# AN INFORMATION STORAGE AND RETRIEVAL SYSTEM FOR MINISTRY OF EDUCATION AND SPORTS

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**APROJECT REPORTSUBMITTED TO THE DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE IN PARTIAL FULLFILMENT OF THE REQUIRMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF LIBRARY AND INFORMATION SCIENCE OF MAKERERE UNIVERSITY KAMPALA**

**JULY, 2018**

## DECLARATION

I, Kisule Nicholous hereby declare that this project report entitled *"An Information Storage and Retrieval system for Ministry of Education and Sports."* is my original work carried out in partial fulfillment for the award of the degree of Bachelor of Library and Information Science under the guidance and supervision of Mr. Mwanje Ssenono Aloysius. The matter embodied in this report has never been submitted for any academic award to any University or higher institution of learning to the best of my knowledge.

..... 27/07/2018

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## APPROVAL

This is to certify that this project report entitled *"An Information Storage and Retrieval system for Ministry of Education and Sports."* by Kisule Nicholous has been submitted for evaluation as a partial fulfillment for the award of the degree of Bachelor of Library and Information Science under my supervision and approval.

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MR. MWANJE SSENONO ALOYSIUS

SUPERVISOR

22/07/2018

.....

DATE

## DEDICATION

I dedicate this piece of work to my family and more particularly to my beloved parents, Mr. Mugweri Richard and Ms. Magambe Juliet. Thank you for your support and May God continue to bless you.

## ACKNOWLEDGEMENT

I am so grateful to the Almighty God for the good health, favour and wisdom he bequeathed me in times of hopelessness and absolute hardship during the composition of this project report.

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## LIST OF ACRONYMS

| | |
|---|---|
| **MoES** | Ministry Of Education and Sports |
| **CIM** | Communication and Information Management |
| **ICT** | Information Communication Technology |
| **HTML** | Hyper Text Markup Language |
| **CSS** | Cascading Style Sheet |
| **MYSQL** | My Structured Query Language |
| **ISRS** | Information Storage and Retrieval System |
| **IR** | Information Retrieval |
| **RAM** | Random Access Memory |

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## ABSTRACT

The project purpose was to design and develop an information storage and retrieval system for MoES. The project objectives were to: Examine the current information storage and retrieval system, Assess the challenges associated with the storage and retrieval system used in the Ministry of education and sports, Determine the requirements for designing an information storage and retrieval system for the Ministry of education and sports and Design and develop an information retrieval and storage system for the Ministry of Education and sports in order to facilitate storage and retrieval

The study focused on a population of 40 respondents from which a sample size of 36 respondents was selected using a simple random sampling technique. The study adopted a qualitative research design in incorporation with the interview, questionnaire and observation methods to collect data from respondents

The study found out that the dominant means of storage and access to information resources at the resource center was the use of library shelves, the means of access to information resources was through the manual procedural process that involved user-staff involvement and paper documenting, the main system requirements were the ability to support electronic information resource storage, quick access and retrieval of the stored resources, the users agreed with the design of the new ISRS to streamline information storage and retrieval at the resource center.

The study concluded that shelves were the means of storage of information resources at the ministry resource center, storage access and retrieval of information resources were a challenge, ability of the new ISRS to support electronic storage, quick access and retrieval were the requirements anticipated by the respondents, the new ISRS was greatly desired for at the ministry resource center to solve challenges experienced with the current manual ISRS

The study recommended that other means of information storage should be thought of to reduce over reliance on the use of shelves, a manual ISRS should be replaced with automated means of storage and retrieval to solve challenges in storage, access and retrieval, the new system should be in support of electronic storage, access and retrieval of information resources as key requirements of an ISRS, the new ISRS should be implemented and that user training and education should be done to orient users on how to interact with the system

# CHAPTER ONE: INTRODUCTION

## 1.1 INTRODUCTION

This chapter presents the background of the study, the problem statement, the project purpose, project objectives, research questions, scope of the study, significance of the project, and the project justification.

## 1.2 BACKGROUND OF THE STUDY

### 1.2.1 CONCEPTUAL BACKGROUND

The ministry of Education and sports coordinates monitors and endures the availability of all government policies and programs relating to education and sports sector. It also ensures availability of information resources to support and promote development and service delivery within the ministry departments and the resource users and other information materials to educated all people

According to Kallus (2000), storage and retrieval systems are processes and systems of capturing and finding materials usually documents of an unstructured nature (usually text) that satisfy information needs from within large collections. This is the professional practice of controlling and governing what are considered to be most important records of an organization throughout the records life cycle. Records storage and retrieval systems are designed to allow the definition, creation, query update and administration of data.

Rouse (2000) expressed that records storage and retrieval systems are created with software like Mysql Microsoft access amongst the many. The study by Laudan (2006) stated that information has increasingly become a major concern of every organization. It is a resource which is required in all aspects of management which include planning, directing, budgeting organizing and controlling therefore many organizations in the world today have to keep track of important information to effectively manage and control their organizations

Storage and retrieval systems have evolved from manual based systems to computerized systems. Computer based systems have now advanced to online based systems that are supported over a

broad band network through which users are able to share resources. Organizations accumulate number records in electronic and print. These need to be promptly stored and preserved for future access and to facilitate easy and quick retrieval when needed. Storage and Retrieval systems at the ministry have not been effective thus the great need to develop an online system to increase the effectiveness of all storage and retrieval tasks.

### 1.2.2 ORGANIZATIONAL BACKGROUND

The Ministry of Education and Sports is a Government entity, charged with the responsibility of providing high quality education and sports services to all Ugandans. Amongst the goals and objectives charged with the ministry is to; ensure of universal and equitable access to quality basic education and to improve the quality of information.

In attempt to achieve the above objectives, MoES established a resource centre that collates, converges and harbours information resources that relate to all project reports, policy statements, annual reports, ministerial reports, magazines, amongst others.

The wide categories of information resources are managed with a manual resource system that mainly facilitates external and internal user access, storage, retrieval and preservation for institutional memory.

Despite of the rich information resource facilities at the ministry resource centre, the manual resource system that is used to manage information resources is not effective to the fullest to ensure prompt user access, storage, retrieval and electronic preservation as the users would require. This project introduced an automated information storage and retrieval system that was seconded by the majority of staff and information resource users to help address storage, access and retrieval functionalities at the ministry resource centre.

## 1.3 PROBLEM STATEMENT

The absence of a well-established information storage and retrieval system at the Ministry of Education has led to inconveniences in the storage and retrieval of information materials that continue to accumulate from all departments at the ministry. The problem source relates to the fact that the system used to store and retrieve information is entirely manual-based and associated with

challenges of diminishing physical storage space, long time of access, search and retrieval problem and cumbersome for management staff. Due to the great deal of challenges, storage and retrieval of information required by users becomes seemingly complex to attain with the existing manual-based system.

Conully(2006)says it is crucial that every institution owns a storage and retrieval system. Ministry of education and sports does not have one and this problem was worth of investigation and through the processes, the design of a storage and retrieval system was to be effected.

## 1.4 PROJECT PURPOSE

The purpose of this project was to design and develop an information storage and retrieval system for the Ministry of education and sports to streamline information storage and to quicken retrieval of the information materials

## 1.5 PROJECT OBJECTIVES

The project objectives were to:

1) Examine the current information storage and retrieval system.
2) Assess the challenges associated with the storage and retrieval system used in the Ministry of education and sports.
3) Determine the requirements for designing an information storage and retrieval system for the Ministry of education and sports.
4) Design and develop an information retrieval and storage system for the Ministry of Education and sports in order to facilitate storage and retrieval.

## 1.6 RESEARCH QUESTIONS

The study was guided by the following research questions:

1) How are information materials stored and retrieved in the Ministry of Education and sports?
2) What challenges are associated with the retrieval and storage system used bin the resource center?

3) What requirements are necessary in the designing of a retrieval and storage system for the Ministry of Education and sports
4) How best can the retrieval and storage system of the resource center be designed?

## 1.7 SCOPE OF THE PROJECT

### 1.7.1 GEOGRAPHICAL SCOPE

The study was conducted at the Ministry of Education and Sports(MOES)

### 1.7.2 TIME SCOPE

The project study ran for a period of five (5) months thus from February, 2018 to June, 2018

### 1.7.3 CONTENT SCOPE

The study focused on designing an Information Storage and Retrieval System (ISRS).The project study also covers content relating to the types of ISRS, challenges of ISRS and the functions of ISRS

## 1.8 SIGNIFICANCE OF THE PROJECT

The primary beneficiaries of this project are;

The Ministry of Education and Sports(MOES):the project benefits the ministry in a way that it solves problems of limited physical space for storage of information resources that were experienced with the manual system. The project also improves access and retrieval to the resources through the use of electronic means that provide for search using an automated index.

Users of the resource center at the Ministry of Education and Sports (MOES): the project supports easy access to information materials through the use of an automated index that facilitates search for information resources stored in the system.

Staff members at the Ministry: the project ensures maintenance of institutional memory because the system supports electronic storage and preservation of information resources. In addition,

administrative staff is able to strengthen delivery and access to information resources with the system.

## 1.9 JUSTIFICATION OF THE PROJECT

This project was important in the following ways.

The major importance of this project was to streamline the storage and retrieval of information resources at MoES.

The project offers simplified access to information resources at the ministry and facilitates electronic storage of information resources. Additionally, it makes retrieval easier through the use of the search index. All the tasks are convenient to the user and to do not take a lot of users' time like it is the case with the manual systems.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 INTRODUCTION

This chapter reviewed related literature on ‘‘storage and retrieval systems’’ according to project objectives in order to establish a research gap.

## 2.2 OBJECTIVE ONE: TO EXAMINE THE CURRENT INFORMATION STORAGE AND RETRIEVAL SYSTEM

Chowdhury(2007) noted that the concept of information retrieval presupposes that there are some documents or records containing information that have been organized in an order suitable for easy retrieval. Sayed(2010) argued that information retrieval system has three major components that is the document subsystem, the user subsystem and the searching subsystem.

Chowdhury(2007) states that information retrieval system allows people to communicate with an information system, in order to find information-text, graphic images, sound recordings or video that meet their specific needs. In the setup an information retrieval system ‘the user intentions and easy to access information must be the first priority

According to Kallus(2000), storage and retrieval system are process and systems for capturing and finding material usually documents of unstructured nature (usually text) that satisfies an information need

Quinn and Haslam(1998) discussed the plan of the University of Nevada at Las Vegas (UNLV) to acquire an AS/RS system similar to the one at California State University, Northridge (CSUN). They argued that government documents were excellent candidates for AS/RS storage. These lower-use items were less vulnerable to vandalism and stored under better environmental conditions. UNLV believed putting government documents into an AS/RS would enable better bibliographic control over the depository collection, although the documents needed to have records created for the AS/RS system. Quinn and Haslam also provided a list of government document titles that would be suitable for storage.

Shirato, Cogan, and Yee (2001) discussed the experience of Eastern Michigan University's (EMU) installation and use of a new AS/RS system in 2000. Their system, which they called ARC (Automated Retrieval Collection), boasted a capacity of 800,000 volumes and greatly alleviated space issues facing the Library. Their policy included loading lower-use items into the system randomly; these items are tracked by item bar code rather than call number. They have experienced some mechanical and technical issues with the system as well as some patron complaints, particularly related to the inability to browse. They intend to continue with patron education to familiarize everyone with the use of the system. Overall, they are satisfied with the performance and space-saving aspects of the ARC.

