* and the *league table app* were developed and tested in the districts in phase one and two respectively (see Table 3).

### 5.2 Phase 1: The Pivot League Table

#### 5.1.1 Designing the Pivot League Table

The *pivot league table* was designed to be user friendly and to support users in understanding and reading the information; it sorted total score to give an overview of the results; and ranked the different units to identify the best and poorly performing ones. The prototype computed a score for different organizational units: zone, district or health facility based on a set of predefined indicators. The use of predefined indicators was done due to the technical limitations

of changing indicators. It also ranked the zones, districts and facilities based on their calculated scores in order to see which units are performing well and which are not.

The first version of the *pivot league table* (Figure 2) was made prior to the assessment done in October 2014, and the indicators were therefore selected based on preliminary research. Because this was an early prototype and there was a lack of population data in DHIS2 on the facility level, we chose to keep it at the zonal level.

	Measles coverage rate ‡	Deliveries by skilled health personnel ‡	Antenatal care during first trimester ‡	OPD utilization rate ‡	Total Score League Table V2 ‡
North Zone	115.9	99.8	17	248.8	120.4
South East Zone	79	66.5	10.2	106.4	65.5
South West Zone	65.1	44	7.2	104.5	55.2
Central West Zone	75.2	63.8	6.8	97	60.7
Central East Zone	64.8	51.6	8.4	122.3	61.8

**Figure 2: Pivot League Table**

### 5.1.2 Testing the Pivot League Table

A number of league table demonstrations and training sessions were carried out with staff at district and zonal levels. The purposes of the meetings were to have league table demonstrations, provide the users with knowledge on the league table concept and skills on creating and how to use the league table as well as provide an opportunity for the users to give feedback on the prototype. All the meetings were held at participants' workplaces where the research team gave a brief background on the league table concept and how it can enhance data use in management decisions. The research team had developed a prototype league table within the familiar DHIS2 system which was demonstrated to the participants for their inputs in order to improve it.

Testing the *pivot league table* was done in Mchinji district between November and December 2014. The demonstration of the league table to the District Health Management Team and district programme coordinators took place at the HMIS review workshop that was organized by the district with support from an NGO working in the district on strengthening HMIS. A total of 12 district programme coordinators participated in the orientation training. The first author of the paper was invited to present the league table concept taking the opportunity that the whole District Health Management Team and district programme coordinators had convened at one place. The presentation included an introduction of the league table concept and a demonstration of the prototype league table using the data in DHIS2. Following on this, a detailed practical training on the preparation and use of league table specifically for HMIS officers took place in the district. The research team comprising the first author and an intern from the University of Malawi conducted orientation training for the district super users.

There were a number of challenges with the implementation of the pivot league table (Frøyen, 2015). One of the challenges encountered was that users were unable to create pivot league tables unless they had DHIS2 administrator rights. As health workers at district level do not have such rights, league tables could not be developed on this level. Pivot tables are generic and the field experiment also showed that creating league table in a pivot table required substantial knowledge. This capacity is not available at district level in Malawi. The users also suggested that it would be helpful to use colours in the league table to indicate whether the performance was good or poor. This was not a feature available for pivot tables in DHIS2. Another challenge was that when an indicator in the league table is either dropped or added, the new aggregated score for ranking is not automatically computed. These results were used as direct inputs to the development of the league table app made in the second field experiment.

