FACTORS INFLUENCING PERFORMANCE OF ROUTINE HEALTH INFORMATION SYSTEM: THE CASE OF GARISSA SUBCOUNTY, KENYA

NICHOLAS KIRIMI SILAS

A Research Project Report Submitted in Partial Fulfilment for the Requirements of the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi.

2017

DECLARATION

This research project report is my original work and has not been presented for a degree or award in any other university.

Signature...................................Date....7|12|2017...........

NICHOLAS KIRIMI SILAS

L50/82504/2015

This research project report has been submitted for examination with my approval as the university supervisor.

Signature............................Date....07-12-2017..............

Dr. LUKETERO STEPHEN WANYONYI

SENIOR LECTURER,

SCHOOL OF MATHEMATICS

UNIVERSITY OF NAIROBI

DEDICATION

This research project is dedicated to my adoring parents Mr and Mrs Silas Mbabu for their invaluable financial assistance and encouragement in my efforts to achieve academic goals.

ACKNOWLEDGEMENT

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

D&M	Delone and McLean
DHIS2	District Health Information System 2
HIS	Health Information System
HMIS	Health Management Information System
HMN	Health Metrics Network
HMT	Health Management Team
HRIO	Health Records Information Officer
IS	Information System
PHD	A Doctor of Philosophy
PRISM	Performance of Routine Information System Management
RHIS	Routine Health Information System
SNNPR	Southern Nations, Nationalities and People's Region
SPSS	Statistical Package for Social Sciences Software

ABSTRACT

Health information plays a critical role in supporting evidence based decision making for all health system pillars. Kenya Ministry of Health uses an online health information system. However, its capacity to provide reliable information is limited by low data quality, inadequate financial and human resource dedicated to health information system. Data quality assessment conducted by Garissa County department of health in 2015 showed Garissa sub county routine health data quality index performance was 53 percent compared to the overall Garissa County performance of 59.7 percent. Therefore, the purpose of this study was to determine the factors influencing performance of routine health information system in Garissa Sub County. The objectives of the study were: to evaluate how technical factors influence performance of routine health information system in Garissa Sub County, to examine how organisational factors influence performance of routine health information system in Garissa Sub County and to determine how behavioural factors influence performance of routine health information system in Garissa Sub county.The study used descriptive research design and census approach to select the target population. Data was collected using self-administered questionnaire from 72 health workers who included all health facility in charges from the 17 government owned health facilities in Garissa subcounty, all the health records information officers in Garissa referral hospital and County department of health monitoring and evaluation office, all heads of departments in iftin sub county hospital and Garissa County referral hospital, all members of Garissa Sub county and Garissa County health management teams. The data was analyzed using frequencies, percentages and spearman's rank correlation coefficient with the aid of Statistical Package for Social Sciences software.The results were presented in tables.The correlation coefficient analysis revealed there was a significant positive relationship between availability of reporting tools (r_s=0.465, p=0.000) use of standard indicators (r_s=0.510, p=0.000), user friendliness of RHIS (r_s=0.546, p=0.000), availability of adequate staffing for RHIS tasks (r_s=0.239*, p=0.043), training of staffs (r_s=0.295*, p=0.043), availability of RHIS governance structures (r_s=0.354**,p=0.002), supervision of RHIS activities(r_s=0.407**,p=0.000), availability of plans for RHIS (r_s=0.465**,p=0.000), promotion of culture of information(r_s=0.501**,p=0.000), data quality checking skills(r_s=0.324**,p=0.006),staff motivation(r_s=0.299*,p=0.011), and performance of routine health information.There was no significant relationship between complexity of the reporting tools (r_s=0.159,p=0.091),funding for RHIS activities(r_s=0.150,p=0.208), competence in RHIS tasks(r_s=0.205,p=0.084), confidence level for RHIS tasks (r_s=0.194,p=0.102) and performance of routine health information. The study therefore, recommends that there is need to have adequate staffing who are trained in RHIS tasks and have clear governance structures for RHIS that are communicated to all the health workers. In addition, there is need to conduct periodic support supervision for RHIS activities, use innovative ways to motivate staffs to perform RHIS related tasks and use evidence from routine health data to make decisions.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Health information provide essential evidence to inform decision making for all the health pillars It is collected systematically through a health information system, which is defined as inclusive and unified structure that collects, organises, analyses Stores and communicates heath and health related data and information for use (World Health Organisation, 2010).An effective health information system has six components which include; information system resources, source of data, performance indicators, database, information products and information use. For effective functioning, the six components are interrelated, dependent on each other and have a unified goal. Health information system is different from monitoring and evaluation in that, it provides a supportive function for management of patients, timely notifications for early warning, enabling planning and research. In particular, its unique characteristic is communication and dissemination of information (Health Metrics Network, World Health Organization, 2008).

Kenya is implementing vision 2030 blueprint which is based on social, economic and political pillars. Health is one of the Kenya's vision 2030 social pillar due to its critical role in improving economic growth, poverty reduction and the realisation of social goals (Kenya Ministry of Planning and National Development, Kenya National Economic and Social Council, 2007).Kenya vision 2030 first medium term implementation plan recognized health information management system was weak and does not provide timely and comprehensive data (Kenya Ministry of State for Planning National Development and Vision 2030, 2008).As a result, Ministry of Health introduced an online health information system that was based on District Health Information System(DHIS)2 software. This replaced the previously used file transfer based HIS system which had several disadvantages such as; delayed transmission of data from districts to national level, absence of inbuilt error checking and validation capabilities, inability to harmonise all the HIS systems and loss of stakeholders trust on the national health information system (Karuri J. , Waiganjo, Orwa, & Manya, 2014).

DHIS2 is software utilized for accumulation, approval, examination and creation of joined and patient particular factual information. It is custom made for integrated health

information management and supports several features of information cycle such as data collection, reporting, quality checks, data access at multiple levels and analysis. The DHIS2 software is used in over 40 countries in Asia, Africa and Latin America. Kenya is among countries that have adopted DHIS2 as their nation-wide HIS software. Other countries that have adopted the same include: Tanzania, Rwanda, Uganda, Bangladesh Ghana and Liberia. (DHIS2 Documentation Team, 2016).

To bridge the health facilities infrastructural limitations such as poor access to computers, slow and or no internet connection and unavailability of electricity, DHIS2 implementation in Kenya allows health facilities to produce paper based monthly reports that are input in the system by the heath information team at a different level. In addition, DHIS2 based health information system provides guest accounts to users not authorized to write data on the database for purposes of retrieving and analyzing data. This allows access and use of the information for purposes aimed at strengthening the health system and the overall improvement of health outcomes (Karuri, Waiganjo, & Orwa, 2014). Similarly in Garissa Sub County, the health facilities in charges submit the monthly reports to the Health Information and Records Officer who input the data on the system. As a result, health workers focus on collecting and transmitting with minimal analysis and interpretation to inform decisions and actions during collection of data. Conversely, limited data collected from health facilities is utilized by health system managers (Cheburet & Otieno, 2016) which affect routine health information system performance.

1.2   Statement of the problem

The ministry of health routine health information system is weak and as a result, provides data which is untimely, incomplete and inaccurate. This is due to inadequate competence of health workers to use the routine health information system, minimal data quality assurance activities, inadequate budget allocation to train health workers and purchase the requisite technology. A data quality audit conducted by Garissa County department of health in 2015found that Garissa sub county routine health data quality index performance was 53 percent compared to the overall Garissa County performance of 59.7 percent. The data quality index used in the assessment was based on recording, reporting, archiving, demographic, core output and use of routine data at the health facility. However, this assessment did not determine performance of the routine health information system beyond the health facility where the report is

2

generated. Furthermore, the assessment did not establish the determinants of the data quality.

Limited studies have assessed performance and factors influencing routine health information system in Garissa County. As a result, the efforts to address factors influencing the performance of routine health information system have not been evidence based. This study will contribute in addressing the knowledge gap on performance of routine health information system as well as determine technical, organisational and behavioural barriers to data quality and information use.

1.3   Purpose of the study

The aim for this study was to assess factors influencing the performance of routine health information system in Garissa Sub County.

1.4   Objectives of the study

The following objectives guided this study:

1. To evaluate how technical factors influence performance of routine health information system in Garissa Sub County.
2. To examine how organisational factors influence performance of routine health information system in Garissa Sub County.
3. To determine how behavioural factors influence performance of routine health information system in Garissa Sub County.

1.5   Research questions

1. How do technical factors influence performance of routine health information system in Garissa Sub County?
2. What is the influence of organizational factors on performance of routine health information system in Garissa Sub County?
3. Do behavioral factors influence performance of routine health information system in Garissa Sub County?

1.6   Significance of the study

The findings of the study could be used by health managers and other health stakeholders to reflect on the performance of routine health information system and identify factors affecting performance of routine health information system to inform remedial actions. The study findings could be used to inform planning and allocation

of resources to priority actions, aimed at improving performance of routine health information system. In addition, the county government health managers and stakeholders could use the findings to mobilize resources from county government and or development partners to fund routine health information system. Furthermore, the study findings could be used to demonstrate the results for investments done to improve performance of routine health information system.

1.7 Basic assumptions of the study

The study assumption was that respondents would voluntarily participate in the study and provide honest responses.

1.8 Limitations of the study

The study limitations included constrained access to some of the sampled health facilities. This was due to poor road infrastructure, and unavailability of some health facility in charges and department heads due to the nurses' strike that was ongoing during the data collection period .To address these limitations, the researcher provided transport to the sampled health facilities for data collection and arranged meetings with the health facility in charges and department heads that were taking part in the study

1.9 Delimitation of the study

The study was delimited to in-charges of government health facilities in Garissa Sub County, health records information officers in Garissa county referral hospital and Garissa County department of health monitoring and evaluation office, heads of department in Iftin Sub county hospital and Garissa County referral hospital, Garissa Sub county health management team and Garissa County health management team. The privately owned health facilities were excluded because they have a different administrative management structure from that of county government.

1.10 Definitions of significant terms used in the study

Behavioral factors: This refers to the routine health information system user's competency, attitudes and motivation to collect and use information generated by the system.

Data quality: This refer to accuracy, completeness and timeliness of data reported by the health facilities and the Ministry of Health's routine health information system.

Organisational factors: This refers the resources, structures, roles and responsibilities of the health system that influence performance of routine health information system

Performance of routine health information system. This refer to the ability of routine health information to provide high data quality and information products that are used to inform decisions aimed at improving health system performance.

Routine health information system. This refer to the web based ministry of health information system used for reporting, analysis and dissemination of aggregated and event data.

Technical factors: This refers to the data collection processes, systems and forms for the routine health information system.

1.11 Organizational of the study

The research project report consist of five chapters. The first chapter focuses on the study background, description of the research problem, purpose of the study, objectives of the study, research questions, significance of the study, basic assumptions of the study limitations of the study, delimitation of the study and definition of significant terms used in the study. Chapter two reviews the existing literature on the technical, organizational and behavioral factors influencing the performance of routine health information system. In addition, it explains the theoretical framework, conceptual framework of the study and the associations among the variables. It also highlights the gaps in the literature review and a summary of literature review .Chapter three focus on the research methodology used in the study, clearly showing the research design, target population, sample size and sampling procedures, data collection instruments including pilot testing process for the instruments, validity and reliability of the instruments. Moreover, it includes procedures used to collect data, data analysis technique used, ethical considerations for the study and operational definitions of the variables of the study. Chapter four summarises data analysis and presents interpretation of the findings per study objective. Chapter five provides a summary of findings, discussions of the findings, study conclusion, recommendations for policy action, contribution to body of knowledge and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines frameworks used to evaluate health information systems (HIS), existing literature on factors influencing performance of health information systems and shows literature gaps. Furthermore, theoretical and conceptual frameworks of the study and an explanation of the variables are included in this chapter.