Bullard,R., &Wrosch,J. (2009). Eastern Michigan University's automated storage and retrieval system: 10 years later. Journal of Access Services, 6, 388–395.[Taylor & Francis Online], [Google Scholar]) further described the process of fully implementing an AS/RS system at Eastern Michigan University (EMU) in 2009. They related the process of deciding what to include in the system, which items stored well and which did not, and the advantages of using an automated system. Unlike UNLV, EMU declined to place their government documents in the AS/RS, as they did not desire to separate parts of the collection. Additionally, the authors outlined the process and procedures needed to make their system a success and an integral part of the Library.

### 2.2.1TYPES OF IR SYSTEMS

IR has concentrated more on finding the documents consisting of written text; much IR research focuses more specifically on text retrieval – the computerized retrieval of machine-readable text without human indexing.But it has spread across other interesting areas. Such as:

Speech Retrieval: Speech is an information-rich element of multimedia. Now there exists several techniques where information can be extracted from a speech signal in a number of different ways. Thus there are several well-established speech signal analysis research fields.

Cross language information retrieval: It is an application area of information retrieval, which deals with fetching information written in a particular language different from the language of the user's query. For example, Using Hindi queries to retrieve English documents. It is one of the challenging fields and a lot of research is going on in this area.

Image Retrieval: It is part of sub-field of information retrieval. It helps the retrieval system for browsing, searching and retrieving images from a large database. The database may contain only digital images, images along with text or may contain other types of resources like graphics, videos, audios along with the image, etc. Most popular and common techniques of image retrieval utilize some method of adding metadata such as use of captioning, keywords, or descriptions to the images so that retrieval can be performed over the annotation words. The manual process of image annotation is not only time-consuming but is also a laborious and expensive affair; to address this, there has been a large amount of research done on automatic image annotation and image detection. Moreover, with the increase in usage of social networks and a shift in paradigm from web to data web warrants new technology framework have inspired the evolution of several web-based image annotation tools.

Music Retrieval: Music information retrieval (MIR) is the interdisciplinary field of retrieving usefulinformation from music. MIR, although small yet it is a growing field of research with many real worldapplications. Several researchers working in MIR may come from different background whichincludes computer science, instrumentation, musicology, psychology, academic music study, signalprocessing, machine learning or some combination of these.

In addition to the above mentioned retrieval systems, IR also deals with any types of entity or object for example work of art, software, courses offered at a university, people, products of any kind, man Text, speech or images, printed or digital, carry information, hence information retrieval

### 2.2.2 FEATURES OF IR SYSTEMS

An information retrieval system is developed in order to help users to discover relevant information from a storehouse containing collection of documents. The idea of information retrieval assumes that there exist several documents or records comprising data that have been arranged in a suitable order for easy retrieval.

The storehouse contains much bibliographic information, which is quite different from other kinds of information or data.

Conventional database management systems, such as Access, Oracle, MySQL, among others, deal with structured data, where the arrangement or structuring of data takes place on the basis of the specific attributes of the data elements specific commodities. The main objective of these databases is to enable the user to search for specific records that be matched with one or more specific conditions or search

The main purpose of designing an information retrieval system is to meet the user requirements. It enables in document retrieval in-order to answer to the users' queries. The retrieved information can be in represented in different forms.

The database can store abstracts of some bibliographic resources or full texts of documents, such as journal articles, conference proceedings, newspaper articles, textbooks, encyclopaedias, legal documents, and statistical records, etc. along with audios, graphics, images and videos information.

### 2.2.3 BASIC COMPONENTS INVOLVED IN STORAGE AND RETRIEVAL

An IR system performs retrieval operation by indexing documents and designing queries, thereby leading to representation of documents and representation of queries, respectively; the system then matches the indexed documents with that of user query and displays the matched documents found and the user selects the relevant items. These operations are tightly intertwined and are directly dependent on each other. The search process often goes through several iterations: several cases feature similarity measurement is used in order to distinguish the relevant documents from irrelevant ones and thereby it is used to improve the query or the indexing (relevance feedback).

### 2.2.4 INDEXING (CREATING DOCUMENT REPRESENTATIONS)

Indexing (from the library science point of view can also be referred as cataloguing, metadata assignment, or metadata extraction) is the manual or automated process creating indexes for record collections. Having indexes allows researchers to more quickly find records for specific individuals; without them, researchers might have to look through hundreds or thousands of records to locate an individual record.

We focus here on subject indexing – act of describing or classifying a document by index terms or other symbols in order to indicate what the document is about, to summarize its content or to increase its find ability. Indexing can also be document-oriented – the indexer captures what the subject of the document, or request-oriented – the indexer assesses the document's relevance to other features of interest to users; for example, indexing the recipes in a cookbook in accordance to the course-type or meal or primary ingredients, etc. making the resource interesting for the users.

Abstracting is related to indexing – act of providing a summary of the full document giving the main content of the document or sometimes it may also include important results (informative abstract, summary). A lot of researchers have their interest on designing algorithms for building automatic summarization.

Automatic indexing begins with feature selection and extraction, this demands in extracting all the words from a text, this is followed by elimination of stop-words (words which are filtered out prior to, or after, processing of natural language data (text).There is not one definite list of stop words which all tools use and such a filter is not always used. Some tools specifically avoid removing them to support phrase search), stemming (the process for reducing inflected words to their stem, base or root form—generally a written word form. In case of images, extractable features include colour distribution, texture or shape detection. For music, extractable features comprises of frequency of occurrence of notes or chords, harmonies, melody, main pitch, beats per minute or rhythm in the piece.

Features are generally processed further for retrieval. The system makes use of a classifier that links the raw or refined features with that of a descriptor from a pre-established index language.

A classifier can be built manually by making each descriptor act as a query description and building a query formulation for it. Moreover a classifier can be built automatically by making use of training sets, for example, the list of documents for biotechnology, for machine learning of what features predict what descriptors. There exist several techniques that enable prediction of different words and word combinations by using the same descriptor, thereby making it easier for users to find all relevant documents on a given context. The process of assigning documents to (mutually

exclusive) classes of a classification is also known as text categorization. Analysing the documents having similar features and clustering them in one group lead to identification of unique classes in which the documents belong. These are some initial steps of document classification.

### 2.2.5 QUERY FORMULATION (CREATING QUERY REPRESENTATIONS)

Information Retrieval means making use of the available information in-order to anticipate the extent to which a given document is significant or useful for a particular users' information need as outlined in a free-form query description, also called topic description or query statement.

A user's query can be transformed, manually or automatically, into a formal query representation (also called query formulation) when combined with features, it helps to predict the usefulness of a document with respect to the query. The information need of the users can be identified by analysing the query in terms of the system's conceptual schema, ready to be matched with document collected in the database.

A query may be in search of text words or phrases that the system should acknowledge and search (free-text search) or any other entity feature, such as descriptors assigned from a controlled vocabulary, an author's organization, or the title of the journal where a document was published. A query can simply give features in an unstructured list (for example, a "bag of words") or combine features using

Boolean operators (structured query). Examples: The Boolean query specifies three conditions, AND, OR, NOT. If a query contains AND operator it indicates narrow search and retrieve records containing all of the words it separates. Similarly if the query includes OR operator it broadens the search and retrieves records containing any of the words it separates. The symbol '|' can be used instead of 'or' (for example, 'mouse | mice | rat' is equivalent to 'mouse or mice or rat'). Lastly NOT operator indicates narrow search and retrieve records that do not contain the term following it.

If there exists some relevant documents, the system can use them as a training set to build a classifier with two classes: relevant and not relevant. These relevant and non-relevant documents will lead to the measurement of recall and precision. The requirement for the information need and

formulating the query often acts as a cup and plate as they move together, directly dependent upon each other.

### 2.2.6 SELECTION

The user searches for the most relevant result and selects the appropriate items. Results can be organized in rank order (the search process can be stopped once the users' need is fulfilled); in case of groupings the documents based on subject, automatic classification scheme or clustering techniques (similar items can be examined side by side) can be applied. The display of titles along with the abstract with key terms highlighted is considered to be the most useful (as title alone is too short, the full text too long). For certain scenarios users may require assistance while making the connection between an item found and the task at hand.

### 2.2.7 RELEVANCE FEEDBACK AND INTERACTIVE RETRIEVAL

Once the user has evaluated the significance of a few items found, the query can be made better. The system can thereby provide assistance for the users in enriching the query by displaying a list of features (assigned descriptors; text words and phrases, and so on) found in many relevant items and another list from irrelevant items. In some cases the system can automatically improve the query by identifying those unique features which can distinguish between relevant from irrelevant items and thus are good predictors of relevance.

## 2.3 OBJECTIVE TWO: TOASSESS THE CHALLENGES ASSOCIATED WITH THE STORAGE AND RETRIEVAL SYSTEM USED IN MoES

AS/RS systems requires knowledge, skills and experience, It requires significant investments of the company’s capital, Particularly for the maintenance and updating of different subsystems, The capital expenses can tempt some business owners to cut the financial corners to buy the bargain systems that are ill-equipped for extensive, long-term use can end up costing far more in the long run (Soffar, 2017).

Chapple (2009) notes that information storage and retrieval systems face challenges of complex, difficult and time consuming to design. To design ISRS requires time which may not be available to some organization. It also needs enough time to train the users on how to use the system. It is

also expensive to buy system requirements like the hardware and software for the system designing.

Alan Norton (2011) Complexity of the ISRS the systems, one obvious trend is irrefutable: The IT world has gotten increasingly complex. The complexity is rapidly reaching a point of critical mass, where one single developer can no longer know everything needed to be proficient at his or her job. Because of this, teamwork is more important than ever.

He also notes that Data storage and retrieval is not obvious since most data needs are short-term, but there is trouble lurking in those data archives. Perhaps you are an unknowing victim of this silent crisis in the making. If you have important files on those old 5 1/4-inch floppies and you need to go back and retrieve one, you may be out of luck. Chances are that that the data is no longer readable and the device you need to read the media has long since been tossed into the trash bin. Or, as in my case, turning on the old antique microcomputer to read my single-sided, single-density floppies might lead to a fire and the quick end of your weekend data retrieval project

Most of the challenges associated with digital preservation are organizational – not technical. The first line of defense against loss of valuable digital information rests with the creators, providers, and owners of digital information. [Marcum, 1997] There are many different stakeholders over the lifecycle of digital resources and uncertainties over who should be responsible for preservation activities.

## 2.4 OBJECTIVE THREE: TO DETERMINE THE REQUIREMENTS FOR DESIGNING AN INFORMATION STORAGE AND RETRIEVAL SYSTEM FOR MoES

### 2.4.1 FUNCTIONING OF IR SYSTEM

The functioning of an ISRS looks at the functional and non-functional requirements.

Requirements of any system are determined through the requirements gathering phase after which they are analysed in the requirement phase where they are structured as functional or non-functional. Functional requirements describe exactly what the system must do whereas non-functional requirements assist the functionality of the functional requirements

System requirements can be determined through the use of a variety of requirement gathering techniques like individual interview, Joint Application Design (JAD), radical engineering, prototyping amongst the many.

#### 2.4.1.1 FUNCTIONAL REQUIREMENTS

An information system essentially makes ensure that users should be satisfied with the service. The system is able to accomplish tasks, solve problems, and make decisions, based on the user needs.

In short an information retrieval system should:

1) allow users to login into the system
2) facilitate search with key terms of the resource materials
3) allow users to upload and download materials
4) facilitate electronic storage and preservation of electronic resources
5) provide statistics of resources manage online
6) allow access with internet connectivity
7) allow librarian to perform administrative controls
8) Match documents with user needs in-order to fetch relevant documents.

To determine the user needs, it involves in studying information needs of users in general as a basic for designing responsive system (such as determining what study materials required for library and information science students typically need to do assignments in content management), and actively soliciting the needs of specific users, expressed as query descriptions, so that the system can provide the information.