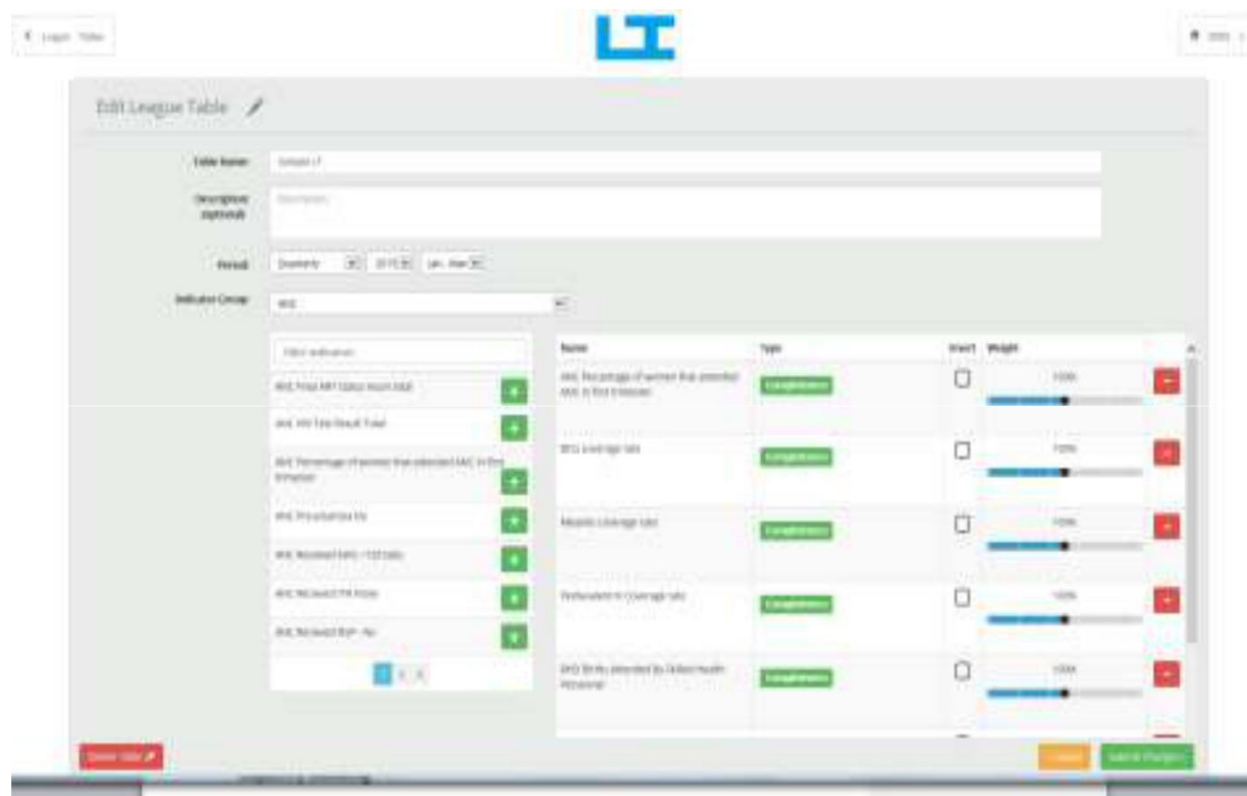
## 5.2 Phase 2: The League Table App

### 5.2.1 Designing the League Table App

The design of the *league table app* was based on the results from the first phase. To meet the identified requirements, a migration from DHIS2 pivot tables to a web based app in DHIS2 was needed. The design started in January 2015 and it culminated into the testing of the solution in November 2015.

A series of meetings were held at the University of Oslo among the researchers to plan the experiment. The first author was involved in the identification of the districts where the testing was to be done and the programme indicators to be used. The identification of the indicators was based on programmes with high reporting rates in DHIS2. Based on this, the league table app used indicators, as a starting point, from the following reports: HMIS summary report, Family Planning, Antenatal care, Maternity and Malaria programme reports which had reasonable amount of data in DHIS2. Figure 3 illustrates the editor for users to design their league table.

Using the editor, the user is able to generate the league table. The user fills the title of the league table; the description (though optional) of what league table is all about. Using the drop down function, the user selects the period under reviewed (monthly, quarterly or yearly and then the year). To choose an indicator, the user specifies the indicator group first such as Antenatal care (ANC), Maternal Health, Child Health before selecting the indicators of interest within that indicator category. The editor displays the name and type of indicator whether it is a rate or ratio. The invert function is used on indicators whose values are supposed to be are closer to zero such as drop-out rates. The weight function is used to give weight to the indicator scores. Weighting the indicators is based on the significance or importance the user may attach to the selected indicator.



**Figure 3: League Table App Editor**



### 5.2.2 Testing the League Table App

The league table app was tested on users mainly at the district level. The introduction included an overview of the league table concept: What league tables can be used for, where they have been used and by whom and a demonstration of the league table app. The demonstration included a step by step walk through of the process of designing the league table. Afterwards, there was a practical session where the participants designed their own league tables.

Throughout the process, participants gave feedback on the league table app. Important issues raised included indicator definitions and how they are calculated; the meaning of scores and ranking of organization units in the league table and how they are calculated; weighting of the indicators; and how to deal with different types of indicators (percentage, ratios and numbers) in the league table. Some of the issues have been incorporated in the league table user guide as well as changed in the design in the subsequent versions of the app.

## 6. FINDINGS AND DISCUSSION: LEAGUE TABLES AND INFORMATION TRANSPARENCY

In this section, we turn to the issue of information transparency and the concepts of information disclosure, clarity and accuracy. While the two field experiments were designed to get feedback on and improve league tables, the focus in our discussion is on how the experiment *process* influenced information transparency. League tables in the setting discussed here are tools for gauging the overall health district or facility performance and can form a basis for discussion among managers at district level. The design of our prototypes was based on document analysis, experiences from other countries and practices. The goal was to present a simple and easy to understand design to let the health workers influence its functionality and design during the data collection period.

### 6.1 Information Disclosure: Data Sharing and Availability to Stakeholders

The league table is a flexible and interactive tool that allows users at different levels to design rankings that reflect their priority needs. Through a consultative process, health managers can identify their own indicators easily adapt the app, as a senior M&E technical advisor in one of the NGOs put it:

*'The league table is a good system for promoting data use. The advantage of the league table is its ability to ranking and weightings. It is easy and simple to use and can make comparison by type of facility. These qualities make the league table to be adopted quickly.'*

When we observed the testing of the league tables, it appeared to help improving communication and exchange of ideas among the users. The interaction between the researchers and users was collaborative and encouraged consensus building around the league table as a tool and it spurred ownership among the users. At the same time, we observed fears expressed by some participants that the league table may demotivate the health workers as noted by one of the district programme coordinator: *'the scorecard application could be demotivating for organization units that are not performing well'*.

The league table experiments increased the awareness of the tools and performance indicators and created coherence and consensus among different parties. Key stakeholders were informed about the league table tool and its strengths and weaknesses. In this way, the experiments became a tool triggering dialogue among different management teams, assisted them in their interpretation and will further help them to guide their actions. The collaborative nature of this process manifested itself by the team reaching a consensus on the indicators which is a daunting task considering the different needs of the users and other stakeholders. Following up on this, the District Health Management Team was able to work together in the identification of indicators and rally together as one management team.