2.2 Performance of Routine Health Information System

According to world health organisation (2010), routine health information system is an inclusive and unified structure that collects, organises, analyses, stores and communicates heath and health related data and information for use. It consists of inputs, processes and system outputs. These components are influenced by organizational, technical and behaviour factors. Consequently, influencing the overall performance of the routine health information system (Aqil, Lippeveld, & Hozumi, 2009).The performance of routine health information system is defined by data quality and information use. Data quality is multi-dimensional and it's defined by data quality attributes used. According to Lippeveld, Sauerborn, & Bodart (2000), data quality is defined by its timeliness completeness, relevance and accuracy. Public Health Information System's review of the quality of data assessment methods by Chen, Hailey, Wang, & Yu (2014) found that completeness, accuracy and timeliness are the commonly used data quality attributes.

A study conducted by Aqil, et al (2010), showed data accuracy at the facility level was above 95 percent and 62.7 percent of the health facilities met the set reporting deadlines. Furthermore, 61 percent of the facilities were holding meetings and among them 41 percent made decisions using the health information system data. In addition, a study conducted in India reported completeness of information recorded in HMIS was 88.5 percent. However, this study was different to the former in that it assessed completion of data in the health management information as opposed to recording of data at health facility (Sharma, Rana, Prinja, & Kumar, 2016).A study conducted by Simba & Mwangu (2006) to assess factors influencing quality of HMIS in Tanzania found completion rates of data was 64.2 percent. In addition, data completeness was higher in government owned health facilities compared to privately owned health facilities.

On the contrary, a study conducted to evaluate quality and utilization of routine health facility data in Rwanda showed high data completion rates of 96.6 percent and reporting timeliness of 93.8 percent (Karengera, Onzima, Katongole, & Govule, 2016).Similarly,high data completeness of 82.9 percent and data accuracy of 75.9 percent were reported in a study conducted in southern Ethiopia (Ermias , Kidist , Taye, & Desalegn , 2016).A study carried out in Eastern Ethiopia found the overall health information system data quality was 75.3 percent (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016). In Kenya, a study conducted in Uasin Gishu County Referral Hospital found that routine health data completion and timeliness was 44 percent and 46 percent respectively (Cheburet & Odhiambo-Otieno, 2016).Nevertheless, a study by Manya & Nielsen (2016) in four counties in Kenya showed monthly reports completion rates was 86.9 percent while timeliness of the reports was 78.7 percent.

2.3 Technical factors and performance of Routine Health Information System

Technical factors refer to the technology and expertise used in creation, administration and improvement of health information processes and performance of health information. These factors include complexity of reporting tools, procedural manuals, design of health information and complexity of information technology (Aqil, Lippeveld, & Hozumi, 2009).According to a study conducted in India, data quality and utilization of health information is influenced by shortfalls in staffing, computers and data entry skills coupled with non-friendly software design features (Mishra, Vasisht, Kauser, Thiagarajan, & Mairembam, 2012).Similarly, a study conducted in eastern Ethiopia found that departments with standard set of indicators, skilled human resource, well-designed reporting formats, and staff trained to fill formats increased the likelihood of achieving data quality compared to those without. However only staff training to fill format was found to be statistically significant (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016).

A study to evaluate HMIS in Kerala India showed all respondents felt the information technology used was easy to manage, reporting forms were easy to use and software used was user friendly. However, 33 percent of the respondent felt the HIS user manual was not friendly (Harikumar, 2012) .Similarly, a study conducted in Ayder referral hospital in Ethiopia to evaluate performance of health information system showed there was poor utilization of health information in the hospital. This was associated with limited knowledge on utilization of HMIS data and minimal supervision of the regional

health bureau. (Tadesse, Gebeye, & Tadesse, 2014).Additionally, a study by Simba & Mwangu (2006) in Tanzania found out that there was an association between knowledge on HMIS basic concept and improved quality of data. However, there was no association between training in HMIS and improved quality of data .A study conducted in Tharaka Nithi county in Kenya revealed that poor staff competence on collecting, analysing and processing data, unavailability of computers to handle data and multiple data collection tools were the technical factors that influenced information use (Mucee, Otieno, Kaburi, & Kinyamu, 2016).In addition, complexity of the health information system which was not user friendly was found to affect data quality in a study conducted in Tanzania (Nyamtema, 2010).

2.4 Organizational factors and performance of Routine Health Information System

Organisational factors that influence performance of routine health information system include; culture of using information ,availabiliy of resources planning, governance, training, supportive supervision and availability of finances. (Aqil, Lippeveld, & Hozumi, 2009)A study conducted in eastern Ethiopia showed decisions based on supervisor directives, organizational culture, decisions based on evidence and regular reporting on data accuracy were the probable factors to influence data quality. However, only decision making guided by supervisors and managers follow up on feedback significantly influenced quality of data (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016). An assessment conducted in Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia found that 67 percent of the HMIS governance criteria were met. However, HMIS quality standards guidelines were absent in 53 percent of the health facilities. Furthermore, 45 percent of the planning and training criteria were met. The respondents based at the health facilities strongly believed that health department managers were emphasizing on information quality and utilization of data (Belay, Azim, & Kassahun, 2013).

An evaluation of PRISM framework in Uganda by Hotchkiss et al. (2010) suggested that health manager's efforts encourage a culture of information indirectly influence HIS performance by influencing HIS task self-efficacy, competency and motivation. In addition, presence of HIS staff directly influence use of HIS information. A study conducted in Kenya found a strong association between support supervision and frequency of support supervision and data quality. (Cheburet & Odhiambo-Otieno,

2016).Nevertheless, a study conducted in Tanzania found that supervision and queries on data accuracies and delays in reporting had no influence on data quality (Simba & Mwangu, 2006). Another study by Samis, Odhiambo-Otieno, & Adoyo (2016) at Kapsabet County referral hospital in Kenya found that organizational factors such as finance, governance, supervision and training have influence on the implementation of health information system.

2.5 Behavioural factors and performance of Routine Health Information System

According to Aqil et al. (2009) ,understanding the importance routine health information tasks results to high self-efficacy and competency in performing HIS tasks .The confidence level in performing RHIS tasks, motivation and competency level for performing RHIS tasks such as skills for checking data quality and solving problems related to data are the behavioral factors that influence performance of health information system. An assessment of health Management Information System in Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia showed that respondent's confidence level for calculating, plotting, and use of data were higher compared to confidence levels for checking data quality and interpretation. In addition, 59 percent of the respondents reported they use the information for decision making. (Belay, Azim, & Kassahun, 2013) This indicates that data is collected for reporting purposes and there is minimal utilization of the information to inform decisions aimed at improve quality of health service delivery.

A study conducted in Benin showed health workers competency and motivation were associated with quality of data (Ahanhanzo, et al., 2014).Similarly, Hotchkiss et al.(2010) conducted a study in Uganda which revealed that HIS task competency,HIS task self-efficay and motivation influence information use,a key aspect of HIS performance.Moreover, a study conducted in South Africa found out that personnel inability to interpret and use data coupled with average confidence level at performing HIS tasks may undermine quality and utilization of health information system (Nicol, Bradshaw, Phillips, & Dudley, 2013).Similarly, a study in Tharaka Nithi County, Kenya found that staff competency, motivation and recognition of well-done job influence health information system performance (Mucee, Otieno, Kaburi, & Kinyamu, 2016).

2.6   Frameworks for evaluation of Health Information Systems

The most common health information system frameworks are; Health Metric Network (HMN) and Performance of Routine Information System Management (PRISM).

2.6.1   The health Metric Network framework

The Health Metrics Network (HMN) framework for evaluation of HIS performance was developed by Health Metric Network. It aims at adequate allocation of resources and technical support on standardizing health information systems as well as serving as benchmark for HMIS assessments. As shown in Figure 2.1, the Health Metric Network framework has two parts. The first part is the health information system's six components and the required standards for each of them. The components can be grouped as RHIS inputs, RHIS processes and RHIS outputs. The RHIS inputs allude to the information system assets such as computers; RHIS processes include performance indicators and sources of data; RHIS outputs comprise of data management systems such as databases, information products, data communication and use. The second part focuses on requisite elements for strengthening health information system which are principles, processes and tools for health information development and assessments (Health Metrics Network & World Health Organization, 2008).
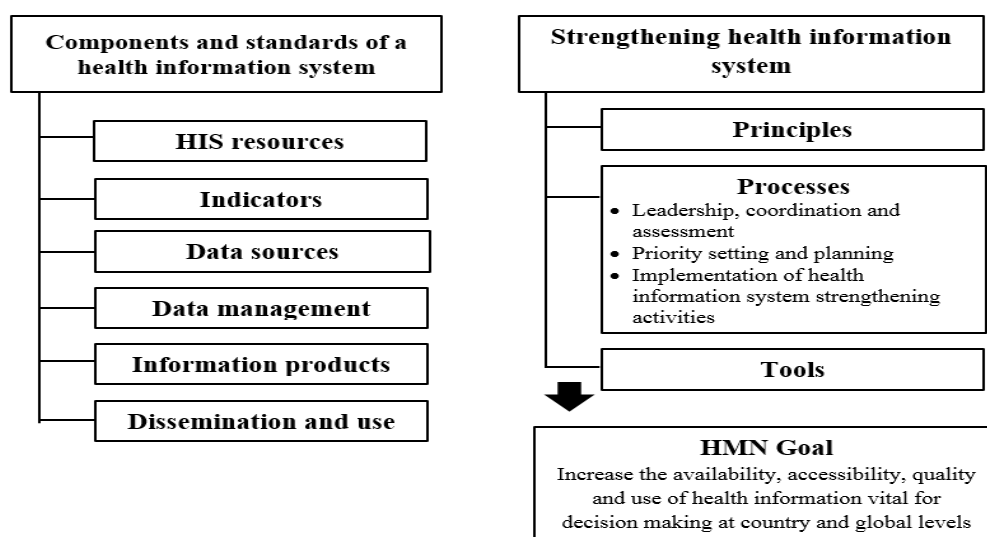
Figure 2.1: The HMN framework *(Health Metrics Network & World Health Organization, 2008)*

2.6.2 The Performance of Routine Information System Management (PRISM) framework

Performance of Routine Information System Management (PRISM) framework is another framework used in evaluation performance of HIS. It defines performance of Routine Health Information System (RHIS) and technical, organizational and management determining factors of RHIS performance (Aqil, Lippeveld, & Hozumi, 2009).The technical factors include; reporting forms, technology used by RHIS and processes. Organization determinants involve management functions, management information needs, information culture and availability of resources. Behavioural determinants include the competencies, skills, confidence and inspiration of the people who gather and utilize the information.