To have a successful retrieval system, it should figure out what information the users require to solve a problem. Query matching involves in mapping a query description with relevant documents in the collection; this is the task of the IR system.

All operations pertaining to information retrieval surround around usefulness and relevance of documents. The use of a document is dependent upon on three major things thus topical connectedness applicability, and originality. A resource is considered to be topically significant

for a particular context, question, or task if it consists of information that either instantly provides answer to the query or can be used, in combination with other information, to infer an answer or perform the task. The appropriateness of the answer completely depends upon the user for a given context. It is original if it provides an input to the user's knowledge. Let us consider a simple situation where, a basketball player is important for a team if his abilities and playing style fit the team strategy, applicable if he is compatible with the coach, and possess unique talent if the team is missing a player in his position.

From the literatures point of view, the term "relevance" is used for different purpose; it can indicate utility or topical relevance or pertinence. Many IR systems focus on finding topically relevant documents, leaving further selection to the user.

### 2.4.1.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements aid the functionality of the functional requirements. The ISRS have the following functional requirements

1) A good processing speed for which it processes user requests
2) The capability to incorporate large volumes of resources stored online
3) Provide quick access to resources stored online
4) The system should be flexible with Graphical user interface to enable users with minimum computer skills to interact with the system
5) Ability to support a number of users at the same time without breakdown

### 2.4.1.3 HARDWARE AND SOFTWARE REQUIREMENTS

Hardware and software requirements are required of any information system. Hardware refers to the tangible components of a system whereas software refers to the programs that run on the hardware and determine the way the system should operate. The hardware and software of the ISRS are briefly described in table 2.1 below

**TABLE 2.1: HARDWARE AND SOFTWARE REQUIREMENTS**

| HARDWARE REQUIREMENTS | SOFTWARE REQUIREMENTS |
|---|---|

| | |
|---|---|
| Internal memory of about 512MB | Operating System like Windows O'S |
| RAM 2GB minimum capacity | Greenstone Software |
| Simple Hard Disk | Server |
| Good processor speed of 1.33GHz minimum speed | Web browser like opera mini, Google chrome, Mozilla Firefox or internet explorer |
| Optical Mouse to support GUI interface | |
| Monitor | |
| Stable bandwidth | |

**SOURCE: PRIMARY DATA (2018)**

### 2.4.1.4 USER REQUIREMENTS

The basis users of the ISRS are the librarian and plain users at the resource center. Each of the requirements are clearly defined in table 2.2 below. The librarian refers to all users that have administrative authorities at the resource center. Their requirements are restricted to managing the users and the resources whereas the users refer to all users that benefit from the services provided by the administrative staff at the ministry resource center.

**TABLE 2.2: USER REQUIREMENTS**

| USER CATEGORY | REQUIREMENTS |
|---|---|
| USER | login, search the ISRS,Download resources, logout |
| LIBRARIAN | login, gather resources, upload resources, add metadata to resources, view uploads, view statistics, authorize access to users,logout |

**SOURCE: PRIMARY DATA (2018)**

### 2.4.2 IMPORTANCE OF RECORDS STORAGE AND RETRIEVAL

According to Penn (2001), space saving is the best most immediately real need benefit of records management program.Stewart (2002) states that an added benefit in improving system is the reeducation of misfiles and lost records which can result in costly search to locate the need record.

Protection of retrieved records, London (2001) says that destruction of important records can cost organization millions of dollars and threaten the organization ability to function, thus jeopardizing its existence. Control over creation of new records. Significant percentage of cost of information is in records creation, proper records storage and retrieval system adoptive management can help reduce the proliferation of unnecessary records, documents and copies and sometime improve the effectiveness of these documents that need to be created (Ginn, 2007)

Helmyhaleem(2018) gave the following advantages of the storage and retrieval system

1) Higher stock keeping capacity within limited space Protection of storage goods from theft and damage
2) Automation of dangerous and hard work of storage and retrieval process
3) Prevention of safety accident
4) Real-time & Easy inventory control with computer system
5) Simple expansion of warehouse
6) Faster and more reliable operation of warehouse
7) Comfort and convenient work environment

8) Easy and faster maintenance through modular and standard design
9) Economy in investment and operation

Regulatory Compliance, Unlike a public company, a privately held business isn't subject to most federal and state government compliance requirements. Despite this, many choose to comply voluntarily, both to provide transparency and enhance the business's public image. In addition, small-business owners must store and maintain tax information so, in case of an audit, the information is readily accessible. A well-organized information storage and retrieval system that follows compliance regulations and tax record-keeping guidelines significantly increases a business owner's confidence the business is fully complying.

Efficiency and Productivity, Any time a business owner or employees spend searching through stacks of loose files or spend trying locate missing or misfiled records is inefficient, unproductive and can prove costly to a small business. A good information storage and retrieval system, including an effective indexing system, not only decreases the chances information will be misfiled but also speeds up the storing and retrieval of information. The resulting time-saving benefit increases office efficiency and productivity while decreasing stress and anxiety.

Improve Working Environment, It can be disheartening to anyone walking through an office area to see vital business documents and other information stacked on top of file cabinets or in boxes next to office workstations. Not only does this create a stressful and poor working environment, but if customers see this, can cause customers to form a negative perception of the business. Contrast this with an office area in which file cabinets, aisles and workstations are clear and neatly organized to see how important it is for even a small business to have a well-organized information storage and retrieval system.

## 2.5 OBJECTIVE FOUR: TO DESIGN AND DEVELOP AN INFORMATION RETRIEVAL AND STORAGE SYSTEM FOR MoES

### 2.5.1 SYSTEM MODELING

Muller (2018) defines system modeling as the process of developing abstract models of a system, with different model presenting a different view or perspective of that system. A system model represents aspects of a system and its environment. There are varieties of system models which vary in accordance to the purpose for which they are modeled. The context below looks at the different system models that suit the design and development of an ISRS for MoES

#### 2.5.1.1 USE CASE DIAGRAM

Use cases reflect the Use modeling language (UML) and clearly show how actors are related to the system through the cross associations represented in the models developed.

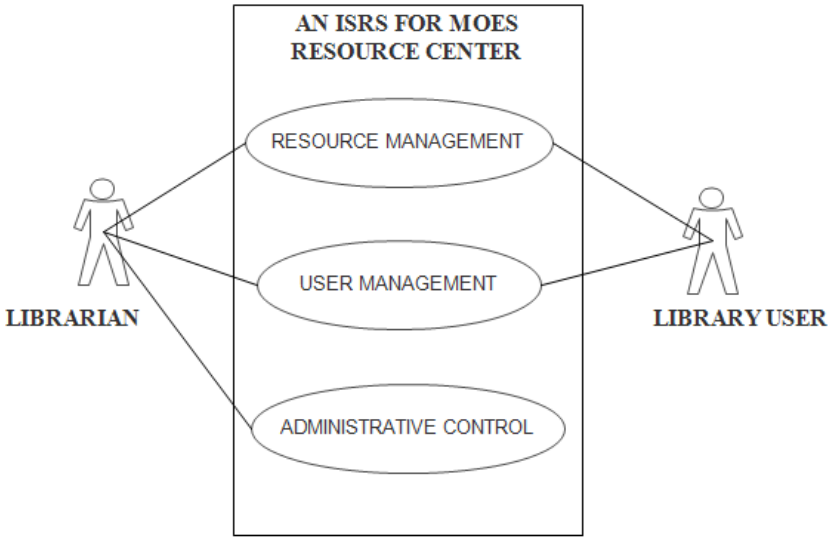
According to Felici (2011), Use Cases in UML capture (to a certain extent) system requirements and support requirements engineering activities and processes

In use case diagrams Actors are represented as stick figures, Use Cases as ellipses whereas Lines represent associations between the actors and use cases

Use case diagrams represent clearly the actors of a system and how they interact with the system activities. The ISRS has two actors thus the ‘user’ and the ‘librarian’.

The user is directly associated with the use case of ‘user management’ and ‘resource management’ whereas the librarian is associated directly with the use cases of ‘user management’, ‘resource management’ and ‘administrative management’. The user management and resource management priorities of users are determined by the librarian in the administrative controls.

**FIGURE 2.1: USE CASE DIAGRAM SHOWING KEY FUNCTIONS OF SYSTEM USERS**



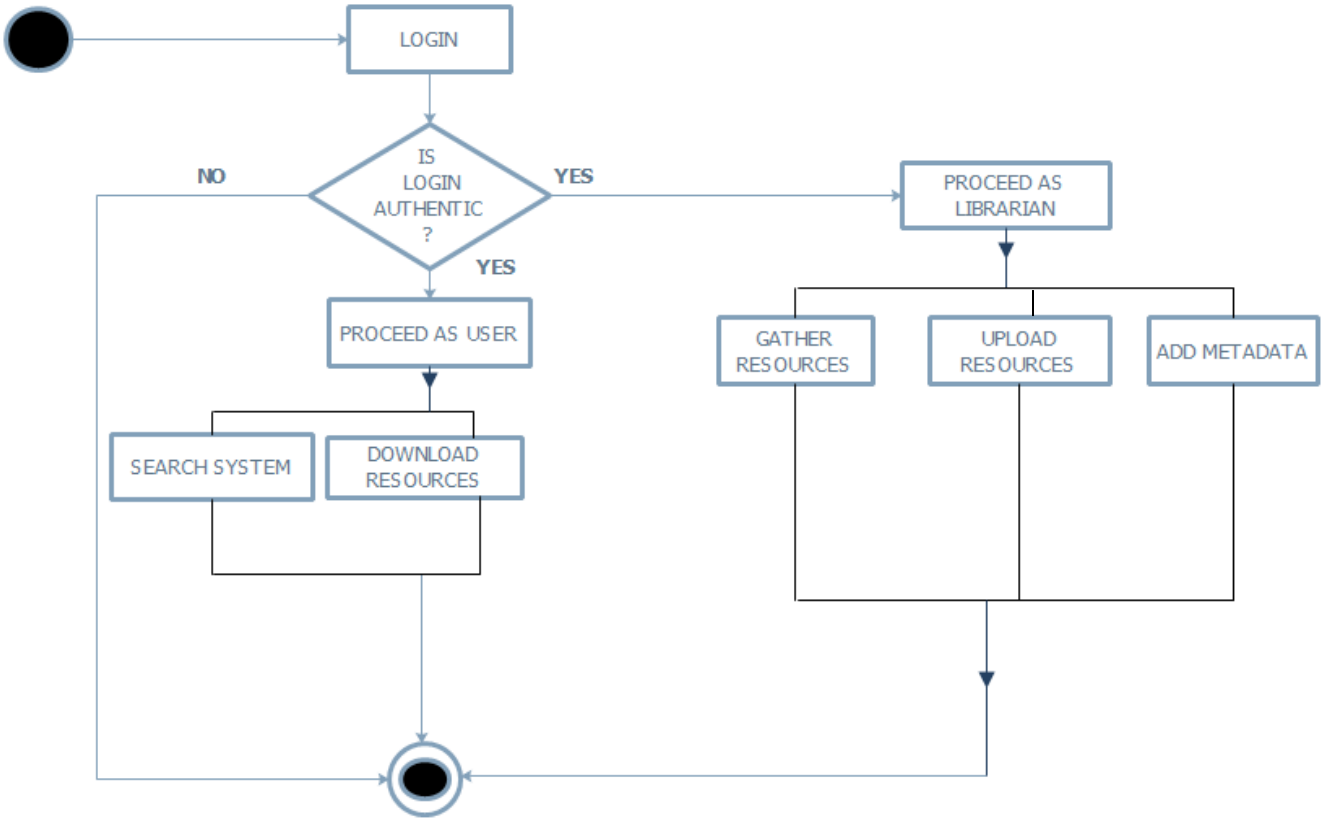

**SOURCE: PRIMARY DATA (2018)**

### 2.5.1.2 ACTIVITY DIAGRAM

An activity diagram is another way of representing system models. It shows clearly the activities played by each entity that is designated to use the system. The activity diagram embraces the action in each of the tasks that take place in the system processes. Each activity is attributed to the entity that is responsible for it from one phase to another.