## 6.2 Clarity of Data

Understanding the operational definition of indicators is necessary to interpret the meaning of the ranking in the league table and taking adequate actions based on this. During the test of the league table in the district it became clear that indicator definitions across the districts and between health workers were different. Even the officers within the same health programmes understood the indicators differently. At the same time, only in two of the four districts the majority of the participants were able to understand and interpret the meaning of the indicators presented in the league table. Further, in one of the districts, data presented in the league table was questioned and did according to them not reflect the reality on the ground. For example, the reproductive health indicator on deliveries by skilled health personnel was only a quarter of what they found to be the actual number. The research team addressed this by examining the database and discovered that this was the result of an indicator poorly defined in DHIS2 as noted by one of the participants: *'The results displayed by the league table varied with the actual situation. The variance was because the indicator was not annualized, thus not properly defined in DHIS2'*. The importance of having well defined indicators in DHIS2 to make meaningful interpretations was echoed by a district health officer in one district:

*'Good indicator definition and calculation is required for the league table to be meaningful. Indicator definitions need to be revisited. The numerator and denominator should be for the same period for the indicator to be meaningful. For example the deliveries by skilled health worker: numerator was for a quarter while the denominator was for the whole year. The value of the indicator is therefore a quarter than what the actual one should be. In addition it is necessary to have accurate formulae of the indicators'*.

We observed huge gaps and substantial variations in the understanding of the indicators as well as general interest in the league table among the district programme coordinators. For example, participants in the districts had little knowledge of what type of indicators were available in the DHIS2. This became evident during testing when the research team asked the participants in the districts to identify indicators in order to come up with a league table.

For a meaningful comparison between districts or facilities with different catchment populations, league tables need to build on rates and ratios. It is necessary to take variations of target populations of the health events into consideration to make relative comparisons. Through the experiments, we found that in most cases, population data for health facility catchment areas are not readily available. The availability of this data in DHIS2 is crucial in order to have meaningful league tables. Currently, the league tables rely on the routine health information in DHIS2 as a single data source. Other data sources may be explored to have wider ranges of data.

## 6.3 Information Accuracy Issues: Missing Data/Gaps

Another effect of the league table experiments showed to be improved visibility on data quality issues. Data quality can have many attributes, but here we define it in terms of missing data or data gaps, or incorrect data. The league table did not only compare the performance of the facilities in the district but also exposed the missing data or data gaps in the DHIS2 database, as one district programme coordinator noted: *'The league table is not complicated, it is easy to use. It can show that some of the data is not correct. If there are errors in the data they can easily be detected.'* Another district programme coordinator in another district also noted the same:

*'The application can provide insights on data gaps which need to be addressed; it can also provide direction for supervision. It is a good data analysis tool that could assist in tracking data entry mistakes. A league table is helpful in detecting errors in the data'*.

Presenting the data in a league table shows the data quality issues of completeness of data due to non-reporting in one district and this affects the affecting its performance against other districts. In this case, the issue is exposed for scrutiny. By doing this in a league table, managers most likely can question the validity of this data and spur action to investigate further. The transparency league tables can thus become an important factor for improving data quality. It also shows a link between information disclosure and information accuracy.

#### **6.4 Capacity Building: Computing and Information Use Skills**

The league table app was designed in a way that the users can generate and use it for their own management purposes. Through a consultative and participatory process district teams selected the indicators to be used. The district management team generated and used the league table themselves. The effect of introducing the league table was that the district management teams acquired the knowledge and computing skills in the process of navigating through the league table in DHIS2. In addition, the district management teams acquired skills on how to use the league table and interpret the indicators.

Through participation in these meetings, District Health Management Team members acquired some knowledge and understanding of the league table concept; worked as a team and built consensus in identifying health indicators for the development of the league table app. The participants identified the district Health Management Information Systems officer as a coordinator for the activity of briefing the rest of the District Health Management Team and all district programme coordinators upon return to the district. After consultations within the management team, the district proposed to the research team the following output and outcome indicators to be used in the development of a district league table: *Pregnant women starting ANC during first trimester; Skilled birth attendance; Measles coverage; OPD utilization rate; Neonatal death rate; Low birth weight and Skin infection rate.* This was the first attempt by the district to identify its own indicators to be used in the league table to compare facility performance in the district and compare with other districts. Out of the list the last two indicators (low birth weight and skin infection rate) had no data in DHIS2 and therefore could not be included in the development of the league table at this moment.

From a participatory point of view, considerable amount of time was spent in the field talking and discussing with the users at district, zone and national level including NGOs and development partners about the usefulness of the league table and what additional functionality the league table should have. Participation level and willingness to use the league table varied among the districts. Some districts were familiar with the league table concept and this facilitated the testing process. The indicator selection process was done in a dynamic and interactive manner where the users and other stakeholders participated. Working in close collaboration with the users also helped to identify potential challenges which hindered the smooth implementation of the league table as well as promote its adoption. In addition, the league table had been developed taking into account the local context where there is limited skills capacity, weak infrastructure in terms of Internet connectivity and power. The testing of the league table in the local setting was beneficial as it strengthened the district management structures, infrastructure and practices as such it can easily be adoption and adaptation.

There are various models for compiling league tables. Some league tables are compiled in the media or by independent think tanks. The practice for compiling league tables in our case is done by the district managers themselves who are also the users of the league table. This encouraged participation in the development and use of the league table app, promoted understanding, built consensus and ownership among the district managers. Going through the

process of testing the league table has helped the districts and the staff to appreciate the importance of understanding the meaning and interpretation of the health indicators.