As shown in Figure 2.2, performance of routine health information system is influenced by health information system processes and behavioural determinants. In addition, technical and organization factors influence health information system processes and performance through the behavioural factors (Aqil, Lippeveld, & Hozumi, 2009). Hotchkiss, Diana, & Foreit (2012) reviewed seven conceptual frameworks linking health information system to health system performance. They resolved its only PRISM framework that distinguishes health information system inputs, processes, outputs, outcomes and impact.
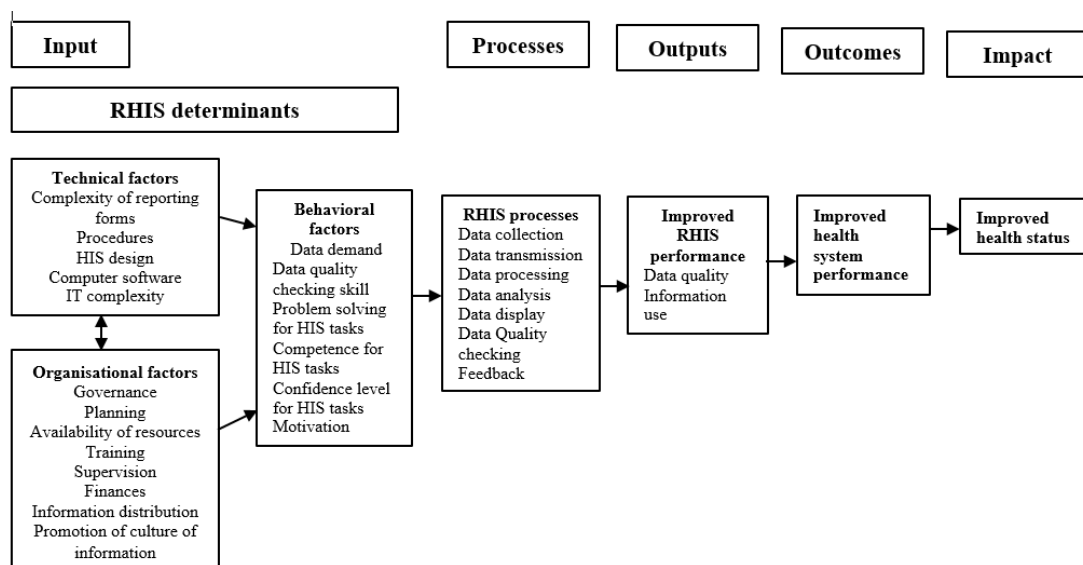
Figure 2.2: Performance of Routine Information System Management (PRISM) framework *(Aqil, Lippeveld, & Hozumi, 2009)*

2.7 Theoretical framework

This study used Delone and McLean Information System success model. It postulates that information, system and service quality as well as their common influences determine information system use and user satisfaction (Delone & Mclean, 2003).This model has been generally used by researchers to not only comprehend but also measure assess information system success (Petter, DeLone, & McLean, 2008) including electronic health records in hospitals (Bossen, Jensen, & Udsen, 2013; Tilahun & Fritz, 2015). IS success model was used in this study because it helped to describe how technical,organisational and behavioral factors individually or collectively influence data quality and information use. Figure 2.3 shows the IS success model six dimensions.
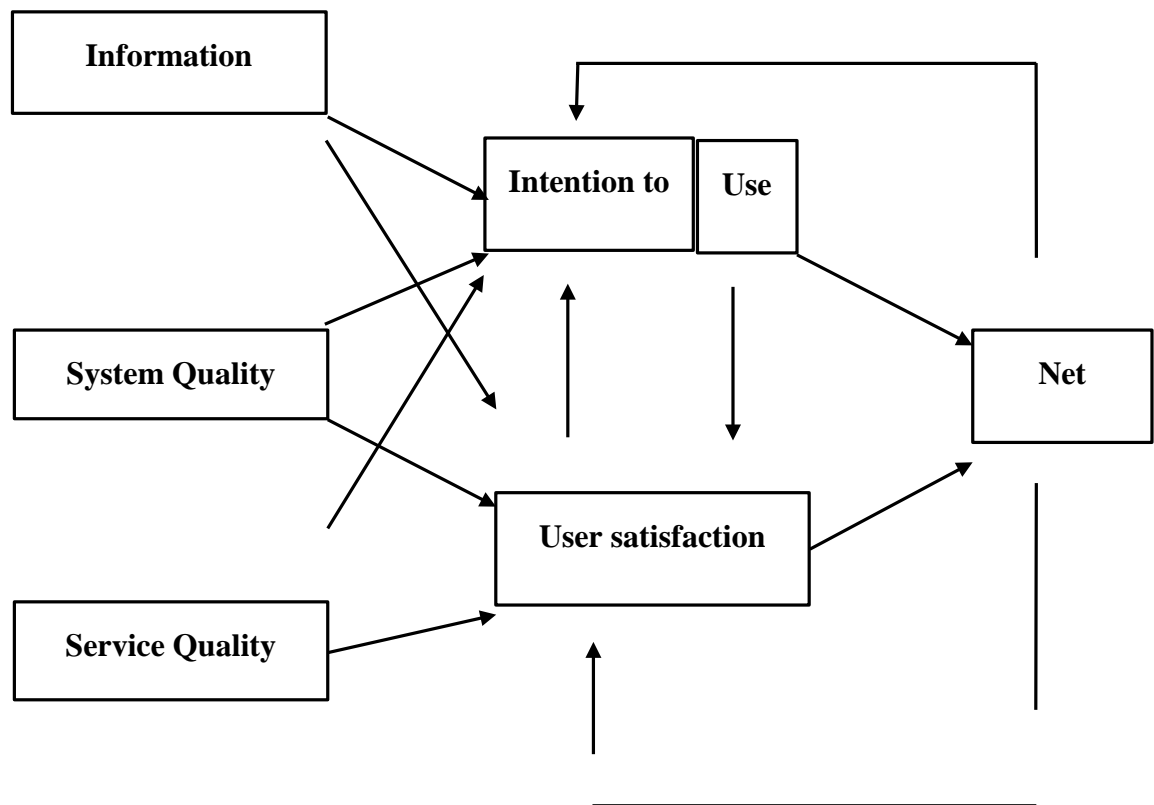
Figure 2.3: Updated Delone and McLean Information System Success Model
(Delone & Mclean, 2003)

2.8   Conceptual framework

Figure 2.4 shows the relationship among the study independent, moderating and dependent variables.

Independent Variables   **Moderating Variable**
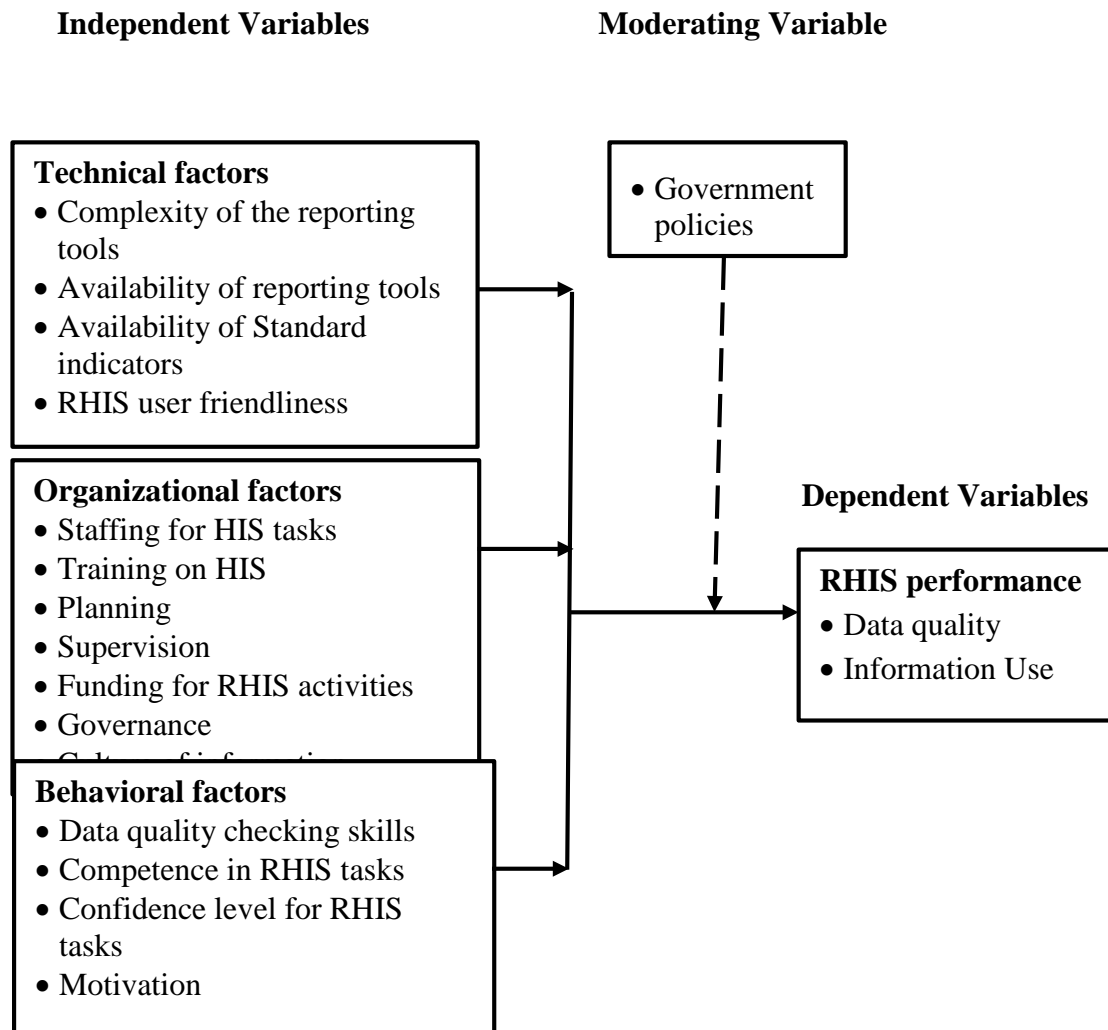
Figure 2.4: Conceptual framework (Adapted from PRISM framework)

Technical and organizational factors directly influence each other as shown in Figure 2.4. For instance, complexity of reporting tools and HIS user friendliness could influence the need for training staff and having staffs to support HIS tasks. In addition, availability of funding for HIS tasks could influence availability of reporting tools. Furthermore, technical and organization factors directly influence behavioural factors. For instance, training of staff on HIS tasks and availability of standards indicators influence data demand, competence and confidence levels for HIS tasks. Technical,

organizational and behavioural factors directly affect the quality of data hence the performance of health information system. However, this relationship is moderated by government policies on health information.

2.9   Gaps in literature reviewed

The literature reviewed showed that data quality was measured either using data completeness and or timeliness in most of the studies. As a result the definition of data quality was different depending on the study being reviewed. In addition, limited studies used inferential statistics to show the relationship between the study dependent variables; data quality, Information use and the independent variables; technical, organizational and behavioural factors. The influence of HIS design, complexity of reporting tools and standard indicators on performance of HIS was included in limited number of studies reviewed. Additionally, organizational factors such as staffing, funding and planning were not included in most of the studies reviewed. Furthermore, few studies reviewed assessed the influence of data quality checking skill, confidence level for HIS tasks and data demand on performance of RHIS.