The ISRS for MoES has majorly two activists that is the user and the librarian. Each of them has a number of activities that they carry out with the system as shown in figure 2.2 below. The tasks required of each activist/user are a breakdown of the use cases resulting from the use case diagram in figure 2.1 above. The user executes tasks under user and resource management as designated to by the librarian(administrator) whereas the librarian executes tasks under user management, resource management and administrative control.

**FIGURE 2.2: ACTIVITY DIAGRAM**




**SOURCE: PRIMARY DATA (2018)**

### 2.5.1.3 FLOWCHART

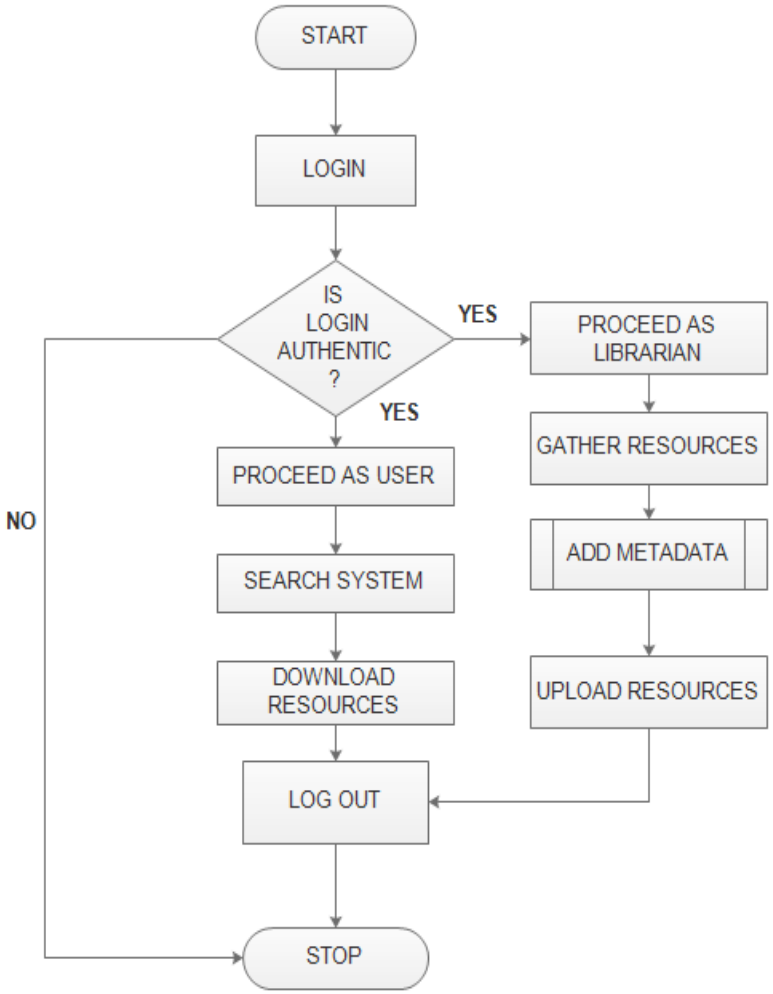
a flowchart is an analytical technique used to describe some aspect of an information system in a clear, concise, and logical manner(Romney and Steinbard, 2003)

A flowchart is a type of diagram that represents an algorithm, workflow or process. It is merely a graphical representation of the sequence of operations in an information system or program. It includes steps from the start to finish.

Flowcharts use standard symbols to represent each stage of activity accruing during the workflow. They use the start/finish, decision, process, sub process, data entity symbols to represent each

activity. Figure 2.3 shows a representation of a flowchart for an ISRS designed for MoES resource center.

**FIGURE 2.3: FLOW CHART SHOWING THE FLOW OF PROCESSES IN AN ISRS**




**SOURCE: PRIMARY DATA (2018)**

### 2.5.1.4 ENTITY RELATIONSHIP DIAGRAM (ERD)

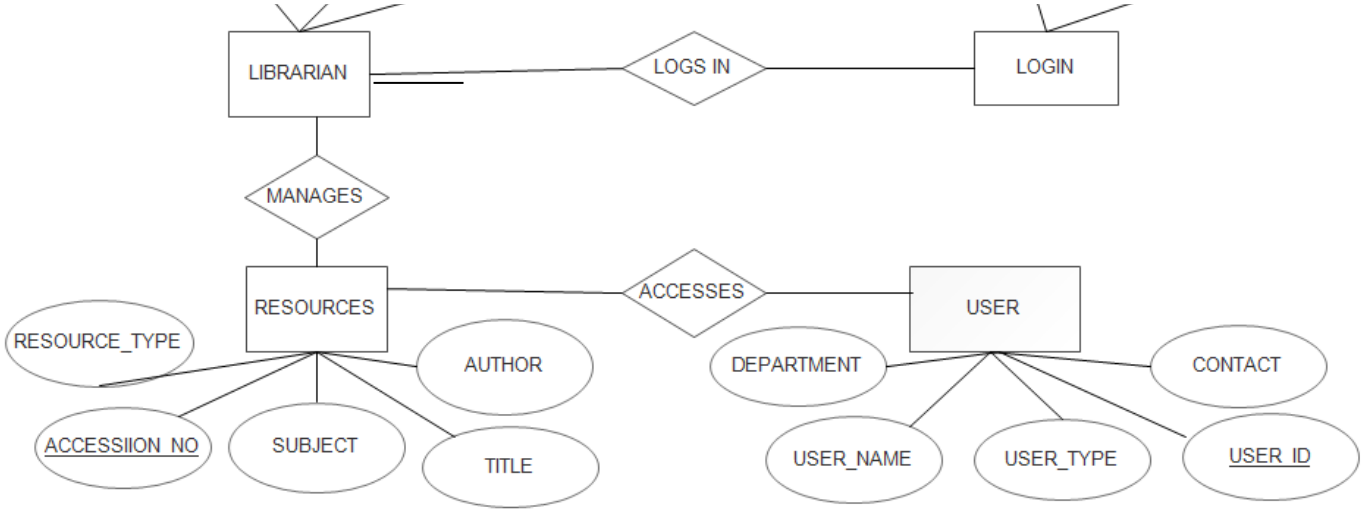
An entity relationship diagram(ERD) isa data modeling technique that graphically illustrates an information system's entities and the relationships between those entities. It is simply conceptual and representational model of data used to represent the entity framework infrastructure.

An ERD helps define processes that occur in an organization and basis for designing a relational database schema. Any ERD has entities that are related to one another via relationships. Each entity has attributes that define it and amongst them is a key attribute that uniquely identifies each of them from other entities.

The ISRS fir MoES has basically four entities thus resources, librarian, user and login. These are clearly represented o

**SOURCE: PRIMARY DATA(2018)**

**FIGURE 2.6: ERD SHOWING THE RELATIONSHIP BETWEEN KEY ENTITIES OF AN ISRS DATABASE**



### 2.5.2 SYSTEM DESIGN

System design is the process of defining the elements of a system such as the architecture modules and components, the different interfaces of those components and data that goes through the system.

It is simply the process of defining the components, modules, interfaces and data for a system to satisfy specified requirements (Blanchard and Fabrycky, 2010)

#### 2.5.2.1 DATABASE DESIGN

Database design is the arrangement of data according to a database model.Database designs represent the relation database schema extracted from the ERD.

Tables below represent the database designs of the ISRS

**TABLE 2.3: LOGIN TABLE**

| FIELD | DATA TYPE (SIZE) | CONSTRAINTS | DESCRIPTION |
|---|---|---|---|
| USER_ID | VARCHAR(20) | PRIMARY KEY | STORE USER_ID |
| USER_PASSWORD | VARCHAR(20) | NOT NULL | STORE USER_PASSWORD |

**SOURCE: PRIMARY DATA (2018)**

**TABLE 2.4: USER TABLE**

| FIELD | DATA TYPE (SIZE) | CONSTRAINTS | DESCRIPTION |
|---|---|---|---|
| USER_NAME | VARCHAR(20) | NOT NULL | STORE USER_NAME |
| USER_ID | VARCHAR(20) | PRIMARY KEY | STORE USER_ID |
| DEPARMENT | VARCHAR(30) | NOT NULL | STORE DEPARMENT |
| USER_TYPE | VARCHAR(20) | NOT NULL | STORE USER_TYPE |
| CONTACT | INT(11) | NULL | STORE CONTACT |

**SOURCE: PRIMARY DATA (2018)**

**TABLE 2.5: LIBRARIAN TABLE**

| FIELD | DATA TYPE (SIZE) | CONSTRAINTS | DESCRIPTION |
|---|---|---|---|
| NAME | VARCHAR(30) | NOT NULL | STORE NAME |
| USER_ID | VARCHAR(20) | PRIMARY KEY | STORE USER_ID |
| DEPARTMENT | VARCHAR(20) | NOT NULL | STORE DEPARTMENT |

**SOURCE: PRIMARY DATA (2018)**

**TABLE 2.6: RESOURCES TABLE**

| FIELD | DATA TYPE (SIZE) | CONSTRAINTS | DESCRIPTION |
|---|---|---|---|
| TITLE | VARCHAR(20) | NOT NULL | STORE RESOURCE TITLE |
| ACCESSION_NO | VARCHAR(20) | PRIMARY KEY | STORE ACCESSION_NO |
| SUBJECT | VARCHAR(30) | NOT NULL | STORE RESOURCE SUBJECT |
| RESOURCE_TYPE | VARCHAR(20) | NOT NULL | STORE RESOURCE_TYPE |
| AUTHOR | VARCHAR(20) | NOT NULL | STORE RESOURCE AUTHOR |

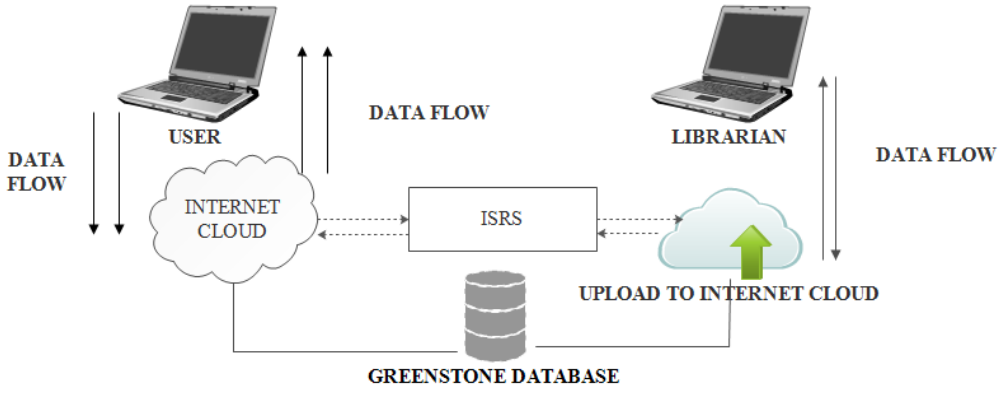
**SOURCE: PRIMARY DATA (2018)**

### 2.5.2.2 DATABASE ARCHTECTURE

According to Wingenious(2005), database architecture is a set of specifications, rules and processes that dictate how data is stored in a database and how data is accesses by components of a system. Database architecture focuses on the design, development, implementation and maintenance of computer programs that store and organize information

The database architecture includes specifications used to describe existing state, define data requirements, guide data integration, and control data assets as put forth in a data strategy (Knight, 2018). Diagram in figure 2.6 below represents a database architecture of an ISRS

**FIGURE 2.6: ISRS DATABASE ARCHITECTURAL DESIGN**




**SOURCE: PRIMARY DATA (2018)**

From the architectural diagram in figure 2.6 above, the key components are the user, librarian and the ISRS database. Each of these is capable of manipulating the ISRS using a computer that is well connected to the internet.Users interact directly with the ISRS via the internet cloud that provides for search and downloading of information resources that are stored in the ISRS repository.