## 7. CONCLUSION

The main aim of this paper was to discuss the effects of the process of introducing league tables in health management on the three fundamental dimensions of information transparency: information availability and sharing; clarity and accuracy (Schnackenberg et al., 2014). The findings of this study have implications for the health system. The introduction of the league table in the districts can help to foster horizontal communication and sharing of information among the users; increased awareness and clarified operational definition of indicators; improved visibility on data quality issues and has helped to build capacity of the users in understanding the league table concept, computing and information use skills. The importance of having data that is visible and accessible, accurate and easily understandable is the first step for ensuring that managers use information for decision making. The importance of understanding the definitions and meaning of indicators ensures that data is accurate with no missing data or gaps.

The league table testing in Malawi has shown that the league table had effects on improved communication and sharing of data between district health management team members. This is in line with the findings of Akkermans et al. (2004). By making information visible and accessible this contributes to improved information transparency among the users and supporting the study findings of Schnackenberg et al., (2014). The league table has fostered greater collaborative benefits of information transparency among the health workers. The introduction of the league table in the districts contributed to understanding the indicator definition and interpretation amongst the users. Furthermore, the users found the league table ease to use and interpret as well as able to identify missing data or/and gaps for action. These findings expand the findings of the study by Marshall et al. (2004).

This field experiment has been carried within the broader research area of promoting information use in decision making. This study has addressed the initial step towards ensuring data availability, clarity and accuracy for decision making. Further research is needed on how the league table can contribute to better decision making processes and eventually improve health service delivery.

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## **Paper 5:**

Sæbø, J., Moyo, C. & Nielsen, P. (2016). Promoting transparency and accountability with district league tables in Sierra Leone and Malawi. Submitted to *Health Policy and Technology*

# ***Working papers in Information Systems***



## **PROMOTING TRANSPARENCY AND ACCOUNTABILITY WITH DISTRICT LEAGUE TABLES IN SIERRA LEONE AND MALAWI**

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## **Promoting Transparency and Accountability with District League Tables in Sierra Leone and Malawi**

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**Abstract:**

**Objectives:** With the increased attention to transparency and accountability in health sector management, this paper looks at how this can be promoted at district levels in two developing countries, Sierra Leone and Malawi. Using league tables for ranking districts and facility performance, the effects on transparency and accountability is examined.

**Methods:** Drawing on long-term action research in the two countries, we have supported development of league tables at district levels. Our practical aim of this work has been to design and develop a tool that helps districts create and change league tables as they please, based on indicators relevant for them. This has been done in a participative manner. The research covers 3 years in Sierra Leone and 2 years in Malawi.

**Results:** Our findings show that such tools have positive immediate effects, most notably on providing new information about relative performance, and improving data quality. They contribute to understanding of health indicators, their applicability, reliability, and relevance at various levels of the health sector. League tables are also suitable for communicating priorities, giving higher levels a way to signal what health facilities are held accountable by.

**Conclusion:** League tables are a promising tool for advancing transparency and accountability at district levels. An implication for policy is that access to peer data is necessary to evaluate your own performance. The true benefits of league tables at district level can only be reaped when they are easily changed and replicated, becoming an integral part of routine district monitoring and evaluation.

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## 1. Introduction

Transparency and accountability are widely held as key building blocks of well-functioning health service provision. Global health initiatives are now almost exclusively based on the paradigm that health providers are held accountable by the public, and transparency is the key to achieve this. In 2015, leaders of the global health agencies signed a five-point call for action to strengthen health measurement and accountability (MA4Health, 2015). Two of their aims are to strengthen country health systems to “use data at all levels” and promote accountability by holding “transparent review of progress at facility, subnational, national, (MA4Health, 2015) regional, and global levels” (p. 1). These goals are explicitly addressing the slow development of evidence-based management rooted in local data, despite the large progress of many countries to strengthen the data collection and processing capacities.

One set of tools that have been widely implemented to provide patient - provider transparency and support accountability is league tables that rank health service providers, both private and public, according to a set of service delivery indicators (Foley and Goldstein, 2012). While the benefits of league tables include helping to make informed decisions, providing a platform for health service evaluation, and incentivizing behavioural change, there are also restraining factors related to data quality issues, creative reporting, and stigmatization of (apparently) poor performers (Adab et al., 2002). Similar tools, such as scorecards (African Leaders Malaria Alliance, 2016), and the balanced scorecard (Edward et al., 2011) are also used to enhance transparency and assess countries' health performance.

Common for these efforts is that the tool is linked to a beneficiary-provider relationship, either for patients to assess prospective health service providers, or for funders to assess effects of interventions on a national scale. At the same time, the benefits of strengthening transparency and accountability also within the health system and health provider organizations have received much less attention. Where league tables have been applied as an evaluation and management tool for the health system itself, it is at national or regional levels only. The literature on the use of league tables as a management tool within the health system remains thin, the literature on development and use of league tables for district level management is almost non-existent.

In this paper, we describe efforts that directly address these gaps, namely the design and use of league tables for intra-organizational transparency and accountability at district levels of health systems. Based on studies in Sierra Leone and Malawi, we evaluate the introduction of league tables, and the implications for transparency and accountability. We argue that league tables can be a powerful tool for increased performance also at this level. For this to take place the tool needs to be simple and flexible, focusing on conveying relative performance rather than being an overly intricate management and strategy tool.