Table 2.1: Summary of knowledge gaps

Year and Author	Study title	Findings	Knowledge gaps
Performance of RHIS (Data quality & information use)			
Aqil, et al (2010)	Guanajuato National Health Information System (SINAIS) Assessment	Data accuracy was 95%, timelines-62.7%, Completeness at health facility-22% and Use of information -41%	The significant technical, organizational and Behavioral factors influencing performance of RHIS were not determined.
Karengera, Onzima, Katongole, & Govule, 2016	Quality and Use of Routine Healthcare Data in Selected Districts of Eastern	High data completeness (97.6%), timeliness	Association between data quality and factors affecting data

Year and Author	Study title	Findings	Knowledge gaps
	Province of Rwanda	(93.8% and accuracy (73.3%)	quality were not statically determined Study did not assess the behavioral factors affecting data quality
Ermias , Kidist , Taye, & Desalegn , 2016	Utilization of Health Management Information System and Associated Factors in Hadiya Zone Health Centers, Southern Ethiopia	Completeness of data and consistency of data were predictors of utilization of HMIS	Study focused only on organization factors associated with utilization of HMIS.In addition, technical and behavioral factors were not assessed
Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016	Level of data quality from Health Management Information Systems in a resources limited setting and its associated factors, eastern Ethiopia	Utilization of health information was found to be 53.1%. Friendly format for reporting and managers provide regular feed back to their staff were found to be significantly associated with health information utilization	The study did not assess the influence of HIS design and availability of standard indicators on data quality

Technical factors influencing performance of routine health information system

Year and Author	Study title	Findings	Knowledge gaps
Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016	Level of data quality from Health Management Information Systems in a resources limited setting and its associated factors, eastern Ethiopia	Friendly format for reporting and managers provide regular feed back to their staff were found to be significantly associated with health information utilization	The study did not assess the influence of HIS complexity on data quality
Mucee, Otieno, Kaburi, & Kinyamu, 2016	Routine Health Management Information Use in the Public Health Sector in Tharaka Nithi County	Lack of technical competence on collecting, analyzing and processing data, multiple HIS tools that consume time in filling, and lack of computers to handle data as technical factors that influence utilization of health management information.	The study did not assess the availability of standard indicators and User friendliness of the HIS systems Association of technical factors and Use of HIS were not established
Nyamtema, 2010	Bridging the gaps in the Health Management Information System in the context of a changing health sector	More than three quarters (81%) of respondents had never been trained on HMIS. In addition, 91% of the respondents had positive attitude towards HMIS. 42%	The study only reviewed only one technical factor: Training and knowledge on HMIS Association of technical factors

Year and Author	Study title	Findings	Knowledge gaps
		of the respondents had never used the HMIS data for planning, budgeting and evaluation of service delivery	and HIS data quality were not determined Data quality only measured using one data quality dimension: Completeness

Organizational factors influencing performance of routine health information system

Year and Author	Study title	Findings	Knowledge gaps
Cheburet & Odhiambo-Otieno, 2016)	Organizational factors affecting data quality of routine health management information system quality: Case of Uasin Gishu County Referral Hospital, Kenya	A strong association was found between support supervision and the frequency of support supervision	The study focused on the following organizational factors: Leadership, Supervision, finances and availability of institutional documents The study did not assess the influence of staffing, training on HIS on quality of HIS
Mucee, Otieno, Kaburi, & Kinyamu, 2016	Routine Health Management Information Use in the Public Health	Staff training on HIS, support supervision and promotion of information use culture influence	The study did not assess the influence of staffing, funding and planning on

Year and Author	Study title	Findings	Knowledge gaps
	Sector in Tharaka Nithi County	health information use	health information use

Behavioral factors influencing performance of routine health information system

Year and Author	Study title	Findings	Knowledge gaps
Ahanhanzo, et al., 2014	Factors associated with data quality in the routine health information system of Benin	Health worker's competency and motivation were associated with quality of data	The study did not assess the influence of data demand and data quality checking skill on data quality
Nicol, Bradshaw, Phillips, & Dudley, 2013	Human Factors Affecting the Quality of Routinely Collected Data in South Africa	Personnel deficiency in their competency to interpret and use data coupled with average confidence level at performing HIS tasks may undermine quality and utilization of health information system	The study did not use statistical means to determine the influence of behavioral factors assessed and the data quality
Mucee, Otieno, Kaburi, & Kinyamu, 2016)	Routine Health Management Information Use in the Public Health Sector in Tharaka Nithi County, Kenya	Staff competency, motivation and recognition of well done job influence health information system performance	The study did not assess the influence of data demand and confidence levels for HIS task on HIS performance

The study did not use statistical means to determine |

Year and Author	Study title	Findings	Knowledge gaps
			the influence of behavioral factors assessed and the data quality

2.10 Summary of Literature Review

The review was on existing scientific literature on technical, organizational and behavioural factors influencing performance of health information system at global, regional and local level. In addition, the frameworks for evaluating health information system and the theoretical framework for this study were reviewed. The conceptual framework for this study was explained showing how independent variables and the dependent variable relate to each other.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   Introduction

This chapter explains the research methodology used in the study. Specifically, it provides details on the research design, target population for the study, sample size and procedure use to identify the sample, data collection instruments and reliability of the instruments. In addition, it explains the procedures used to collect data, techniques use to analyse data analysis, operational definition of the variables and the study ethical considerations.

3.2   Research design

Research design denotes the rational that link data collected, from whom it's collected and how it answers the research question (Yin, 2015). This study used descriptive research design because it allows cross sectional survey to be conducted in the target population. In addition, descriptive research design allows generalization of data collected from a sample to the whole population. It also allows for exploration of status of study variables and their relationships (Mugenda & Mugenda, 2003).

3.3   Target population

According to Mugenda& Mugenda(2003), population denotes a whole gathering of people, objects or occassions that share mutual features. The study target population was   80 health workers who included all health facility in charges from the 17 government owned health facilities in Garissa subcounty, all the health records information officers in Garissa referral hospital and County department of health monitoring and evaluation office, all heads of departments in iftin sub county hospital and Garissa County referral hospital, all members of Garissa Sub county and Garissa County health management teams.

The health workers included in the target population are responsible for quality of RHIS reports and they use the data from RHIS to inform decision aimed at improving quality and coverage of health services offered.Table 3.1 shows a summary of the target population per category.

Table 3.1 : Target population

Category	Target population
Health facility in-charges	17
Health records information officers	7
Garissa County hospital heads of departments	19
Iftin Subcounty hospital heads of departments	5
Garissa Subcounty health management team	7
Garissa County Health management team	25
Total	**80**

3.4   Sample size and sampling procedures

A sample is a subsection containing characteristics of the accessible population. Sampling refers to the process of choosing a representative sample from the accessible population. This allows generalization of study findings to the whole population from which the sample was drawn. (Mugenda & Mugenda, 2003) .This study used census approach where the whole target population of 80 was included in the sample size because the sampling universe was not vast.

3.5   Data collection instrument

Research instruments are the tools used by researcher to collect data. Data was collected using a structured questionnaire because it's easier to administer, saves time and it's cheaper. In addition, structured questionnaire used closed ended questions which are easier to analyze. The questionnaire questions on the general characteristics of the respondents were on nominal level of measurement whereas the questions answering the research objectives were on ordinal level of measurement .Likert rating scale was used for questions that were on ordinal level of measurement.

3.5.1 Pilot testing of the instrument

Pretesting of research instruments is important because it helps to reveal questions that are vague and identify deficiencies in the questionnaire. In addition, it allows the researcher to research questionnaire questions to confirm appropriateness of methods of analysis (Mugenda & Mugenda, 2003). Pretesting of the study questionnaire was done in Balambala Sub county hospital which was not the study target sub county .It is recommended to use 5-10 percent of the sample size for pretesting (Saha & Paul , 2016). In this study, the size of the population for pretesting was 8 which was 10 percent of the study sample size. The questionnaire was administered to a sample of 8 health officials purposively selected to include similar characteristics of the target population. Thereafter, the collected data was analyzed to determine the questionnaire's reliability and validity.

3.5.2 Validity of the instrument

Validity of an instrument is the measure of accuracy and relevance of inferences in light of research findings (Mugenda & Mugenda, 2003).Therefore,data collected using the questionaire should accurately represent the study variables.To determine content validity of the study questionaire,it was shared with my research supervisor and experts in the field of health information management.They were requested to determine whether the questionaire accurately represented the purpose of the study and also assess what concept the questionaire was measuring. In addition,the questionaire was pretested in a population with similar characteristics with the target population before the actual study.The findings of the pretesting and expert review of the questionaire were used to standardize the questionaire content to ensure its validity.

3.5.3 Reliability of the instrument

Reliability refer to the extent to which a research instrument yields similar outcomes on repeated use. Its is influenced by random errors that cause deviation from a true measurements.The random errors are caused by factors such as interviewer bias,ambigous instructions to the respondents and interviewee's fatigue (Mugenda & Mugenda, 2003). The reliability of the study questionaire was tested using the test retest technique.The questionaire was admnistered to the same sample used for pretesting after one week.Then the scores from both testing periods will be correlated.The coefficient of reliability was calculated using pearson product-moment correlation and

it was 0.920.According to Adams & Lawrence (2014), coefficient of reliability of 0.7 or higher is acceptable.

3.5.4 Data collection procedures

The researcher requested consent to carry out the research from the National Commission for Science Technology and Innovation. In addition, an introductory letter was obtained from University of Nairobi. Thereafter, the researcher sought permission from Garissa County director of heath to conduct the research in the targeted health facilities and departments in Garissa Sub County. This was done through a request letter to the county director of health. The request letter explained the study objectives, target population and the ethical considerations. In addition, the research clearance permit and letter of transmittal were attached to the request letter. After approval, an introductory letter was sent from the County director of health office to the institutions from which the target population was drawn. The researcher then sampled the health officials as per the sampling procedure and booked appointments for a meeting with each of them. The researcher then visited the sampled health officials to explain the objectives of the study and seek their informed consent to participate in the study. Once informed consent was given, the researcher issued the questionnaire to the respondents for self-administration. The completed questionnaires were collected within two days after they were checked for any missing information.

3.6 Data analysis techniques

The collected data was coded, errors were checked and analysis was done using descriptive statistics using Statistical Package for Social Sciences software .The level of data collected for the all the variables both independent and dependent variables was ordinal. Therefore, the variables were described using frequencies and percentage of responses. The association between each independent variable and dependent variable was analyzed using spearman's rank correlation coefficient. This measured the strength and direction of association between the two ranked variables. The data analysis outputs were presented in tables.

3.7 Ethical consideration

Permission to carry out the study was requested from the National Commission for Science Technology and Innovation, University of Nairobi and Garissa County department of health. The respondents were asked to make informed consent to

voluntary take part in the study before being given the questionnaire to self-administer. To ensure confidentiality of the data collected, the respondents were not required to show their names on the questionnaire. There was no psychological harm caused by the study to the respondents because the questions asked were neither personal nor sensitive. The final research report was also availed to Garissa County director of health office where it can be easily accessed by the respondents for use.

3.8 Operational definition of the variables

The operational definition of variables provides a description of how the study variable were measured. Table 3.2 describes how the study variables were measured.

Table 3.2: Operational definition of variables

Variable	Indicator(s)	Measurement scale	Data collection tools	Type of analysis
Performance of routine health information system (Dependent variable)	Data quality	Ordinal scale	Questionnaire	Descriptive statistics
	Use of health information	Ordinal scale	Questionnaire	

Objective 1: To evaluate how technical factors influence performance of routine health information system in Garissa Sub county

Technical factors (Independent Variable)	Complexity of the reporting tools	Ordinal scale	Questionnaire	Descriptive & inferential Statistics
	availability of reporting tools	Ordinal scale	Questionnaire	
	Availability of standard indicators	Ordinal scale	Questionnaire	

Variable	Indicator(s)	Measurement scale	Data collection tools	Type of analysis
	user friendliness of RHIS design	Ordinal scale	Questionnaire	

Objective 2: To examine how organizational factors influence performance of routine health information system in Garissa Sub County.

Variable	Indicator(s)	Measurement scale	Data collection tools	Type of analysis
Organizational factors (Independent Variable)	Adequacy of staffing for RHIS tasks	Ordinal scale	Questionnaire	Descriptive & inferential Statistics
	Training status of staffs on RHIS	Ordinal scale	Questionnaire	
	Availability of a strategic or annual work plan	Ordinal scale	Questionnaire	
	Regular support supervision visits	Ordinal scale	Questionnaire	
	Availability of funding for RHIS activities	Ordinal scale	Questionnaire	Descriptive & inferential Statistics
	Governance for RHIS tasks	Ordinal scale	Questionnaire	

Variable	Indicator(s)	Measurement scale	Data collection tools	Type of analysis
Objective 3: To determine how behavioural factors influence performance of routine health information system in Garissa Sub County				
Behavioral factors (Independent Variable)	Data quality checking skill	Ordinal scale	Questionnaire	Descriptive & inferential Statistics
	Staff competence in RHIS tasks	Ordinal scale	Questionnaire	
	Staff cconfidence levels for RHIS tasks	Ordinal scale	Questionnaire	
	Staff Motivation	Ordinal scale	Questionnaire	

CHAPTER FOUR

DATA ANALYSIS, PRESENTATIONS, AND INTERPRETATIONS

4.1 Introduction

This chapter summarises data analysis, presentation of the findings and interpretation of the findings per study objective.