Similarly, the librarian also interacts directly with the ISRS via the internet. The librarian can upload and perform all administrative tasks across the network connected. In all processes, data flows between all entities providing feedback to the queries made

## 2.6 RESEARCH GAP

Many writers and researchers have been calling on organisations to turn from manual storage and retrieval systems, however many organisation are still using the manual system despite such calls. Little attention has been given to storage and retrieval systems thus causing challenges to the users in accessing information materials in the Ministry of Education and Sports, That is why the researcher decided to design an information storage and retrieval system for the Ministry of Education and Sports, for effective use of information.

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

This chapter presents research design, area of study, study population, sampling, data collection methods, data collection instruments, data analysis and presentation, data quality control, research procedure, ethical considerations, project constraints and delimitations

## 3.2 RESEARCH DESIGN

Burns and Grove (2003:195) defined a research design as "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". Parahoo (1997:142) described a research design as "a plan that describes how, when and where data are to be collected and analyzed". Polit et al (2001:167) defined a research design as "the researcher's overall for answering the research question or testing the research hypothesis". According to Kakinda, (2000) research design refers to the systematic plan drown by the person carrying out research during the research study.

The study used aqualitative Research design method to collect data from research field. According to Hiatt (1986), qualitative research methods focus on discovering and understanding the experiences, perspectives, and thoughts of participants.

Holloway and Wheeler (2002:30) refer to qualitativeresearch as "a form of social enquiry that focuses on the way people interpret and makesense of their experience and the world in which they live". Researchers use the qualitativeapproach to explore the behavior, perspectives, experiences and feelings of people and emphasize the understanding of these elements.

The rationale for using a qualitative approach in this research was to explore and describe the opinion of the users and the staff at Ministry of education and sports towards creating storage and retrieval system.

The study employed a case study approach of the qualitative design method to collect data and the case study was “the design and development of an information storage and retrieval system**”**

## 3.3 AREA OF STUDY

### 3.3.1 CONCEPTUAL AREA

Conceptually, the study focused at designing an information storage and retrieval system.

### 3.3.2 GEOGRAPHICAL AREA

Geographically, the project was done at the Ministry of Education and Sports.

### 3.3.3 TIME SCOPE

The project ran for a period of five (5) months that isfrom February, 2018 to late June, 2018.

## 3.4 STUDY POPULATION

Parahoo (1997:218) defines population as “the total number of units from which data can be collected”, such as individuals, artifacts, events or organizations.

Burns and Grove (2003:213) describe population as all the elements that meet the criteria for inclusion in study.

The project study targeted a population of 50 respondents at the Ministry (MoES) resource center.

## 3.5 SAMPLING

Burns and Grove (2003:31) refer to sampling as a process of selecting a group of people, events or behavior with which to conduct a study.

Polit et al (2001:234) confirm that in sampling, a portion that represents the whole population is selected. Sampling is closely related to generalization of the findings.

### 3.5.1 SAMPLING METHOD

Chelevvaug (2009) defines sampling techniques as a mechanism used to select a sample. The sampling method was probable and it adopted a simple random sampling technique to select essential respondents relevant to the study.

In a simple random sampling technique, respondents are selected without the researcher's judgment. The researcher sought to use a simple random sampling technique method because it was the best way to disregard bias in the choice of respondents to participate in the study.

### 3.5.2 SAMPLE SIZE

Sample size refers to the number of respondents the researcher intends to interact with during data collection process.

The sample size of this study was determined with reference to Krejcie and Morgan table (1970) and it constituted of 40 respondents established from the population of 50 respondents. The sample size is distributed in table 3.1 below

**TABLE 3.1: SAMPLE SIZEDISTRIBUTION**

| **CATEGORY** | **RESPONDENTS** | **PERCENTAGE (%)** |
|---|---|---|
| Staff members | 10 | 20 |
| Librarians | 3 | 45 |
| Users | 27 | 35 |
| **TOTAL** | **40** | **100** |

**SOURCE: PRIMARY DATA(2018)**

### 3.6 DATA COLLECTION METHODS

Data collection methods refer to the mechanisms that the researcher uses to collect data from the field of study. This study used a variety of methods including observation, interview and questionnaire methods. These have been elaborated in the context below

### 3.6.1 OBSERVATION METHOD

Kanangu (2009) defined observation method as a method that involves human or mechanical observation of what people actually do. The researcher used his/her eyes to see how the existing system operated. This method of collecting data involved watching what was happening in the field. During observation the researcher had to take curious look at different aspects related to the study that helped him to collect the useful information from the field concerning a given phenomenon (Amin, 2005)

The method was applied with the aid of an observation guide that comprised of aspects critical for study. It was used because it is recommended for its provision of firsthand information and that it supplements on other methods (Amin, 2005)

### 3.6.2 INTERVIEW METHOD

Harrell, M.C. & Bradley, M.A (2009), defined interview as the discussion usually one on one interview or interviewee meet to gather information on asset of topics. Kakinda (2000) also defined interview as a conversation between two or more people.

The researcher held interviews with the staff and the users of the resource center at MoESbasing on the questions prepared in the interview guide. According to the guide the first respondent was the head of the department of the resource Centre who had knowledge on library operation and challenges faced in the service delivery

Interview method covered questions relating to challenges faced in service delivery and knowledge of library operations

### 3.6.3 QUESTIONNAIRE METHOD

Onganya (2009) defined a questionnaire as a set of systematically structured questions used by the researcher to get needed information from the respondents.

According to Sankara(2006) questionnaires are a pre-formulated written set of questions to which respondents record their answers. The questionnaires were administered to library users and the

staffs these are the ones who faced the challenges of information retrieval due to lack of the storage and retrieval system.

The method was implemented through the use of questionnaires made of structured and semi-structured questions that were posed to the respondents

### 3.7 RESEARCH INSTRUMENTS

A research instrument is a tool that is used to collect data from respondents in the field of research. This study used a number of tools including observation guide, interview guide and questionnaires to collect data. These are elaborated below

#### 3.7.1 OBSERVATION GUIDE

Kawulich (2005) defines observation as the systematic description of events behaviors and artifact in the social setting chosen for study. This was constructed in order to aide in conducting observation at the ministry of education and sports. It was simply a list of key issues to be observed. The rational was to keep the researcher focused on the issues for designing the system

With reference to the observation guide, challenges faced by users using the current system were observed, the way users interact with the current systemwas also observed

#### 3.7.2 INTERVIEW GUIDE

Tripathi (2003) defined interview guide as a guide designed by the researcher to help in what questions to be asked to the respondents and this can be brief, require short answering and where necessary can explain in details. This was used as a tool to gather information from the librarians, staff and the users that the researcher used to focuson the objectives of the study.

It was built to cover closed ended and open ended questions

#### 3.7.3 QUESTIONNAIRE

Lake (2015) definedquestionnaire as a document that is used to guide what questions are to be asked respondents and in what order. Sometimes lists the alternative response that is acceptable.

Kombo & Tropo (2006) define questionnaire as a research instrument that collects data over a large sample of respondents. These were developed for both close and open ended questionnaires to obtain information from all respondents during the study.

The instrument was used widely with users of the resource center

### 3.8 DATA ANALYSIS AND PRESENTATION

#### 3.8.1 DATA ANALYSIS

Analysis of qualitative data is an active and interactive process (Polit et al 2001:383).According to Kumar (2011:278-279), content/data analysis is an analysis of the contents of interviews or observational notes in order to identify the main themes that emerge from the responses given by respondents or the observation notes made by the researcher

This study used both qualitative and quantitative approaches of data analysis to analyze data to extract meaningful information which enabled the researcher to make sense out of it, correct mistakes, to organise, provide structure and elicit meaning.

#### 3.8.2 DATA PRESENTATION

The researcher presented the data got from the primary sources, secondary sources and the results were presented in form of tables and graphsfor easy interpretation.

### 3.9 DATA QUALITY CONTROL

Data quality control ensures that the data collected is accurate and trustworthy. It looks at data validity and data reliability.

#### 3.9.1 DATA VALIDITY

Validity is the degree to which qualitative data can accurately gauge what the researcher is trying to measure (Gay *et al,* 2009:375). In affirmation, Gray (2004:219) expressed that an instrument is valid if it measures what it was intended to measure. In addition, the instrument should cover all the research issues pertaining to both content and detail. To corroborate this view, Nardi (2006:58) indicates that validity is about accuracy and whether the items are correctly indicating what they

are supposed to indicate. Nardi (2006:58-60)This is the accurateness of information, in order to ensure validity in the data the research used the appropriate instruments for each data collection method (Mugenda.2003), all data were subjected to security and interpretation without biasness. The research consulted supervisors in questionnaires in this study, the value of the research findings wascensured by addressing the issues of both reliability and validity in the following manner:

To achieve data validity, Triangulation was applied by using different sources of data as well as different methods of data collection. The findings from various sources of data were compared. The objective was to boost confidence in the research findings.

All the respondents who participated in the study were assured of confidentiality. The respondents were not asked for their names, thus freely respond to the questions without any fear of being identified. This was done to ensure that they did not hold back some information. This was believed to contribute to the true picture of the situation as seen and experienced by the respondents.

### 3.9.2 DATA RELIABILITY

Reliability refers to consistency of measurement (Creswell, 2009:149; Delport, 2005:162; Kumar, 2011:181), that is the extent to which results are similar over different forms of the same instrument or occasions of data collection (McMillan & Schumacher, 2001:245). This means that if another person carrying out the research follows the same procedure of measurement and then gets the same result, over a certain period, the instrument is reliable. According to Bell (2010:119), reliability is the extent to which a test or procedure produces similar results under constant conditions on all occasions. There are ways of ensuring that the reliability of an instrument is increased. According to McMillan and Schumacher (2001:245), these are:

Stability – This is consistency of stable characteristics over time. It involves administering the same test to the same people over time. Then if the result is the same, the test is stable.

Equivalence – This is a comparison of two measures of the same trait given at about the same time. It involves administering different forms to the same people at about the same time. Equivalence

and stability – This is also a comparison of two measures of the same trait given over time. This is done by administering different forms of questions to the same people over time.

Agreement – This is consistency of ratings or observations. This involves two or more persons carrying out observations and the extent to which they agree on what they have seen, heard or rated.

Therefore to achieve data reliability, the researcher observed the ways above as elaborated by McMillan and Schumacher (2001:245)

### 3.10 ETHICAL CONSIDERATIONS

Qualitative researchmethod carries with it an obligation to follow certain ethical norms. The current study involves people as respondents. A study that involves human and animal subjects needs to take into account ethical implications. It is vital to respect people, in particular their rights, as well as details of their lives" (Pickard, 2007:123).

According to Salant and Dillman (1994:9), any time a researcher asks people to participate in a survey, it is his/her responsibility to respect both their privacy and their voluntary participation. In support of the views of the scholars above, the researcher ensured the following in regards to ethical considerations

Practically, researcher politely encouraged participants to respond but did not put pressure on them in an offensive manner. This required one to make good judgments based on the situation pertaining to project

Researcher had to do his absolute best to ensure confidentiality. This meant releasing the results of the project in such a way that individual's responses were not identified.