## 2. Related Literature

The World Development Report 2004, published by the World Bank, brought transparency and accountability to the forefront of the international development agenda. The terms have since become widespread, and linked to almost every major international initiative, such as the Millennium Development Goals and now the Sustainable Development Goals. Also in the health sector, countries are urged to put transparency and

accountability as leading principles to improve service delivery (MA4Health, 2015 and Chan et al., 2010). Despite the prominence, and a growing literature of examples, lessons from the field and evaluations, research on transparency and accountability is reflecting that they can mean all things to all people (Fox, 2007). Their current use originated from two ideological strands, one being New Public Management in the nineties, where market mechanisms were applied within organizations to make managers more accountable, and the other being a response to the failure of democratic institutions to cater to the poor (Joshi, 2013). With this background, transparency as a concept is applied widely, such as a public value to fight corruption, to denote open decision-making by governments and nonprofits, or as a complex tool of good governance (Ball, 2009). More minimalist definitions include the degree of openness in conveying information (ibid) and governments' willingness to disseminate policy-relevant data (Hollyer et al., 2011). The definition of accountability is even more elusive, but can be seen as referring to a relationship between two actors where answerability, being the duty to inform what one part is doing, and enforcement, being the capacity of the other part to wield power and implement sanctions, are key parts (Schedler, 1999). Transparency is thus often seen as prerequisite, but not sufficient, for accountability. Furthermore, accountability can serve several purposes, such as to control the misuse and abuse of resources and authority, to provide assurance that resources and authority is used appropriately according to standards, and to promote improved service delivery through feedback and learning (Brinkerhoff, 2004).

Our ambition in this paper is not to discuss what transparency and accountability can be, but instead focus on concrete examples where openness of data within public health management can improve data quality, decision making, and ultimately public health services. Accountability in this setting is not necessarily between the government and citizens, but can equally be analysed horizontally and vertically between government branches, as in our case between health districts or between districts and national level (George, 2003). We define health districts as the first administrative level above service provision, and they are typically semi-autonomous in relation to budgeting and organizing the majority of health services through primary health clinics and district hospitals (Görge, 2004). As such, they are routinely performing evaluations on their performance. In most developing countries however, the information they need for this is not readily available, is of poor quality, and they lack the tools to adequately compare their relative performance (AbouZahr and Boerma, 2005 and Braa and Sahay, 2012). It is in this context that we will have a particular look at the league table as a tool for improving transparency and accountability.

A league table is a tool for displaying the comparative ranking of organizations in terms of their performance (Adab et al., 2002), and is widely used in the public sector (Foley and Goldstein, 2012). League tables are especially suited for identifying good and poor performance, as well as the degree of variance (Marshall et al., 2014). The term league table is sometimes used interchangeably with other tools, such as scorecards and report cards (McNamara, 2006), and has much in common with the more comprehensive balanced scorecard (Edward et al., 2011 and Inamdar et al., 2002). Common for all these tools are that they seek to evaluate performance based on relevant key indicators, while the league table in addition focuses explicitly on relative performance and ranking.

Without this information, across health districts for instance, "providers tend to view their

performance as average or above average” (McNamara, 2006, p. 102), curbing incentives to improve. League tables have also been used in several sectors to promote accountability of public or private providers by sharing this information to citizens. They are increasingly applied in the health sector in developing countries (see for example Misra and Ramasankar, 2007; Kossi et al., 2012; Moyo et al., 2016; and Tashobya et al., 2016), as are scorecards through large international initiatives (African Leaders Malaria Alliance, 2016).

Despite their widespread use, league tables are not without controversy. They are criticized for offering only a snapshot of the situation, thereby hiding fluctuations, promoting creative reporting, steering resources towards services included in the ranking, and lacking contextualization (Foley and Goldstein, 2012 and Adab et al., 2002). When used as a link between providers and the public, there is a risk that performance is self-reinforcing as good performers will attract richer patients or better students (Goldstein and Leckie, 2008).

The design of league tables will determine how effective they are in promoting transparency and accountability. McNamara (2006) examined a range of implementations, and presents some guiding principles of their design. The most comprehensive league table examined had 35 indicators, while most were much smaller in scope. The indicators included in any league table should be reliable at the provider-specific level, and should be feasibly tracked within local constraints. This implies that for league tables to be relevant at district level, they should include indicators which are relevant and valid also at individual clinic level. Indicators should also cut across different health programs to give a broad picture. Furthermore, one should choose indicators where there is wide variation, and that are actionable. Again, in our case, that would include indicators for which services the district administration has authority and resources to address locally. A study of district league tables in the health sector in Uganda found that it was especially de-motivating when key indicators of performance was seen to be outside the control of the district managers (Tashobya et al., 2016). Indeed, it was questioned if these tables could be seen to measure “district performance” at all when they were designed centrally using indicators totally dependent on central policies and financing (Innocent, 2005). Finally, an important point is that league tables should be replicable routinely, based on local data. A country-oriented balanced scorecard approach in Afghanistan was found to be too comprehensive for local levels to replicate, and could only be done annually by relying on survey data (Edward et al., 2011). Interestingly, and contrary to what we present in our paper, all league table implementations found in the literature were annual, and, where they were also used at local levels, designed by a central authority.

### **3. Research Objective and Methods**

Our research is part of a long-term engagement across the developing world to strengthen health information systems (Braa and Sahay, 2012). We specifically report from two of the countries, Sierra Leone and Malawi, where initial prototypes of league tables proved promising to support local information use. Our practical aim of this work has been to design and develop a tool that helps districts create and change league tables as they please, based on indicators relevant for them. The research objective of this paper is to look at the effects of these district league tables on transparency and accountability.