4.2 Questionnaire return rate

A total of 80 questionnaires were distributed to the study respondents who were requested to fill the study questionnaire and return them once completed. The researcher collected the questionnaires from the respondents after verifying they were completely filled. Table 4.1 shows a summary of the questionnaire return rate.

Table 4.1: Questionnaire return rate

Target population	Number of questionnaire issued out	Number of questionnaires returned	Return rate
Health facility managers	17	13	76.6%
Health records information officers	8	8	100.0%
Garissa County referral hospital heads of department	21	21	100.0%
Iftin sub county heads of department	6	6	100.0%
Garissa Sub county health management team	7	7	100.0%
Garissa County health management team	21	17	80.9%
Total	**80**	**72**	**90.0%**

72 respondents out of the study sample of 80 returned the questionnaires. Therefore, the return rate was 90% which was very good. A questionnaire return rate of 50% is

adequate for analysis and reporting, a return rate of 60% is good while that of 70% and above is very good. (Mugenda & Mugenda, 2003).The questionnaire return rate for health facility managers was affected by the nurse's strike that was ongoing during the data collection period.

4.3 Demographic characteristics of the respondents

The demographic characteristics of the respondents was described in terms of gender, level of education, current designation and duration of employment in the current job. The findings of the study are described below.

4.3.1 Distribution of respondents by gender

The distribution of the respondents by gender was as shown in Table 4.2.

Table 4.2: Distribution of the Study Respondents by Gender

Gender	Frequency	Percent
Male	41	56.9
Female	31	43.1
Total	**72**	**100.0**

The study findings showed that male respondents were majority at 56.9% while 43.1% were female. This indicated that most of the health managers at the health facilities, Sub County and county health management teams were male. The findings showed that the researcher was able to include both male and female respondents in the research.

4.3.2 Distribution of respondents by level of education

The study sought to determine the respondent's highest level of education and the findings are shown in Table 4.3.

Table 4.3: Distribution of respondents by level of education

Level of education	Frequency	Percent

Diploma	38	52.8
Undergraduate	18	25.0
Postgraduate	16	22.2
Total	**72**	**100.0**

52.8% of the respondent's highest level of education was diploma while 25.0% of the respondents had undergraduate degree and 22.2% had postgraduate degree. This shows majority of the respondents had diploma as the highest level of education. This indicates the study respondents had basic understanding of routine health information system.

4.3.3 Distribution of respondents by current position

The study determined the current positions held by the respondents and the findings are shown on Table 4.4.

Table 4.4: Distribution of respondents by current position

Designation	Frequency	Percent
Health facility in-charge	14	19.4
Head of department	27	37.5
Health Records Information Officer	8	11.1
Sub county health management team member	6	8.3
County health management team member	17	23.6
Total	**72**	**100.0**

The study showed 37.5% respondents were heads of department, 23.6% were members of County health management team, 19.4% were health facility in charges, 11.1% were health record information officers and 8.3% were members of sub county health management team. Therefore, majority of the respondents were head of department at County referral hospital and Iftin Sub county hospital. This showed all the study respondents were currently in positions that use routine health information system for reporting, analysis and dissemination of data.

4.3.4 Distribution of respondents by duration of employment in current job

The study determined duration of employment for the respondents in their current job and the findings are summarised in Table 4.5.

Table 4.5: Distribution of respondents by duration of employment

Duration of employment	Frequency	Percent
Less than 5 year	33	45.8
5-9 years	20	27.8
10-15 years	8	11.1
Over 15 years	11	15.3
Total	**72**	**100.0**

The study findings revealed that 45.8% of the respondents had worked in their current job for less than 5 years, 27.8% of the respondents had worked for 5-9 years, 11.1% of the respondents had worked for 10-15 year and 15.3% of the respondents had worked for over 15 years. This shows that the respondents had worked for a considerable number of years and therefore suited to provide information on factors influencing performance of routine health information system.

4.4 Performance of Routine Health Information System

The performance of routine health information was determined by assessing quality of data and utilization of health information. Data quality was further assessed using three aspects; data accuracy, data completeness and timeliness. The respondents were requested to rate the extent to which they agreed or disagreed with statements matching the dimensions of data quality and use of health information. The rating was based on a five point Likert scale of strongly disagree, disagree, neither, agree and strongly agree.

4.4.1 Data quality

The study assessed data quality using three dimensions; data accuracy, data completeness and timeliness. This section describes the findings for each of the data quality dimension that was assessed.

4.4.1.1 Data accuracy

The respondents were asked to rate the accuracy of the data by comparing similarity of the data reported in the health facility registers, monthly reports and data reported in

the routine health information system. Table 4.6 shows a summary of the respondent's rating of the routine health information system data accuracy.

Table 4.6: Summary of Responses to Statements on RHIS Data Accuracy

Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Data reported in the health facility monthly reports is similar to the data in the health facility registers	f	14	43	4	9	2	72
	%	19.4	59.7	5.6	12.5	2.8	100
Monthly data available in the DHIS2 is similar to the data on monthly reports submitted to records office	f	15	44	3	8	2	72
	%	20.8	61.1	4.2	11.1	2.8	100

The study findings showed that 79.1% of the respondents either agreed (59.7%) or strongly agreed (19.4%) that the data reported in the health facility monthly reports was similar to data in the health facility registers. Similarly, 81.9% of the respondents either agreed (61.1%) or strongly agreed (20.8%) that data reported in the health facility monthly reports available in the DHIS2 was similar to the data on monthly reports submitted to the records office. This showed majority of the respondents rated the data in the RHIS to be accurate.

4.4.1.2 Data completeness

The study sought to find out how the respondents rated the completeness of the monthly reports submitted to the health records office. Table 4.7 shows the respondents rating of the RHIS data completeness.

Table 4.7: Summary of Responses to Statements on RHIS Data Completeness

Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Expected monthly reports are submitted to the health records office	f	25	41	2	2	2	72
	%	34.7	56.9	2.8	2.8	2.8	100
Data elements in the expected monthly reports are completely filled	f	12	47	2	11	0	72
	%	16.7	65.3	2.8	15.3	0	100

The study findings showed that 91.4 % of the respondents felt all the expected monthly reports were submitted to the health records offices. In addition, 82 % of the respondents either agreed or strongly agreed that data elements in the expected monthly reports were completely filled. Therefore, majority of the respondents rated RHIS data as complete.

4.4.1.3 Data timeliness

The study sought to find out how the respondents rated the timeliness of submitting the RHIS monthly reports. Table 4.8 shows the respondents rating of the RHIS data timelines.

Table 4.8: Summary of Responses to Statements on RHIS Data Timelines

Statement	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total

Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Monthly reports are submitted by the specified deadline to the health records office	f	21	30	6	12	3	72
	%	29.2	41.7	8.3	16.7	4.2	100

The study findings showed that majority (70.9 %) of the respondents either agreed (41.7%) or strongly agreed (29.2%) that the monthly reports are submitted by the specified deadlines to the health records office. Therefore, majority of the respondent felt the RHIS reports were timely.

4.4.2 Use of health information

The study sought to find out how the respondents rated the use of RHIS data to inform decisions and the findings are summarised in Table 4.9.

Table 4.9: Summary of Responses to Statements on Use of Health Information

Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Heath data is analyzed and used to inform decisions aimed at improving quality and coverage of health services	f	12	40	8	12	0	72
	%	16.7	55.6	11.1	16.7	0	100
Performance of health indicators is discussed during staff meetings	f	12	37	10	9	4	72
	%	16.7	51.4	13.9	12.5	5.6	100

The study findings revealed that 72.3% of the respondents either agreed (55.6%) or strongly agreed (16.7%) that heath data is analyzed and used to inform decisions aimed at improving quality and coverage of health services. Furthermore, 68.1 % of the

respondents either agreed (51.4%) or strongly agreed (16.7%) that the performance of health indicators is discussed during staff meetings.

4.5   Technical factors and performance of Routine Health Information System

This theme is from the first objective which sought to evaluate how the technical factors influence performance of routine health information system in Garissa Sub County. The technical factors were described using the following indicators; complexity of reporting tools, availability of reporting tools, availability of standard indicators and user friendliness of routine health information system.

4.5.1   Descriptive statistics of technical factors influencing performance of Routine Health Information System

The respondents were requested to rate the extent to which they agreed or disagreed with statements matching each of the indicators. The rating was founded on a five point Likert scale of strongly disagree, disagree, neither, agree and strongly agree. The responses for the statements matching each technical factor were analysed using frequency and percentages as shown in Table 4.10.

Table 4.10: Summary of Responses to Statements on Technical Factors that Influence Performance of RHIS.

Indicator/Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Complexity of reporting tools							
Routine health information system reporting forms and registers used in your	f	3	17	4	41	7	72
department are complicated	%	4.2	23.6	5.6	56.9	9.7	100
Availability of reporting tools							
Your health facility	f	13	44	7	7	1	72
/department has	%	18.1	61.1	9.7	9.7	1.4	100

adequate reporting
forms and registers

Availability of standard indicators							
All the indicator reported on monthly basis by your health facility/department are standardized	f	19	39	7	7	0	72
	%	26.4	54.2	9.7	9.7	0	100
User friendliness of RHIS							
District health information system(DHIS) is user friendly	f	15	34	6	11	6	72
	%	20.8	47.2	8.3	15.3	8.3	100

The study findings showed that 56.9 % and 9.7% of the respondents either disagreed and strongly disagreed respectively that that routine health information reporting system's forms and registers they use were complicated. Conversely, 23.6 % and 4.2 % of the respondents agreed and strongly agreed respectively that the RHIS forms and registers are complicated. Furthermore, the analysis showed 61.1 % and 18.15 % of the respondents agreed and strongly agreed respectively that their health facility or department had adequate reporting forms and registers. However, 9.7 % and 1.4 % disagreed and strongly disagreed respectively.9.7% of the respondents neither agreed nor disagreed that the reporting forms and registers were adequate.

54.2 % and 26.4 % of the respondents agreed and strongly agreed respectively that all the indicators reported on monthly basis are standardized. On the other hand, 9.7 % and 9.7 % of the respondents disagreed and neither agreed or disagreed respectively. In addition, 47.2 % and 20.8 % of the respondents agreed and strongly agreed respectively that the district health information system was user friendly. However, 15.3 % and 8.3 % of the respondents disagreed and strongly disagreed respectively.

4.5.2 Relationship between technical factors and performance of Routine Health Information System.

The association between each of the technical factors and performance of the routine health information was analysed using spearman's rank correlation. This form of non-

parametric correlation was used because technical factors and performance of routine health information system data were on ordinal scale. Table 4.11 shows a summary of the Spearman's rank coefficient between technical factors and performance of RHIS.

Table 4.11: Spearman's Rank Coefficient between Technical Factors and Performance of RHIS

| | Performance of RHIS | |
	Spearman's rho	Significance level
Complexity of the reporting tools	0.159	0.091
Availability of reporting tools	0.465**	0
Availability of standard indicators	0.510**	0
User friendliness of RHIS	0.546**	0

** Correlation is significant at the 0.01 level (2-tailed).

The analysis showed there was a significant (p<0.05) moderate positive relationship between availability of reporting tools, availability of standard indicators and user friendliness of RHIS as shown in Table 4.11.In addition, there was an extremely weak positive but not significant relationship between the complexity of reporting tools and performance of routine health information system.

4.6 Organisational factors and performance of Routine Health Information System

This theme is from the second objective which sought to examine how organisational factors influence performance of routine health information system in Garissa Sub County. The organisational factors assessed in the study were; staffing for RHIS tasks, training on RHIS, planning for RHIS, supervision of RHIS activities, availability of funding for RHIS activities, availability of clear governance structure for RHIS and promotion of culture of using information for decision making.