Researchers had to obtain permission to enter sites where research conducted the researcher which ensured confidentiality to the respondents. This was done by seeking permission from the Ministry of Education and Sports administration to acquire the study goals and objectives.

## 3.11 RESEARCH PROCEDURE

The project study was valued in to design an ISRS to solve problems experienced with the manual resource system used to store and retrieve resources at the ministry resource center. The study proceeded by proposing to design and develop an automated ISRS for MoES. When the proposal was approved, an introductory letter from the Head of department-Library and Information Science to MoES permitting the researcher to collect data with the authority of the ministry was granted. After the data collection process, data was analyzed and the research findings were presented, interpreted, discussed and composed in a project report that was submitted to the Head of department Library and Information Science together with a fully functioning information storage and retrieval system(ISRS).

## 3.12 PROJECT CONSTRAINTS

There researcher encountered the following constraints during the data collection process:

Limited time was a factor on the research to be conducted and completed since data analysis and interpretation require a lot of techniques and commitment therefore the time issue was a big challenge that affected the research.

Some respondents deliberately refused to avail out information because of the fear that information collected could cause harm to them

The researcher suffered charges on printing questionnaires, proposal, and the project report.

## 3.13 DELIMITATIONS

The researcher attempted to solve the time constraint by choosing to make a time schedule of conducting research. The schedule varied with a work plan which the researcher used to engage respondents with interviews and questionnaires.

The researcher explained the motives of the study and assured the respondents that all data/information collected from them was to be treated confidential and to be used strictly for academic purposes. This was done to call for attention of all respondents that had deliberately refused to participate in the study due to fear of the implications of the information provided.

The researcher solicited and reserved funds specifically for printing. This helped the researcher to meet costs spent on printing questionnaires, proposal, and project report.

# CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSION OF FINDINGS

## 4.1 INTRODUCTION

This chapter presents analyses and discusses the study findings.The purpose of this project was to design and develop an information storage and retrieval system for the Ministry of education and sports to streamline information storage and to quicken retrieval of the information materials. Data collected was presented in graph and table form

## 4.2 DESCRIPTION OF RESPONDENTS

### 4.2.1 RESPONSE RATE

Response rate of respondents was necessary of this study because the researcher wanted to establish the overall involvement of different respondent categories in the study so as to pass judgment on whether the study was equally balanced or not. Data relating to the respondents' rate was collected using questionnaire and interview methods.

During the process of data collection, the researcher distributed 27 questionnaires to 27 resource users at MoES and only 20(66.6%) questionnaires were answered successfully. The researcher also scheduled 10 individual interviews and achieved only 8(26.8%). The study also targeted to interview 3 librarians at the resource center and only 2(6.6%) were reached. The findings are represented in table 4.1 below

**TABLE 4.1: GENERAL RESPONSE RATE**

| **CATEGORY** | **EXPECTED RESPONDENTS** | **ACTUAL RESPONDENTS** | **PERCENTAGE (%)** |
|---|---|---|---|
| Staff members | 10 | 08 | 26.8 |
| Librarians | 03 | 02 | 6.6 |
| Users | 27 | 20 | 66.6 |
| **TOTAL** | **40** | **30** | **100** |

**SOURCE: PRIMARY DATA (2018)**

The response rate from table 4.1 above shows that the assumed sample size of 40 respondents that was targeted deduced to only 30 respondents that were reached in interviews and questionnaires with the resource users constituting of the highest respondents involvement of 20(66.6%) against the general involvement. This notes that the researcher put in much effort in interviewing and collecting back the questionnaires from the respondents thus the highest percentage composition of users' involvement in the study

### 4.2.2 RESPONDENT'S GENDER

The researcher examined the gender of the respondents to find out the numbers of males and females who participated in the study. This was done to avoid bias in data collected. The obtained findings were collected using questionnaire, observation and interview methods. These arerepresented in table 4.2 below.

**TABLE 4.2: GENDER RESPONSE RATE**

| GENDER | NO. OF RESPONDENTS | PERCENTAGE (%) |
|---|---|---|
| Female | 18 | 60 |
| Male | 12 | 40 |
| **TOTAL** | **30** | **100** |

**SOURCE: PRIMARY DATA (2018)**

The findings indicated that 18 (60%)were femalesand only 12 (40%) were males. The females participated fairly more than the male respondents. This is partly because the female population at the ministry resource center slightly supersedes that of the males though the overall response rate showed that that the system is important to all user categories

## 4.3 OBJECTIVE ONE: TO EXAMINE THE CURRENT INFORMATION STORAGE AND RETRIEVAL SYSTEM

Respondents' views on the current system was necessary to enable the researcher acquire knowledge of how the proposed system should be designed with a clue of the mode of operation of the current manual ISRS at MoES. Views were collected through conducting individual

interviews, direct observations and through questionnaire methods. The findings revealed that users access and retrieve information resources including, books, ministerial reports, project reports, pamphlets, journals, Newspapers, discs, records, among others from either shelves, storage boxes, file folders, cabinets and disk jackets. The findings are presented in table4.3 below

**TABLE 4.3: STORAGE MECHANISM AT THE MINISTRY RESOURCE CENTER**

| MODE OF STORAGE | NO. OF RESPONDENTS | PERCENTAGE (%) |
|---|---|---|
| SHELVES | 20 | 67 |
| BOXES | 02 | 07 |
| FILE FOLDERS | 04 | 13 |
| CABINETS | 04 | 13 |
| DISK JACKETS | 00 | 00 |
| **TOTAL** | **30** | **100** |

**SOURCE:PRIMARY DATA(2018)**

The findings from table 4.3 above indicate that the most dominant mode of storage of information resources was the use of Shelves. At least 20(67%) of the respondents had accessed information resources from the library shelves. This is assumed to be so because the ministry resource center has more book materials than any other resources and that users opt for books than any other resources thus the use of shelves in attempt to keep the books to the reach of users.

It was found out from the several interviews that users access and retrieve resources after whenthe users have registered in the borrower's book and sign for the materials to be borrowed from the library. The librarians capture the users name, ID number, title of the book to be bowered and the date of rotation and bowering.During observation it was also found out that users could also opt to use the materials within the resource center

## 4.4 OBJECTIVE TWO: TO ASSESS THE CHALLENGES ASSOCIATED WITH THE ISRS USED AT MoES

The researcher sought to find out the challenges associated with the current system so as to attain knowledge on what issues to address during the design and development of a new ISRS at MOES. Interview, observation, and questionnaire methods were used to collect data from respondents.

Form the researcher's observation the current system used in storage and retrieval in MoES is manual and it highly posses a variety of problems. It was observed that users spend a lot of time before accessing information materials from the librarians and sometimes they do not get want they ask. Too much time is also wasted in searching the shelves and cabinets by the librarians to retrieve information materials, due to the absence of standardized classification, cataloguing and shelving scheme.

Library users and librarians were interviewed about the challenges the faced with the current system. The librarians stressed out the following in regards to the challenges faced with the current ISRS system;

Improper maintenance of information materials due to the limited funds in MoES to bind dust and buying stationeries for cataloguing and classification of the information materials

Limited space for storage newly accessioned information materials due to limited space of the library and few shelves and cabinets to keep the materials

20 library users of the library of MoES were engaged with questionnaires and stressed out the following;

Lack of information materials in the library, the library users reported that sometimes information materials needed are not available in the library.

Limited staff to attend to the library users, users reported that librarians are few toattend to them when information materials are needed.

Long time of retrieval of information materials due to lack of standardized classification, cataloguing and shelving scheme, which leads to delay in retrieving of information materials in MoES

The respondents' views on the challenges faced by the current ISRS extracted from the interviews and questionnaires are presented in table 4.4 below for further analysis.

**TABLE 4.4: CHALLENEGES FACED WITH THE CURRENT ISRS**

| **CHALLENGE** | **NO. OF RESPONDENTS** | **PERCENTAGE (%)** |
|---|---|---|
| LONG TIME OF RETRIEVAL | 13 | 43 |
| LIMITED STAFF | 02 | 07 |
| INADEQUATE INFORMATION RESOURCES | 04 | 13 |
| IMPROPER MAINTENANCE OF INFORMATION MATERIALS | 03 | 10 |
| INADEQUATE STORAGE SPACE | 06 | 20 |
| ABSENCE OF A STANDARDIZED CLASSIFICATION SCHEME | 02 | 07 |
| **TOTAL** | **30** | **100** |

**SOURCE: PRIMARY DATA (2018)**

Table 4.4 above indicates that long time of retrieval of information materials was a big challenge with the current system contributing to 43% of the general challenges revealed from the study.The challenges of inadequate space was at 20%, followed by inadequate information resources at 13%, improper maintenance of information materials at 10%, limited staff and absence of a standardized classification scheme followed in each at 07% to constitute the least percentage.

The challenge of long time of retrieval of information materials is partly drawn to the fact that the system is manual and staff is less resourced to quicken the processes of access and retrieval in the resource center and as such it rises out as a major problem that is contributed to by other problems of limited staff, lack of a standardized scheme which leads to higher chances of retrieval problems.

## 4.5. OBJECTIVE THREE: TO DETERMINE THE REQUIREMENTS FOR DESIGNING AN ISRS FOR MOES

### 4.5.1 RESPONDENTS' VIEWS ON THE NEW ISRS

The respondents view on the new ISRS was necessary to establish whether there was a necessity to design and develop a new ISRS for the ministry or not. Data on this aspect was collected using questionnaire and interview methods.

Research findings revealed that respondents had both positive and negative views towards the new information storage and retrieval system. 27 (75%) of the respondents gave a positive response whereas only 03(03%) gave a negative response. The views are represented in table 4.5 below.

**TABLE 4.5: RESPONDENTS' VIEW ON DESIGNING THE NEW ISRS**

| RESPONDENTS' VIEW | NO. OF RESPONDENTS | PERCENTAGE (%) |
|---|---|---|
| YES | 27 | 90 |
| NO | 03 | 10 |
| **TOTAL** | **30** | **100** |

**SOURCE: PRIMARY DATA (2018)**

The table 4.5 above shows that the highest number 27(90 %) of respondents fell in agreement with the design of the proposed system. This was partly attributed to the challenges experienced with the current system and that the users had great expectations from the new information storage and retrieval system.

### 4.5.1 PROPOSED REQUIREMENTS OF THE NEW ISRS

The researcher sought to find out the respondents suggestions on requirements that the new system should have so as to give a picture of how the proposed system should look like and what it must do. Data relating to this aspect was collected using interview method.

Several interviewees were engaged in an interview on a question of what requirements in their thought would the new ISRS execute.

One library staff stressed out that *"the system should ensure quick access and retrieval to information materials by providing details of location, type of material, author, subject …."*

Another staff still in an interview expressed that *"the system should at least provide for electronic storage for materials which can be stored in electronic format so as to create space in the resource center"*

In an interview with other staff at the ministry resource center, interviews expressed a number of requirements the proposed system should have and these were generalized to include the following;

Quick access and retrieval of information materials, Generate statistics on the number of materials currently managed at the resource center, Facilitate electronic storage on certain information materials, Enable search for materials using the system, Ensure distribution of information resources among users and Ensure security on materials managed at the resource center.

The respondents' views from the interviews are presented in table 4.6 below for further analysis, discussion and interpretation.