The research has been carried out according to tenets of action research (Baskerville, 1997). Two of the authors have extensive experience in the countries, engaged in strengthening their respective national Health Management Information Systems (HMIS). In Sierra Leone, the first author spent considerable time on numerous visits from 2008-2011. The visits lasted from one week to two months, focusing primarily on four districts and the national level of the Ministry of Health and Sanitation. In Malawi, the second author holds a senior position at the Ministry of Health, being engaged in HMIS strengthening for more than fifteen years. He facilitated the planning, participated in data collection, and in following up the participating districts on their use of league tables. The first author also visited Malawi twice in relation to developing league table prototypes, and supervising master students who were developing an app to design and manage league tables. The third author has been involved in data analysis and writing.

The league tables discussed in this paper were developed and introduced with the aim to assist public health management, which is primarily done at district level in both countries. Our focus on the health district as an organizational entity within the public health sector is motivated by its role as the first administrative level for the vast majority of public health services. The districts are responsible for planning, monitoring, evaluating, and giving feedback to health posts, clinics, health centres and district hospitals.

In Sierra Leone, league tables were made ad-hoc, manually pulling data from the national HMIS into spreadsheets. This was made at the national level, and distributed to districts through quarterly health information bulletins. The experiences from Sierra Leone formed the basis for later research in Malawi. The two cases are thus connected through the action research carried out by the authors. We consider the overall structure, routines, aims, and skills level within the public health system in the two countries adequately similar for comparing design, appropriateness, and effects of league tables.

In Malawi, a first round of prototyping in 2014 attempted to create league table templates within the software used for the HMIS. Despite promising reception at district levels, the software presented some limitations on the ability to customize the league tables, so an app was developed to give more flexibility in this regard, as well as to give better visual representation of the data. During two months of 2015, the prototype was tested and further developed in Malawi. Four districts were included in the research, where we showed a league table of all districts, as well as helping to design district-specific tables ranking health facilities. Discussions were held on selection of indicators and status of data quality and accessibility.

The selection of the districts in Malawi for testing the prototype league table was based on availability of data in the HMIS central server, accessibility and proximity of the districts from where the research team was based, and availability of Non-Governmental Organizations (NGOs) supporting data management in the districts. The league table was demonstrated to the following groups of users: district programme coordinators; district HMIS officers; zonal health officers; national programme managers and NGOs and development partners.

Both the early ad-hoc tables in Sierra Leone and the later league table app in Malawi would use data already present in the HMIS. No additional health data collection was

thus necessary for this study. The league tables only use aggregate data, and no data on individuals were encountered or used. As per the researcher-client agreements of the action research projects, access to all aggregate data was in agreement with the relevant authorities.

Data analysis was carried out by all authors based on field notes, documents like the Sierra Leone quarterly health bulletin, and email correspondence with health staff and students involved in the development, testing, and implementation of the league tables.

For this particular paper, emphasis was given to identify users' reception of the league tables, discussions relating to data quality and significance of the indicators, and feedback relating to design and the functionality of the league table app. In particular, we have looked for effects of transparency and accountability by examining users' reaction to be compared and ranked through league tables.

A limitation of our study is that the two cases are relatively small and cover too short time to analyse the long term effects. We nonetheless believe there are some general lessons to be learned from them, both relating to appropriate design of both league tables and an app to make them, and the short-term effects of introducing them in settings with poor data quality and visibility.

#### **4. Findings from Sierra Leone**

In the period 2008-2011, Sierra Leone embarked on strengthening their national HMIS. The process included redesigning their reporting forms, introducing electronic data collection and processing, and formalizing the information system organizationally with trained Monitoring and Evaluation (M&E) officers in each district. The M&E officers are in charge of collecting paper reports from the various health facilities, enter this data in the electronic tool, and conduct analysis on relevant health indicators for periodic district reviews. At the same time, the Ministry of Health and Sanitation published a quarterly health bulletin where the first league tables were introduced. Ranking the districts the league tables were produced ad-hoc, by extracting the data from the database to populate a table in a spreadsheet. The indicators covered key data from mother and child health as well as indicators of data quality. The details of the case is documented earlier (Kossi et al., 2012), but four points are worth summarizing.

First, the initial league tables ranking districts were based on data of poor quality, especially due to low reporting rates. The "reporting rate" was indeed one of the indicators included in the table, and it communicated to all districts that improving this was a priority for the new system. Reporting rates are relatively easy to improve, but in a situation where information is not used and little feedback is given back to the districts, the rates had deteriorated. For the next bulletin, the reporting rates had increased.

Second, the league table's internal ranking of the district highlighted their relative performance. For example, one district scored very low on institutional delivery rate, possibly due to its urban nature which meant that comparatively wealthier people used the many private clinics available, and the comparatively poorer people in the shantytowns were struggling to pay the fees at the public clinics. The district then announced that certain services were free at public health centres, and started collecting the data from the private clinics, and subsequently improved their score for this indicator.

Third, a district replicated the league table for their sub-districts, and presented it to the community leaders at monthly meetings. Issuing diploma to the top performing communities, they inspired local community leaders to implement bye-laws regarding traditional birth attendants, and to push higher levels for increased funding for health services.

Forth, the league tables had to be created ad-hoc, by pulling relevant data from the system to spreadsheets. This was cumbersome, necessitated some skills, and meant that only one district was identified as having made such tables themselves. The technology did not at the moment support easy re-creation or alteration of tables, which could have led to more widespread use. To develop such technology became an important part of further work with league tables, in Malawi.