4.6.1 **Descriptive statistics organisational factors influencing performance of Routine Health Information System**

The respondents were asked to rate the extent to which they agreed or disagreed with statements matching each of the organisational factors. The rating was based on a five point Likert scale of strongly disagree, disagree, neither, agree and strongly agree. The responses for each statement were analysed using frequencies and percentages and the findings are summarised on Table 4.12.

Table 4.12: Summary of Responses to Statements on Organisational Factors that Influence Performance of RHIS

Indicator/Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Staffing for RHIS tasks							
Your health facility or department has adequate staffs responsible for routine health information system related tasks	f	4	35	3	27	3	72
	%	5.6	48.6	4.2	37.5	4.2	100
Training on RHIS							
Staffs in your health facility or department are trained on routine health information system	f	3	28	7	28	6	72
	%	4.2	38.9	9.7	38.9	8.3	100
Planning for RHIS activities							
Your health facility or department has a strategic plan or	f	12	42	5	9	4	72
	%	16.7	58.3	6.9	12.5	5.6	100

Indicator/Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
annual work plan with a clear monitoring and evaluation plan							
Supervision of RHIS activities							
Your health facility/ department receives regular supportive supervision visits	f	14	33	4	15	8.3	72
focusing on quality of data and use of information	%	19.4	45.8	5.6	20.8	8.3	100
Availability of funding for RHIS activities							
Your health facility/ department has adequate funds to	f	1	12	8	40	11	72
support routine health information system activities	%	1.4	16.7	11.1	55.6	15.3	100
Availability of clear governance structure for RHIS							
Your health facility/ department has a clear structure on who is responsible	f	13	35	8	14	1	71
for routine health information system tasks	%	18.1	48.6	11.1	19.4	1.4	100
Culture of using information for decision making							
Your health facility/ department	f	9	43	7	10	3	72
promotes a culture	%	12.5	59.7	9.7	13.9	4.2	100

Indicator/Statement	Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
of using evidence from routine health data to make decision						

The analysis showed that 48.6% and 5.6 % of the respondents agreed and strongly agreed respectively that their health facility or department had adequate staffs responsible for RHIS tasks. However, 37.5 % and 4.2 % disagreed and strongly disagreed respectively. 38.9 % and 4.2 % of the respondents agreed and strongly agreed that staff in their health facilities and departments were trained on RHIS. However a slight majority of 47.2 % of the respondents disagreed. Analysis also showed 75% of the respondents either agreed (58.3%) or strongly agreed (16.7%) that their health facility or department had a strategic plan or annual work plan with a clear monitoring and evaluation plan. Similarly, 65.2 % of the respondents either agreed (45.8%) or strongly agreed (19.4%) that their health facility or department receives regular supportive supervision visits focusing on quality of data and use of information. Furthermore, 17.8 % of the respondents either agreed (16.7%) or strongly agreed (1.4%) while 70.9 %(51) either disagreed (55.6%) or strongly disagreed (15.3%) that their health facility or department had adequate funds to support RHIS activities. In addition, 66.7 % of the respondents either agreed (48.6%) or strongly agreed (18.1%) that their health facility or department had a clear structure on who is responsible for RHIS tasks.72.2% of the respondents agreed that their health facility or department promotes a culture of using evidence from routine health data to make decision.

4.6.2 Relationship between organisational factors and performance of Routine Health Information System

The relationship between the organisational factors and performance of the routine health information was analysed using spearman's rank correlation and the findings are shown in Table 4.13.

Table 4.13: Spearman's Rank Coefficient between Organisational Factors and Performance of RHIS

	Performance of RHIS	
	Spearman's rho	Significance level
Staffing for RHIS tasks	0.239*	0.043
Training on RHIS	0.295*	0.012
Planning for RHIS	0.465**	0
Supervision of RHIS activities	0.407**	0
Funding for RHIS activities	0.15	0.208
Governance of RHIS	0.354**	0.002
Culture of using information	0.501**	0

** Correlation is significant at the 0.05 level (2-tailed).

*. Correlation is significant at the 0.01 level (2-tailed).

The analysis showed that there was a significant (p<0.05) moderate positive relationship between availability of plans for RHIS, supervision of RHIS activities and promotion of the culture of using information from routine health data to make decisions. In addition, the analysis showed that there was a significant (p<0.05) positive relationship between availability of adequate staff for RHIS tasks, training of staff on RHIS, availability of clear governance structure for RHIS and performance of RHIS. The relationship between availability of funding for RHIS activities and performance of RHIS was extremely weak positive and not significant.

4.7 Behavioral factors and performance of Routine Health Information System

This theme is based on the third objective and seeks to determine how behavioral factors influence performance of routine health information system in Garissa Sub County. This study assessed the following behavioral factors; data quality checking skills, competency to perform RHIS tasks, confidence to perform RHIS tasks and motivation to perform RHIS tasks.

4.7.1 Descriptive statistics of behavioral factors influencing performance of Routine Health Information System

The respondents were asked to rate the extent to which they agreed or disagreed with statements matching each of the behavioral factors. The rating was based on a five point Likert scale of strongly disagree, disagree, neither, agree and strongly agree. The responses for statements matching each behavioral factor were analysed using frequencies and percentages and the findings are summarised on Table 4.14.

Table 4.14: Summary of Responses to Statements on Behavioral Factors that Influence Performance of RHIS

Indicator/Statement		Strongly agree	Agree	Neither	Disagree	Strongly disagree	Total
Data quality checking skills							
Staffs in my health facility/department	f	2	34	11	23	2	72
have data quality checking skills	%	2.8	47.2	15.3	31.9	2.8	100
Competency for RHIS tasks							
Staffs in my health facility/department have the skills to perform RHIS	f	5	31	6	26	4	72
related tasks such as data analysis and interpretation	%	6.9	43.1	8.3	36.1	5.6	100
Confidence for RHIS tasks							
Staffs in my health facility/department have confidence to	f	5	31	10	22	4	72
perform RHIS related tasks such as	%	6.9	43.1	13.9	30.6	5.6	100

data analysis and interpretation						

Motivation for RHIS tasks

Staffs in my health facility/department are motivated to perform DHIS related tasks	f	2	24	13	28	5	72
	%	2.8	33.3	18.1	38.9	6.9	100

The analysis showed 47.2 % and 2.8 % of the respondents agreed and strongly agreed that staff in their health facility or department had data quality checking skills. However, 34.7 % either disagreed or strongly disagreed. In addition, 50 % of the respondents either agreed (43.1%) or strongly agreed (6.9%) staffs in their health facility or department have the skills to perform RHIS related tasks such as analysis and interpretation. Similarly, 50 % of the respondents either agreed (43.1%) or strongly agreed (6.9%) that staffs working in their health facility or department have confidence to perform RHIS tasks.

Moreover, 45.8 % of the respondents either disagreed (38.9%) or strongly disagreed (6.9%) that staffs in their health facility or department are motivated to perform RHIS related tasks. However, 36.1 % of the respondent agreed (33.3%) or strongly agreed (2.8%) that staff in their health facilities or department are motivated to perform RHIS tasks.

4.7.2 Relationship between behavioral factors and performance of Routine Health Information System

The relationship between the behavioral factors and performance of the routine health information was analysed using spearman's rank correlation and the findings are shown in Table 4.15.

Table 4.15: Spearman's Rank Coefficient between Behavioral Factors and Performance of RHIS

	Performance of RHIS

	Spearman's rho	Significance level
Data quality checking skills	0.324**	0.006
Competence in RHIS tasks	0.205	0.084
Confidence level for RHIS tasks	0.194	0.102
Motivation to perform RHIS tasks	0.299*	0.011

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed)

The analysis showed there was a significant ($p<0.05$) weak positive relationship between data quality checking skills, motivation to perform RHIS tasks and performance of routine health information system. There was a weak non-significant positive relationship between competences to perform RHIS tasks and performance of RHIS, In addition, there was extremely weak positive and non-significant relationship between confidence level to perform RHIS tasks and performance of RHIS.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section provides a summary of findings, discussion of findings, conclusions, recommendations for action, contribution to body of knowledge and suggestions for further research.

5.2 Summary of findings

5.2.1 Performance of Routine Health Information System

The performance of routine health information was measured in terms of use of health information and data quality. Data quality was defined using data accuracy, data completeness and timeliness. The study findings revealed that 80.5% of the respondents felt the data reported in the monthly and uploaded in the routine health information system was accurate. Furthermore, 86.7% of the respondents felt the RHIS data was complete in terms of submitting the expected monthly reports and filling all the monthly reports data elements.70.9% of the respondents reported that RHIS monthly reports were submitted timely as per the set deadline. In addition, 70.2% of the respondents felt the RHIS data was being analysed discussed in meetings to inform decision making.

5.2.2 Influence of technical factors on performance of Routine Health Information System

The first study objective was to determine how technical factors influence performance of routine health information system in Garissa Sub County. The study findings showed that majority (66.6%) of the respondents felt that the RHIS forms and register were not complicated to use. In addition 79.6% of the respondents interviewed agreed that their health facility or department had adequate reporting tools.80.6% of the respondents felt the indicators they report on monthly basis are standardized and 68% of the respondents reported that the district health information system was user-friendly .Analysis of the correlation between technical factors and performance of RHIS using spearman's rho showed there was a moderate positive and a significant ($p<0.05$) relationship between availability of reporting tools ($r_s =0.465$, $p=0.091$), availability of standard indicators

(r_s =0.510, p=0.000),availability of standard indicators(r_s =0.510,p=0.000) and user friendliness of RHIS (r_s =0.546, p=0.000) .Moreover, it was established that there was weak positive and not significant relationship between the complexity of reporting tools (r_s =0.159, p= 0.091) and performance of routine health information system.

5.2.3 Influence of organisational factors on performance of Routine Health Information System

The second study objective was to evaluate how organisational factors influence performance of routine health information system in Garissa Sub County. The study results revealed there is a significant (p<0.05) weak positive relationship between availability of adequate staffs for RHIS tasks (r_s =0.239, p=0.043), training on RHIS (r_s =0.295, p=0.012), availability of clear governance structure for RHIS (r_s =0.354, p=0.002) and performance of RHIS. Furthermore, the study findings showed there is a non-significant extremely weak positive relationship between availability of funding for RHIS activities (r_s =0.150, p=0.208) and performance of RHIS. In addition, the analysis revealed there is a significant (p<0.05) moderate positive relationship between availability of plans for RHIS (r_s =0.465, p=0.000), supervision of RHIS activities (r_s=0.407, p=0.000), promotion of culture of using information from routine health data to make decision (r_s =0.501, p=0.000).

5.2.4 Influence of behavioral factors on performance of Routine Health Information System

The third study objective was to determine how behavioral factors influence performance of routine health information system in Garissa Sub County. The study results showed there is a significant (p<0.05) weak positive relationship between data quality checking skills (r_s =0.324, p=0.006), motivation to perform RHIS tasks (r_s =0.299, p=0.011) and performance of routine health information system. The study findings also found a weak non-significant positive relationship between competences to perform RHIS tasks (r_s =0.205, p=0.084) and performance of RHIS. In addition, there is extremely weak positive relationship between confidence level to perform RHIS tasks (r_s =0.194, p=0.102) and performance of routine health information system.