**TABLE 4.6: PROPOSED REQUIREMENTS FOR THE NEW ISRS**

| **REQUIREMENT** | **NO. OF RESPONDENTS** | **PERCENTAGE (%)** |
|---|---|---|
| QUICK ACCESS AND RETRIEVAL | 05 | 50 |
| SUPPORT ELECTRONIC STORAGE | 02 | 20 |
| GENERATE STATISTICS | 01 | 10 |
| OTHERS | 03 | 30 |
| **TOTAL** | **10** | **100** |

**SOURCE: PRIMARY DATA (2018)**

From the table 4.6 above, it is represented clearly that most of the respondents engaged in the interviews to determine which requirements the new ISRS stressed out ''quick access and

retrieval'' as the most dominant requirement expected taking it to 50% of the general response. In other views the ability of the new system to support electronic storage followed in at 20%, the ability to generate statistics at 10% and other requirements constituted 30% of the general responses. The highest percentage composition of the respondents who proposed the requirement of 'quick access and retrieval' is drawn to the fact that there is a problem in the access and retrieval of information materials at the ministry resource center and therefore users expect an improvement with the new proposed ISRS.

## 4.6. OBJECTIVE FOUR: TO DESIGN AND DEVELOP AN ISRS FOR MOES INORDER TO FACILITATE STORAGE AND RETRIEVAL

### 4.6.1 EXPECTATIONS FROM THE NEW INFORMATION STORAGE AND RETRIEVAL SYSTEM

The expectations of the respondents of the proposed ISRS were necessary to help the researcher ascertain the different functionalities to calibrate with the system so as to suit the users' choice. Interview and questionnaire methods were used to collect data on this element.

Respondents in interviews and from questionnaires showed high positive expectation from the new system and amongst the many the key expectations were generalized and elaborated below.

Librarians expect the new system to give metadata of existing collections, creating new collections in the library that helps in the retrieval process of information materials atMoES.

Users expect the new system to provide an index and catalogue showing the information materials in the library so as to improve access and retrieval of the materials.

Librarians expect improvement in service delivery to the users. The new ISRS provides metadata of all information materials in the library that ensures quick retrieval and storage in the ministry of education and sports.

The library staff also expects the new ISRS to support digitization of some information resources as a way of creating more space for storage of newly accessioned information materials in the library.

The expectations of the respondents engaged through the questionnaires and interviews conducted as reported above are presented in table 4.7 below for further analysis, discussion and interpretation.

**TABLE 4.7: RESPONDENTS' EXPECTATIONS FROM THE NEW ISRS**

| **RESPONDENTS' EXPECTATIONS** | **NO. OF RESPONDENTS** | **PERCENTAGE (%)** |
|---|---|---|
| IMPROVED SERVICE DELIVERY | 13 | 43 |
| PROVIDE METADATA | 04 | 13 |
| PROVIDE AN INDEX AND CATALOGUE | 05 | 17 |
| SUPPORT DIGITIZATION | 08 | 27 |
| **TOTAL** | **30** | **100** |

**SOURCE: PRIMARY DATA (2018)**

Table 4.7 above clearly represents the findings from the respondents' expectations of the new ISRS. The findings show that 13 respondents expected greatly an improved mode of service delivery and this formed the highest response rate contributing to 43% of the general response. In other findings, 04(13%) of the respondents expected the new system to provide metadata on the information resources, 05(17%) expected the new system to provide an index and catalogue for quick search, access and retrieval of materials whereas 08(27%) of the respondents expected the system to be able to support digitization in an attempt to create storage space for the newly accessioned information materials at the ministry resource center.

# CHAPTER FIVE: AN INFORMATION STORAGE AND RETRIEVAL SYSTEM FOR MINISTRY OF EDUCATION AND SPORTS

## 5.1 INTRODUCATION

This chapter presents the proposed information storage and retrieval system for MoES with a proper description of how the system works, system requirements, system implementation.

## 5.2 SYSTEM REQUIREMENTS

### 5.2.1 LIBRARIAN REQUIREMENTS

The librarian is charged with administrative tasks of the ISRS. The librarian logs in, gathers the collection, enriches the information materials by giving metadata about it, designs the collection with its specific plug-ins and creates the collection by uploading thus previewing the collection.

The librarian also register users, search and keep track on submitted information materials, logs out, receive and send notifications to students and supervisors.

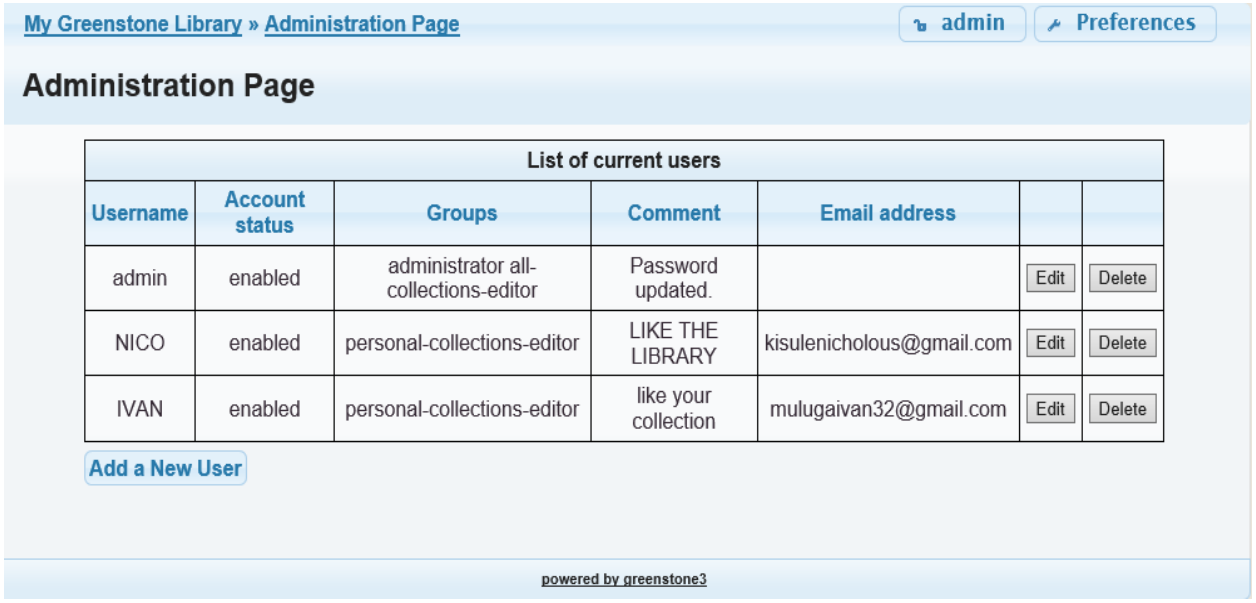
### 5.2.2 USER LOGIN INTERFACES

The user login interface allows users to login into the system according to the designated login specifications. System users may login as plain users and the librarians as system administrator. The login stage proceeds with the valid user-name and password required for all users. See figures below.

**FIGURE 5.1: LIBRARY USER LOGIN INTERFACE**


**FIGURE 5.2: LIBRARIAN LOGIN INTERFACE**

**FIGURE 5.3: LIBRARIAN PAGE FOR MANAGING USERS.**




### 5.2.3 USER REQUIREMENTS

The users logs in, views user profile, views uploads, submits comments about the collection , searches using advance search and text search, logs out, receive notifications of new collection

**FIGURE 5.4: USER SEARCHING PROCESS**

Figure 5.4 above the users searching process, the user logs in and queries in a topic of his/her choice and different results are retrieved.

**FIGURE 5.5 SEARCHING USING TEXT SEARCH**


Figure 5.5 above, the user uses text search to search for information material in the resource centre. Search retrieves all the materials related to that word the user has searched

**FIGURE 5.6 SEARCHING USING FORM SEARCH**

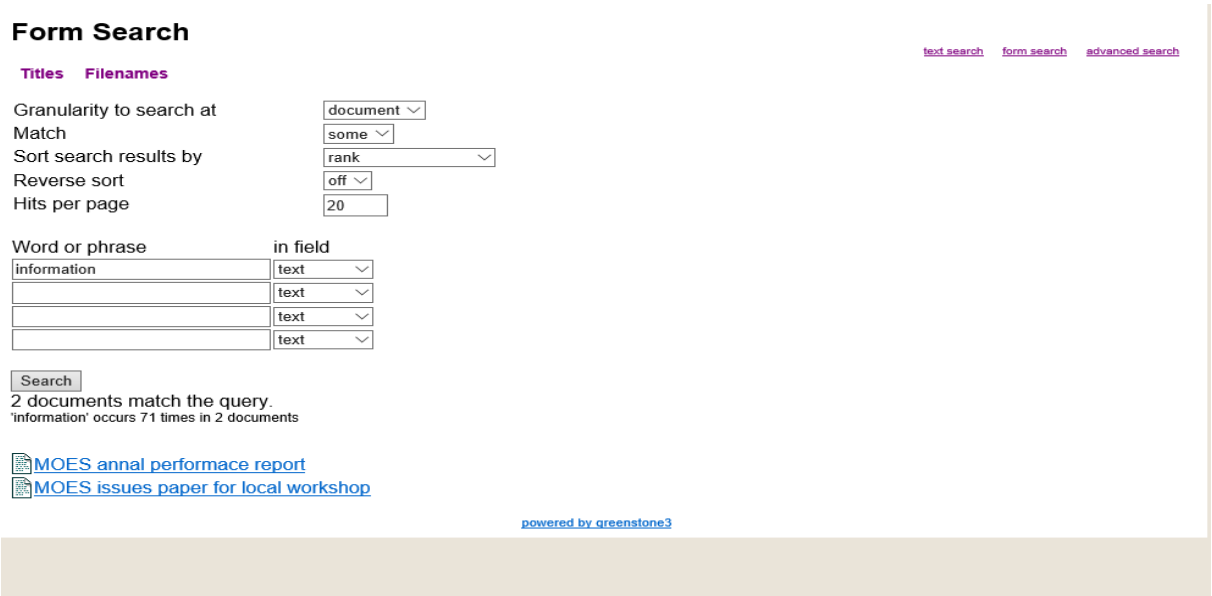



Figure 5.6 above the user searches the collection using the form search which retrieves all information materials that match a particular topic and it sorts search results by reverse sort hits per page. In this case the user searched for word '' information''

**FIGURE 5.7 SEARCHING USING ADVANCED SEARCH**

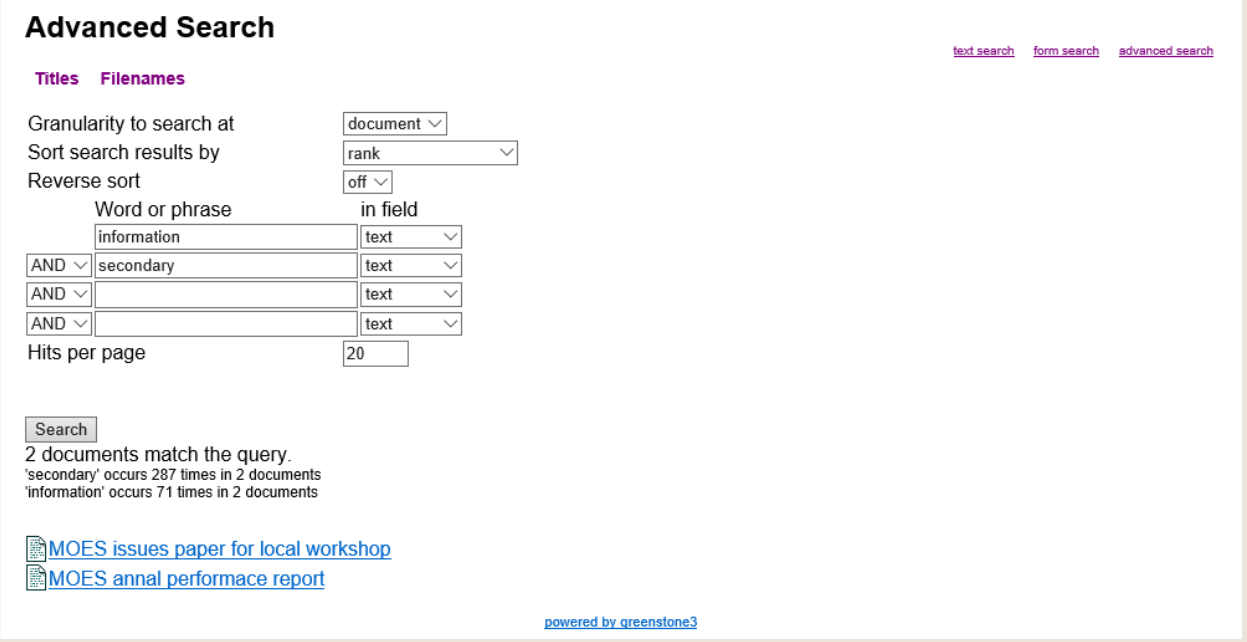



Figure 5.7 above the user uses advanced search to get results of different topics that matches his/her topic. This search uses boolean operates like ‘’And’’ ’’ Or’’ and “Not” .This retrieves only topics that match the users specific field.