## 5. Findings from Malawi

In Malawi, the routine health management information system (HMIS) is paper based at health facility level and computerized at district and national levels, like the situation in Sierra Leone. The HMIS is used for collecting data routinely, reporting on activities in the health facilities.

Several prototypes of digital league tables were developed based on the HMIS software. The motivation behind this approach was to utilize the already existing system, thus minimizing the need for development and organizational change. All relevant data is already collected through the HMIS, and the health workers have experience in using it. A first attempt was made at making templates based on existing functionality, but these templates were considered as not flexible enough for district users to easily change the indicators. An independent app was thus developed by two students, which would access all data from the HMIS, be available from the HMIS menu bar, and resemble as much as possible the HMIS user interface. This gave us freedom to experiment with features specific for league tables, such as color-coding performance and change the way indicators were contributing to the ranking. Examples of the latter include weighing indicator values differently and being able to include indicators of different arithmetic logics. The league table app, as the HMIS, was web based and designed specifically for creating and editing simple league tables. The figure below shows a sample league table to the left and the editor page to the right.



*The league table application: To the left an example league table with two indicators, ranking a set of districts. To the right side parts of the editor for the same league table. A simple user interface is important to promote custom league tables*

The league table app, and various template league tables, were tested within a set of already existing district management structures, infrastructure and practices. The District Health Management Team (DHMT) is the main structure for managing health services at the district level, consisting of more than twenty managers in each district.

The effects of introducing league tables in terms of improving information transparency in the health sector in Malawi are many. Since the league tables have not been in use over a long time period, our focus in this case is not primarily on the effects of the use of the league tables, but the implementation effects when introducing and implementing it.

First, an immediate effect of the league table experiments showed to be improved visibility of data quality issues, such as missing or incorrect data. Two main problems were either lack of reporting, meaning there would be blank spaces in the league tables, or incorrect or missing population data, which are fundamental in the calculation of many of the indicators. Both influenced the score and ranking in the league tables. As in Sierra Leone, the implication of poor data quality became more visible, and district staff members would investigate the causes of this. With access to peer data, staff would also question the data quality of other districts. For instance, they would question why other districts have over 100% of some population-based indicators, which is typically caused by too low (old) population figures.

Second, the initial selection of indicators was done by the research team, based on standard key indicators of important mother and child health services. But in each district, district teams were encouraged to select the indicators for their own tables. This encouraged participation in the development and use of the league table, promoted understanding, built consensus and ownership among the district managers. Going through the process of testing the league table has helped the districts and the staff to appreciate the importance of understanding the meaning and interpretation of the health indicators. For example, some indicators are only really relevant when based on a large population, and do not lend themselves to month to month analysis at local levels.

Third, the initial selection of indicators also communicated what the central level emphasizes. The key indicators for mother and child health thus signalled what the districts are held accountable for at the national level. Thus the initial league tables (ranking all districts) also functioned as a communication channel between the central Ministry HQ and the districts.

## **6. Discussion**

In this section, we discuss the two cases of league table implementations related to transparency and accountability.

The league tables created were based on data already collected and available, but in practice the data from different organizational units and health programmes was seldom seen together. The league tables' role in transparency is to bring data together and visualize their comparison. In Sierra Leone, which did not use an online HMIS, data from other districts was not available and the league tables as such also filled the role of distributing this data to a wider audience. But even in Malawi, where such data was available through the online HMIS, the district management did not access this to compare their performance with others. One obvious strength of league tables is that they create and make transparent this new information, namely relative performance. When



data from the various ranked entities is available, the league tables add to this by aggregating a score from the included indicators, showing how the different entities perform against each other. This has a clear value, as without this information there is a tendency to assess one's own performance better than the average (McNamara, 2006). The main contribution of the league tables towards transparency is this visualization of relative performance.

Another immediate effect in both cases was transparency of data quality. This was partly because the indicator "reporting completeness" was included, and partly because poor data negatively influenced the other indicator scores. The direct influence of data quality on score and ranking, as well as increased transparency of the differences in data quality across the ranked entities, made data quality issues much more visible.

In relation to accountability, the league tables fill two important roles. First, the ranking is a direct measure of performance, and is thus a feedback tool indicating who is performing well, and who must improve. In our cases, no sanctions were applied on poor performers, except the potential (but not intentional) "shaming" of being one of the poor performers. This is not to be underestimated, but the "shamed" must be in a position to themselves improve on the relevant indicators to avoid demotivation (Tashobya et al., 2016). In Sierra Leone the indignation of being amongst the poorest performers repeatedly led to action to improve on data quality, collect data from the private sector, and improve services. There could potentially be a tension here, between a negative sense of being controlled or shamed, and the more positive intention of using this accountability as feedback and an occasion for learning (Brinkerhoff, 2004). In our cases, this performance accountability was received positively, leading to discussions on how to improve data quality. The other important role of the league table is to communicate what the involved entities are held accountable by. While one of the critiques against league tables is that they are based on a few indicators which again can lead to an undesirable prioritization of resources, such prioritization might be exactly what the ministry of health or district intends. By basing the league tables on a handful of indicators, those who make it signal that these indicators are important, and that the ranked entities are held accountable by how they perform in these areas.