5.3   Discussion of the research findings

5.3.1   Performance of Routine Health Information System

The performance of routine health information system was assessed using data quality and use of health information system. Data quality was assessed in terms of data accuracy, data completeness and timeliness. The study findings showed 80.5 % of the respondent felt the RHIS data was accurate. Similarly high data accuracy was reported in a study conducted by Aqil, et al (2010) that revealed data accuracy at health facility was above 95%. Furthermore, a study conducted in in southern Ethiopia reported high data accuracy at 75.9% (Ermias , Kidist , Taye, & Desalegn , 2016) while a study carried out in Eastern Ethiopia found the overall health information system data quality was 75.3 percent (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016).This study findings further revealed 86.8% of the respondents felt RHIS data was complete. Similarly, high data completeness of 96.6% was reported in a study conducted in Rwanda (Karengera, Onzima, Katongole, & Govule, 2016) and a study conducted in Southern Ethiopia that reported a data completeness of 75.9% (Ermias , Kidist , Taye, & Desalegn , 2016).This is further supported by findings of a study by Manya & Nielsen (2016) in four counties in Kenya that reported a high data completeness of 86.9%.In the contrary, a study conducted by Simba & Mwangu (2006) in Tanzania reported lower data completeness of 64.2% and a study conducted in Uasin Gishu County Referral Hospital reported data completeness of 44% (Cheburet & Odhiambo-Otieno, 2016). The study findings showed 70.9% of the respondents felt the RHIS data was submitted timely as per the set deadlines. This is further supported by findings of studies by Manya & Nielsen (2016) and Karengera et al. (2016) that reported data timelines of 78.7% and 93.8% respectively. However studies by Aqil, et al (2010) and Cheburet & Odhiambo-Otieno (2016) reported lower data timeliness of 62.7% and 46% respectively. 70.2% of the respondents felt the RHIS data was being analysed discussed in meetings to inform decision making. These findings are slightly higher than those of a study by Aqil, et al (2010) that showed 61% of the facilities were holding meetings and among them 41 % made decisions using the health information system data.

5.3.2 Influence of technical factors on performance of Routine Health Information System

The first study objective sought to determine how technical factors influence performance of routine health information system in Garissa Sub County. The study showed there is a significant positive relationship between user-friendliness of RHIS and performance of RHIS. This confirms findings of studies by Teklegiorgis et al.(2016) and Mishra et al.(2012) that showed data quality and use of health information is influenced by non-friendly software design features. Therefore, it's advisable to design a routine health information system that is easy to use in order for its performance to be high in terms of the quality of data uploaded in it as well use of the information for decision making. Contrary to findings that HIS tools that consume time in filling influence utilization of health information (Mucee, Otieno, Kaburi, & Kinyamu, 2016) and well-designed reporting formats increase likelihood of achieving data quality (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016),this study found non-significant weak positive relationship between complexity of reporting tools and performance of RHIS. Therefore, it's important to use reporting tools that are easy to understand and use to ensure high performance of the routine health information system. Furthermore, the findings of this study revealed there is a significant moderate positive relationship between availability of standard indicators and performance of RHIS.These findings are similar to those of Tadesse et al. (2014) and Teklegiorgis et al. (2016) that showed departments with standard set of indicators had increased likelihood of achieving data quality.

5.3.3 Influence of organizational factors on performance of Routine Health Information System

The study findings showed there was a significant weak positive relationship between availability of adequate staff for RHIS tasks and performance of RHIS. Additionally, the study revealed there was a significant moderate positive relationship between training of staff on RHIS and performance of RHIS. These findings are similar to those of Tadesse et al. (2014) and Teklegiorgis et al. (2016) that showed availability skilled human resource and staffs trained to fill formats had increased likelihood of achieving data quality. Additionally, the findings are consistent with findings of a study by Mucee et al. (2016) that showed staff training on health information system influenced health information use. Furthermore, the study findings revealed there was a weak positive

relationship between availability of clear governance structure for RHIS and performance of RHIS. This is consistent with findings of a study by Simba & Mwangu (2006) that revealed presence of HMIS focal person and accountability concept were associated with improved quality of data. Support supervision and promotion of information use culture influence health information use (Mucee, Otieno, Kaburi, & Kinyamu, 2016). Similarly, this study findings showed there was a significant positive relationship between supervision of RHIS activities and promotion of culture of using information from routine health data to make decision. These findings are further supported by a study in Ethiopia that showed respondents who got supportive supervision and timely feedback were 3 times more likely to be good practitioners of health information use than those who did not get it (Andualem, 2017).

5.3.4 Influence of behavioral factors on performance of Routine Health Information System

The third study objective was to determine how behavioral factors influence performance of routine health information system in Garissa Sub County .The study findings showed there was a significant positive relationship between motivation of staff and performance of RHIS.Similarly, previous studies have shown staff motivation and health worker's competency are associated with quality of data (Ahanhanzo, et al., 2014); (Mucee, Otieno, Kaburi, & Kinyamu, 2016); (Nicol, Bradshaw, Phillips, & Dudley, 2013). Studies have further shown staff competency on RHIS tasks influence health information use (Andualem, 2017); (Mucee, Otieno, Kaburi, & Kinyamu, 2016).However, this study findings found a weak positive and non-significant relationship between staff competency to perform RHIS tasks and performance of RHIS. Similarly the study findings showed there was a weak positive and non-significant relationship between confidence level to perform RHIS tasks and performance of routine health information system. This is contrary to findings of a study by Hotchkiss et al. (2012) that showed self-efficacy had a direct influence on the use of RHIS information. Furthermore, a study by Ahanhanzo, et al. in 2014 showed health workers competency and motivation were associated with quality of data.The study findings revealed there was a significant weak positive relationship between data quality checking skills and performance of routine health information. These findings are similar to those of a study conducted in South Africa that found out that staff inability to interpret and use data coupled with average confidence level for performing

RHIS tasks may undermine quality and utilization of health information system. In addition, the study also revealed that data quality checking skills was found to be predictors of competence in RHIS tasks (Nicol, Bradshaw, Phillips, & Dudley, 2013). However this study did not assess the relationship between data quality checking skills and competency to perform RHIS tasks.

5.4 Conclusion

The study sought to evaluate how technical factors influence performance of routine health information system in Garissa Sub County. Based on the study findings, the study concludes that availability of reporting tools, availability of standard indicators and user friendliness of RHIS have a positive and significant influence on performance of routine health information system. Furthermore, complexity of reporting tools has a positive influence on performance of RHIS but it is not significant.

The study also sought out to examine how organisational factors influence performance of routine health information system in Garissa Sub County. The study findings revealed that availability of staffs for RHIS tasks, training of staffs on RHIS tasks, availability of plans for RHIS activities, supervision of RHIS activities, promotion of culture of using information and availability of clear RHIS governance structure had a positive and significant influence on the performance of routine health information system. In addition, the findings showed the availability of funding for RHIS tasks had extremely weak positive influence on the performance of RHIS however it was not significant. Though the relationship was not significant, it is important for health managers allocate funding for RHIS tasks because it could have an influence of the above mentioned factors that had significant influence on performance of RHIS.

The third objective of this study sought to determine how behavioural factors influence performance of routine health information system in Garissa Sub County. From the results, the study concludes that data quality checking skills and motivation to perform RHIS tasks have a positive and significant influence on performance of routine health information system. In addition, competence and confidence level to perform RHIS tasks have a weak positive influence on performance of RHIS however it is not significant.

5.5 Recommendations for policy action

Based on the study findings, the researcher recommends the following;

1. The County department of health to ensure that all the indicators reported are standardized and their respective reporting tools are available.

2. The County department of health to ensure there is adequate staffing for RHIS tasks where possible and if not, responsibilities for the RHIS tasks could be assigned to specific staffs within other health cadres. In addition, the governance structure for RHIS should be clear and communicated to all the health workers.

3. The County department of health to train staffs who are responsible for RHIS tasks on how to conduct RHIS activities and also conduct post training mentorship to build the staff's data quality checking skills as well as competency and confidence to perform the RHIS tasks.

4. The County department to encourage health facilities and departments to develop plans for RHIS activities and also promote a culture of using evidence from the routine health data to make decisions.

5. The department of monitoring and evaluation within the county department of health to conduct periodic support supervision for RHIS activities and use innovative ways to motivate staffs to perform RHIS related tasks and use evidence from routine health data to make decisions.

5.5.1 Suggestions for further studies

Health sector in Kenya is a devolved function to county governments. As a result, the level of investment to strengthen the performance of routine health information varies across counties. Therefore, there is need to conduct a national wide assessment of factors influencing performance of routine health information system in Kenya. Furthermore, there is need to conduct further research on the factors influencing performance of routine health information system in the private sector health facilities. There is also need to establish how technical, organisational and behavioural factors influence each other and also assess the quality of data collected routinely at the health facilities and determine the factors that influence its quality.

5.6   Contribution to the body of knowledge

Most of the studies reviewed described data quality in terms of data completeness and timeliness excluding data accuracy. In addition, limited studies reviewed had used inferential statistics to show the relationship between the study dependent variables (data quality, Information use) and the independent variables; technical, organizational and behavioural factors. This study advances the PRISM framework by using inferential statistics to show how technical, organisation and behavioral factors influence performance of routine health information system. In addition, the study defined performance of routine health information system using data quality and information use. Data quality was defined further using data accuracy, data completeness and timelines. This addressed the gaps identified in the literature review.

REFERENCES

Adams, K. A., & Lawrence, E. K. (2014). *Research Methods, Statistics, and Applications.* SAGE Publications.

Ahanhanzo, Y. G., Ouedraogo, L., Kpozèhouen, A., Coppieters, Y., Makoutodé, M., & Wilmet-Dramaix, M. (2014). Factors associated with data quality in the routine health information system of Benin. *Archives of Public Health.*

Andualem, M. A. (2017). Determinants of routine health information utilization at primary healthcare facilities in Western Amhara, Ethiopia. *Cogent Medicine.*

Aqil, A., Ávila, J. E., Mejía, L. S., Parbul, A. S., Plaza,, B., Wilson, N., . . . Lippeveld, T. (2010). *Guanajuato National Health Information System (SINAIS) Assessment.* Measure Evaluation.

Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy and Planning.*

Belay, H., Azim, T., & Kassahun, H. (2013). *Assessment of Health Management Information System (HMIS) Performance in SNNPR, Ethiopia.* Ethiopia: MEASURE Evaluation and SNNP Regional Health Bureau.

Black, R. E., Allen, L., Bhutta, Z. A., Caulfield, L. E., de onis, M., Ezzati, M., . . . Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*, 243-260.

Bossen, C., Jensen, L. G., & Udsen, F. W. (2013). Evaluation of a comprehensive EHR based on the DeLone and McLean model for IS success: Approach, results, and success factors. *International Journal of Medical Informatics.*

Cheburet, S. K., & Odhiambo-Otieno, G. (2016). Organizational factors affecting data quality of routine health management information system quality: Case of Uasin Gishu County Referral Hospital, Kenya. *International Research Journal of Public and Environmental Health.*

Cheburet, S. K., & Odhiambo-Otieno, G. (2016). State of data quality of routine Health Management Information System: Case of Uasin Gishu County Referral Hospital, Kenya. *International Research Journal of Public and Environmental Health.*

Cheburet, S. K., & Otieno, G. O. (2016). Technological factors affecting data quality of routine health management information system: Case of Uasin Gishu county referral hospital, Kenya. *International Research Journal of Public and Environmental Health*, 191-200.

Cochran, W. G. (1977). *Sampling techniques (3rd ed.).* New York: John Wiley & Sons.

Delone, W., & Mclean, E. (2003). The DeLone and McLean Model of Information Systems Success:A Ten-Year Update. *Journal of Management Information Systems*.

DHIS 2 Overview. (2017, 1 19). Retrieved from DHIS2: https://www.dhis2.org

DHIS2 Documentation Team. (2016). *DHIS2 User guide.* Retrieved from DHIS2: https://docs.dhis2.org

Ermias , A., Kidist , D., Taye, L., & Desalegn , T. (2016). Utilization of Health Management Information System and Associated Factors in Hadiya Zone Health Centers, Southern Ethiopia. *Research in Health Science*.

Harikumar, S. (2012). *Evaluation of Health Management Information Systems-A Study of HMIS in Kerala.* Doctoral dissertation, SCTIMST.

Health Metrics Network & World Health Organization. (2008). *Framework and standards for country health information systems.* Geneva, Switzerland: World Health Organisation.

Health Metrics Network, World Health Organization. (2008). *Framework and standards for country health information systems.* Geneva, Switzerland: World Health Organisation .

Hotchkiss, D., Aqil, A., Lippeveld, T., & Mukooyo, E. (2010). Evaluation of the Performance of Routine Information System Management (PRISM) framework: evidence from Uganda. *BMC Health Services Research*.

Hotchkiss, D., Diana, M. L., & Foreit, K. F. (2012). How Can Routine Health Information Systems Improve Health Systems Functioning in Low- and Middle-Income Countries? Assessing the Evidence Base. *Advances in Health Care Management*.

Karengera, I., Onzima, R. A., Katongole, S.-P., & Govule, P. (2016). Quality and Use of Routine Healthcare Data in Selected Districts of Eastern Province of Rwanda. *International Journal of Public Health Research*.

Karuri, J., Waiganjo, P., & Orwa, D. (2014). Implementing a Web-based Routine Health Information System in Kenya: Factors affecting acceptance and Use. *International Journal of Science and Research (IJSR)*.

Karuri, J., Waiganjo, P., & Orwa, D. (2014). Implementing a Web-based Routine Health Information System in Kenya: Factors Affecting Acceptance and Use. *International Journal of Science and Research (IJSR)*.

Karuri, J., Waiganjo, P., Orwa, D., & Manya, A. (2014). DHIS2: The Tool to Improve Health Data Demand and Use in Kenya. *Journal of Health Informatics in Developing Countries*.

Kenya Ministry of Planning and National Development, Kenya National Economic and Social Council. (2007). *Kenya vision 2030.* Nairobi: Government printer.

Kenya Ministry of State for Planning National Development and Vision 2030. (2008). *First medium term plan, 2008-2012: Kenya vision 2030 : a globally competitive and prosperous Kenya.* Nairobi: Government printer.

Lippeveld, T., Sauerborn, R., & Bodart, C. (2000). *Design and implementation of health information systems.* Geneva: World Health Organization.

Manya, A., & Nielsen, P. (2016). Reporting Practices and Data Quality in Health Information Systems in Developing Countries: An Exploratory Case Study in Kenya. *Journal of Health Informatics in Developing Countries*.

Ministry of Health. (2014). *Kenya Health Policy 2014-2030.* Nairobi: Ministry of Health.

Mishra, A., Vasisht, I., Kauser, A., Thiagarajan, S., & Mairembam, D. S. (2012). Determinants of Health Management Information Systems performance:Lessons from a district level assessment. *BMC Proceedings*.

Mucee, E. M., Otieno, O., Kaburi, L. W., & Kinyamu, R. K. (2016). Routine Health Management Information Use in the Public Health Sector in Tharaka Nithi County, Kenya. *Imperial Journal of Interdisciplinary Research (IJIR)*.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research Methods:Quantative and Qualitatibe approaches.* Nairobi: Acts Press.

Nicol, E., Bradshaw, D., Phillips, T., & Dudley, L. (2013). Human Factors Affecting the Quality of Routinely Collected Data in South Africa. *IOS Press*.

Nicol, E., Bradshawa, D., Phillipsa, T., & Dudley, L. (2013). Human Factors Affecting the Quality of Routinely Collected Data in South Africa. *IMIA and IOS Press*.

Nyamtema, A. S. (2010). Bridging the gaps in the Health Management Information System in the context of a changing health sector. *BMC Medical Informatics and Decision Making*.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success:models, dimensions, measures,and interrelationships. *European Journal of Information Systems*.

Saha, I., & Paul , B. (2016). *EEssentials of Biostatistics.* Academic Publishers.

Sharma, A., Rana, S. K., Prinja, S., & Kumar, R. (2016). Quality of Health Management Information System for Maternal & Child Health Care in Haryana State, India. *PLoS ONE*.

Simba, D. O., & Mwangu, M. A. (2006). Factors influencing Quality of Health Management Information System(HMIS) data:The case of Kinondoni District in Dar es Salaam Region,Tanzania. *East African Journal of Public Heath*.

Statistics, K. N. (2015). *Kenya Demographic and Health Survey.*

Tadesse, K., Gebeye, E., & Tadesse, G. (2014). Assessment of health management information system implementation in Ayder referral hospital, Mekelle, Ethiopia. *International Journal of Intelligent Information Systems*.

Teklegiorgis, K., Tadesse, K., Mirutse, G., & Terefe, W. (2016). Level of data quality from Health Management Information Systems in a resources limited setting and its associated factors, eastern Ethiopia. *South African Journal of Information Management* .

Tilahun, B., & Fritz, F. (2015). Modeling antecedents of electronic medical record system implementation success in low-resource setting hospitals. *BMC Medical Informatics and Decision Making*.

World Health Organisation. (2010). *Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and their Measurement Strategies.* Geneva: World Health Organisation.

Yin, R. K. (2015). *Case Study Research Design and Methods.* London: SAGE Publications.

APPENDIX 1: QUESTIONNAIRE

FACTORS INFLUENCING PERFORMANCE OF ROUTINE HEALTH INFORMATION SYSTEM IN GARISSA SUB COUNTY

INTRODUCTION

The purpose of this questionnaire is collect data on the perceptions, views and experiences of health facility managers and departmental heads on the factors influencing performance of the routine health information system in Garissa Sub County. Kindly provide your honest answers to all the questions in the questionnaire

SECTION A: GENERAL INFORMATION

Kindly tick (√) your response for the following questions in the appropriate box

1. What is your gender?

   ☐ Male

   ☐ Female

2. What is the type of facility/department/management level do you work (*Tick one*)

   ☐ Dispensary

   ☐ Health Centre

   ☐ Sub county Hospital

   ☐ County referral Hospital

   ☐ Sub county health management team

   ☐ County health management team

3. What is your position category? (*Tick one*)

☐ Health facility manager

☐ Head of department

☐ HRIO

☐ Sub county HMT member

☐ County HMT member

4. What is your highest level of education?

☐ Diploma

☐ Undergraduate Degree

☐ Postgraduate degree(Masters, PhD)

5. How long have you been employed in your current position?

☐ Less than 5 years

☐ 5-9 years

☐ 10-15 years

☐ Over 15 years

SECTION B: PERFORMANCE OF ROUTINE HEALTH INFORMATION SYSTEM

In your opinion, please rate the extent to which you agree with the following statements. Tick (√) your preferred answer

		Strongly disagree	Disagree	Neither	Agree	Strongly agree
	Data Accuracy					
1.1	Data reported in the health facility monthly reports is					

		Strongly disagree	Disagree	Neither	Agree	Strongly agree
	similar to the data in the health facility registers					
1.2	Monthly data available in the DHIS2 is similar to the data on monthly reports submitted to records office					
	Data Completeness					
1.3	Expected monthly reports are submitted to the health records office					
1.4	Data elements in the expected monthly reports are completely filled					
	Timeliness					
1.5	Monthly reports are submitted by the specified deadline to the health records office					
	Use of health information					
1.6	Heath data is analyzed and used to inform decisions aimed at improving quality and coverage of health services					

		Strongly disagree	Disagree	Neither	Agree	Strongly agree
1.7	Performance of health indicators is discussed during staff meetings					

Section 2: Influence of technical factors on performance of routine health information system

In your opinion, please rate the extent to which you agree with the following statements. Tick (√) your preferred answer

	Statement	Strongly disagree	Disagree	Neither	Agree	Strongly agree
2.1	Routine health information system reporting forms and registers used in your health facility/department are complicated					
2.2	Your health facility/department has adequate reporting forms and registers					
2.3	All the indicators reported on monthly basis by your health facility/ department are standardized					

		Strongly disagree	Disagree	Neither	Agree	Strongly agree
2.4	District health information system(DHIS) is user friendly					

Section 3: Influence of Organizational factors on performance of routine health information system

In your opinion, please rate the extent to which you agree with the following statements. Use Please tick (√) the appropriate answer.

	Statement	Strongly disagree	Disagree	Neither	Agree	Strongly agree
3.1	Your health facility or department has adequate staffs responsible for routine health information system(RHIS) related tasks					
3.2	Staffs in your health facility or department are trained on routine health information system					
3.3	Your health facility or department has a strategic plan or annual work plan with a clear monitoring and evaluation plan					
3.4	Your health facility/department receives regular supportive supervision					

	Statement	Strongly disagree	Disagree	Neither	Agree	Strongly agree
	visits focusing on quality of data and use of information					
3.5	Your health facility/department has adequate funds to support routine health information system activities					
3.6	Your health facility/department has a clear structure on who is responsible for routine health information system tasks					
3.7	Your health facility/department promotes a culture of using evidence from routine health data to make decision					

Section 4: Influence of behavioral factors on performance of routine health information system

In your opinion, please rate the extent to which you agree with the following statements. Please tick (√) the appropriate answer

	Behavioral factors	Strongly disagree	Disagree	Neither	Agree	Strongly agree
4.1	Staffs in my health facility/department have data quality checking skills					
4.2	Staffs in my health facility/department have the skills to perform DHIS related tasks such as data analysis and interpretation					
4.3	Staffs in my health facility/department have confidence to perform DHIS related tasks such as data analysis and interpretation					
4.4	Staffs in my health facility/department are motivated to perform DHIS related tasks					

Nicholas Kirimi Silas

P.O Box 668 Garissa

Tel 0724431712

Email: nicholas.kirimi@gmail.com

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: REQUEST TO PARTICIPATE IN RESEARCH STUDY

Am a postgraduate student at the University of Nairobi pursing a Master of Arts degree in Project planning and management. As part of the course, am conducting a research to determine the **factors influencing performance of routine health information system in Garissa Sub County**.

I kindly request you to participate in this study by providing honest responses to all the questions in the attached questionnaire. The data collected will be kept confidential and used for academic purposes only. In addition, it will enhance knowledge on factors that influence performance of health information system.

Thank you

Yours faithfully

Nicholas Kirimi Silas

APPENDIX 3: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MR. NICHOLAS KIRIMI SILAS
of UNIVERSITY OF NAIROBI, 668-70100
Garissa,has been permitted to conduct
research in *Garissa County*

on the topic: *FACTORS INFLUENCING
PERFORMANCE OF ROUTINE HEALTH
INFORMATION SYSTEM: THE CASE OF
GARISSA SUBCOUNTY, KENYA*

for the period ending:
7th July,2018

Permit No : NACOSTI/P/17/59165/18096
Date Of Issue : 10th July,2017
Fee Recieved :Ksh 1000

....
Applicant's
Signature

....
Director General
National Commission for Science,
Technology & Innovation

APPENDIX 4: RESEARCH AUTHORIZATION LETTER

NATIONAL COMMISSION FORSCIENCE, TECHNOLOGY ANDINNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9ᵗʰFloor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/59165/18096**   Date: **10ᵗʰ July, 2017**

Nicholas Kirimi Silas
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Factors influencing performance of Routine Health Information System: The case of Garissa Sub County, Kenya,"* I am pleased to inform you that you have been authorized to undertake research in **Garissa County** for the period ending **7ᵗʰ July, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Garissa County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Garissa County.

The County Director of Education

APPENDIX 5: UNIVERSITY OF NAIROBI INTRODUCTION LETTER

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
N A I R O B I

30th JUNE 2017

REF: UON/CEES /NEMC/059

TO WHOM IT MAY CONCERN

RE: NICHOLAS KIRIMI SILAS- REG NO L50/82504/2015

This is to confirm that the above named is a student at the University of Nairobi College of Education and External Studies, School of Continuing and Distance Education, Department of Extra-Mural Studies pursuing Master of Arts in Project Planning and Management.

He is working on his project entitled "Factors influencing performance of Routine Health Information System: The case of Garissa Sub county, Kenya. "

Any assistance given to him will be appreciated.

CARREN AWILLY
CENTRE ORGANIZER
NAIROBI LEARNING CENTRE

67