Our study also shows that league tables work well both within the health sector, and between the health sector and the civil society. An example of the latter is the distribution of league tables to community leaders in Sierra Leone, who went on to implement by-laws and calling for more funds upon seeing the community's low institutional delivery rate. This resonates well with the current body of literature, which focus on transparency and accountability between the public sector and the civil society. However, we also want to stress the benefits of using league tables as an intra-organizational management tool, without necessarily sharing the tables with the wider public. The benefits related to transparency and accountability are applicable also in the routine management of health services, as both cases show. As a feedback tool, the league table can foster accountability by communicating within the health sector which indicators the relevant actors are held accountable by, although the benefit of this is dependent on an able bureaucracy (Brinkerhoff, 2004).

In both Sierra Leone and Malawi, the league tables were positively received at local levels. In Sierra Leone, the national league table was replicated at district level, despite

the absence of any assisting tool. In Malawi, the league tables were welcomed as a potential useful tool in the district management meetings. One major challenge is that indicators that are valid at the national level are not necessarily so at local levels. One example is “Maternal mortality rate”, which is the annual number of female deaths related to pregnancy per 100.000 live births. With small populations the indicator score will be erratic. Furthermore, smaller clinics may not offer all services. League tables at local levels would need to rely on other indicators that at national level, and regional differences may even lead to different districts making different tables. The development of the league table app in Malawi is an example of coupling this needed flexibility with standardized functionality to assist in locally customized league tables. However, this functionality needs to be balanced with making the tool simple enough to make league table development a replicable exercise for changing needs (Edward et al., 2011).

The development and implementation of the league table app presents some lessons for designing relevant league tables. First, league tables must be flexible and allow users to customize and adjust to meet local needs and specificities, such as functionality for adding, deleting, weighing, and inverting indicators. Second, customization and adjustments must be easy and not require skills beyond what is available at the district level. Third, to get institutionalized, the league table should be built as an extension to, or integrated with, the existing HMIS software and thus allow seamless reuse of data and indicators. The reuse of data will avoid double reporting, and contribute to speed up the implementation process. Building the league table as an extension of the HMIS software also support the ease of use since district managers are already familiar with the technology.

## **7. Conclusions**

To conclude, we summarize the effects of district league tables on transparency and accountability. For Ministries of Health and district managers, we see league tables as a rather simple tool that can be used to make some small, but quick, steps towards improving data quality and service delivery. First, league tables will through its transparency trigger entities to reflect about indicators and own performance, and compare themselves with other entities on the same level. Where data is missing and performance is poor, league tables can become an incentive for change and improvements.

Often poor data is “hidden” when aggregated to national level, but becomes much more visible at lower levels. Second, the design in terms of selection of indicators will be perceived by lower levels as a call for focus. This signal may also be perceived as communicating expectations and what one is accountable for.

Some implications of our work are also worth noting. For a district to see how they perform in comparison with other districts, they need access to peer data. This is not given, even with the introduction of online information systems where this technically is feasible. Structures of data approval and access still limit the access to peer data in many countries. Lastly, for districts themselves to be able to make league tables, any supporting technology should balance the more advanced functionalities with simplicity. The true benefits of league tables at local levels can only be reaped when they are easily changed and replicated, becoming an integral part of routine district monitoring and evaluation.

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## Appendix 2: Approval from the National Health Sciences Research Committee

Telephone: + 265 789 400  
Facsimile: + 265 789 431

All Communications should be addressed to:

The Secretary for Health and Population



In reply please quote No.

MINISTRY OF HEALTH AND POPULATION

P.O. BOX 30377  
LILONGWE 3  
MALAWI

21<sup>st</sup> October, 2014

Christon Moyo  
MOH  
Lilongwe.

Dear Sir,

**RE: PROTOCOL # 1342: 'INFORMATION USE FOR LOCAL ACTION: FEEDBACK PRACTICES FOR HEALTH INFORMATION SYSTEMS STRENGTHENING'**

Thank you for the above titled proposal that you submitted to the National Health Sciences Research Committee (NHSRC) for review. Please be advised that the NHSRC has reviewed and approved your application to conduct the above titled study.

- **APPROVAL NUMBER** : 1342
- The above details should be used on all correspondences, consent forms and documents as appropriate.
- **APPROVAL DATE** : 21/10/2014
- **EXPIRATION DATE**  
This approval expires on 20/10/2015. After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the NHSRC Secretariat should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING:** All serious problems having to do with subject safety must be reported to the NHSRC within 10 working days using standard forms obtainable from the NHSRC Secretariat.
- **MODIFICATIONS:** Prior NHSRC approval using forms obtainable from the NHSRC Secretariat is required before implementing any changes in the protocol (including changes in the consent documents). You may not use any other consent documents besides those approved by the NHSRC.
- **TERMINATION OF STUDY:** On termination of a study, a report has to be submitted to the NHSRC using standard forms obtainable from the NHSRC Secretariat.
- **QUESTIONS:** Please contact the NHSRC on phone number +265 888 344 443 or by email on [mohdocentre@gmail.com](mailto:mohdocentre@gmail.com).
- **OTHER:** Please be reminded to send in copies of your final research results for our records (Health Research Database).

Kind regards from the NHSRC Secretariat

  
2014 -10- 21  
For: **CHAIRPERSON, NATIONAL HEALTH SCIENCES RESEARCH COMMITTEE**  
Promoting Ethical Conduct of Research

Executive Committee: Dr C. Mwansambo (Chairperson), Prof. E. Molyneux (Vice-Chairperson)  
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