## 5.3 SYSTEM REQUIREMENTS

Hardware and software requirements were necessary to execute functional and non functional requirements of the storage and retrieval system for MOES.

**TABLE 5.1: SYSTEM REQUIREMENTS**

| HARDWARE | SOFTWARE |
|---|---|
| COMPUTER | greenstone software, |
| 1GHZ micro processor | HTML and CSS styling |
| Network | Windows or Linux |
| An average memory of 512MB | Web browser for example Mozilla fire fox, Internet explorer, Google chrome |
| Stable Bandwidth | |

**SOURCE: PRIMARY DATA (2018)**

## 5.4 SYSTEM DESIGNING

The system was designed using greenstone software, HTML and CSS styling software. The system was designed to support graphical user interface that makes it easy to gather materials for a collection, download collection, enrich collection by adding metadata, design the searching Indexes and browsing classifiers, build and save the collection.

### 5.4.1 COLLECTION DEVELOPMENT

To build new collection, the librarian collects sets of documents, imports or assigns metadata, and builds them into a Greenstone collection. Enrich the documents by adding further metadata to individual documents or groups of documents.

**FIGURE 5.8: BUILDING A NEW COLLECTION**

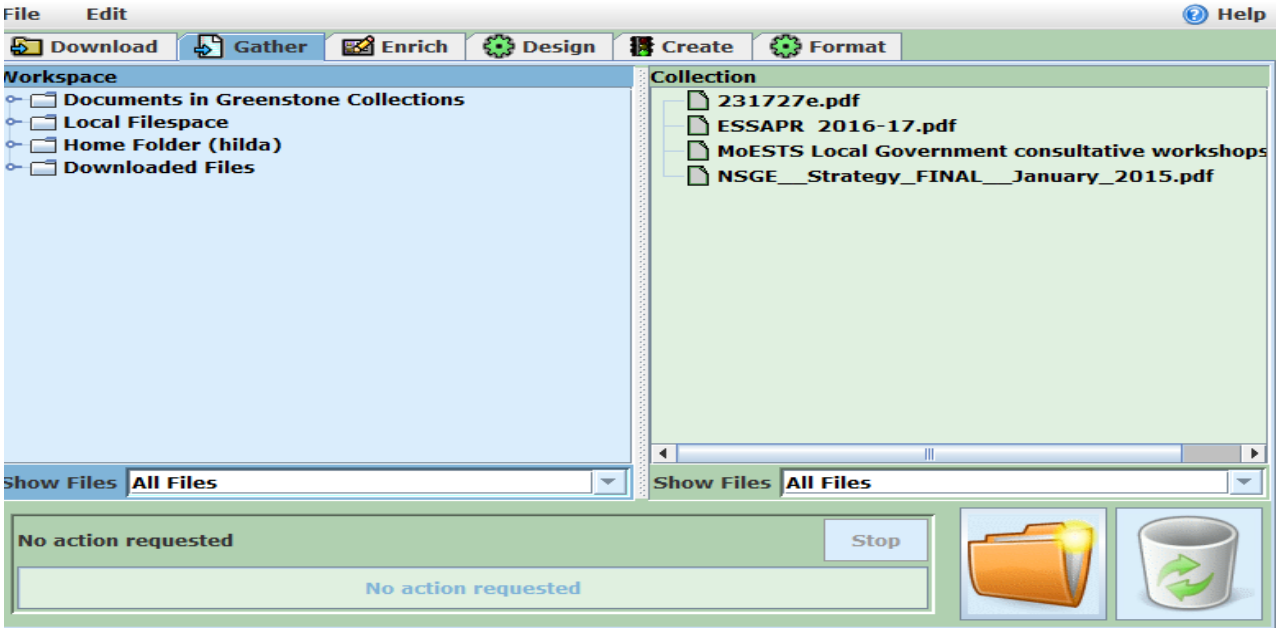



Figure 5.8 above documents are copied from the computers file space and added into the new collection. Any existing metadata remains "attached" to these documents. Documents may also be gathered from the web through a built-in mirroring facility.

**FIGURE 5.9: ADD META DATA**

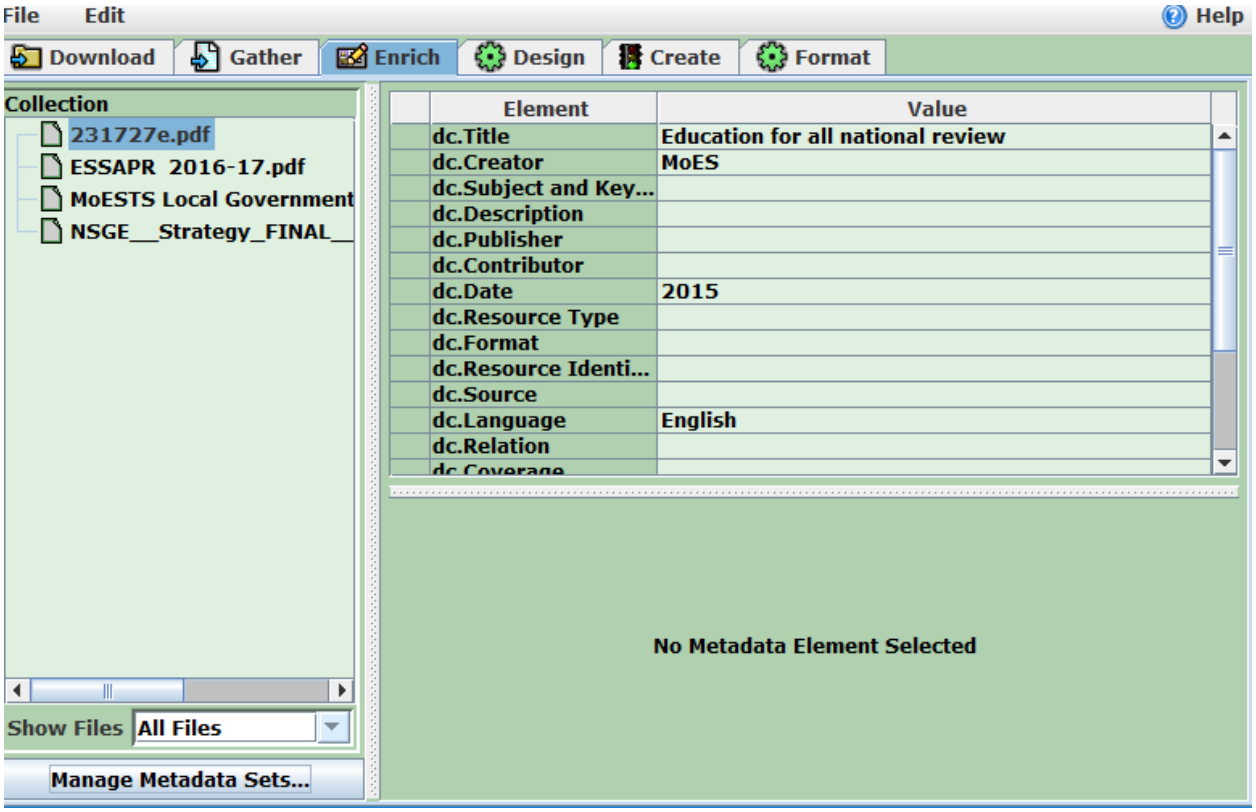



Figure5.9 above enriches the documents by adding further metadata to individual documents or groups of documents. For example title, creator, date, language etc.

**FIGURE 5.10: CREATING THE COLLECTION**

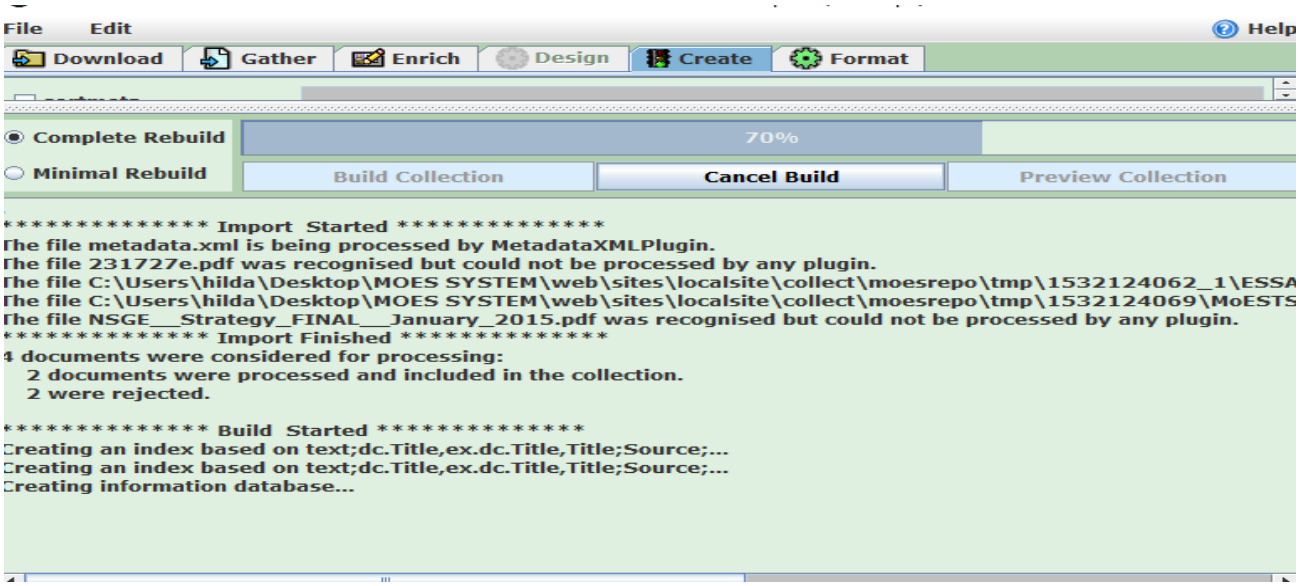



Figure 5.10 creating the collection by determining its appearance and the access facilities that it will support. This is guided by the document plug-ins like PDF, Post Script, Word, RTF, HTML, Plain text, Latex, ZIP archives, Excel, PPT, GIF, JIF, JPEG, TIFF Audio**:** MP3, MPEG,MIDI etc. the build collection is previewed using the browsers.

**Figure 5.11 MOES REPORTS COLLECTION**

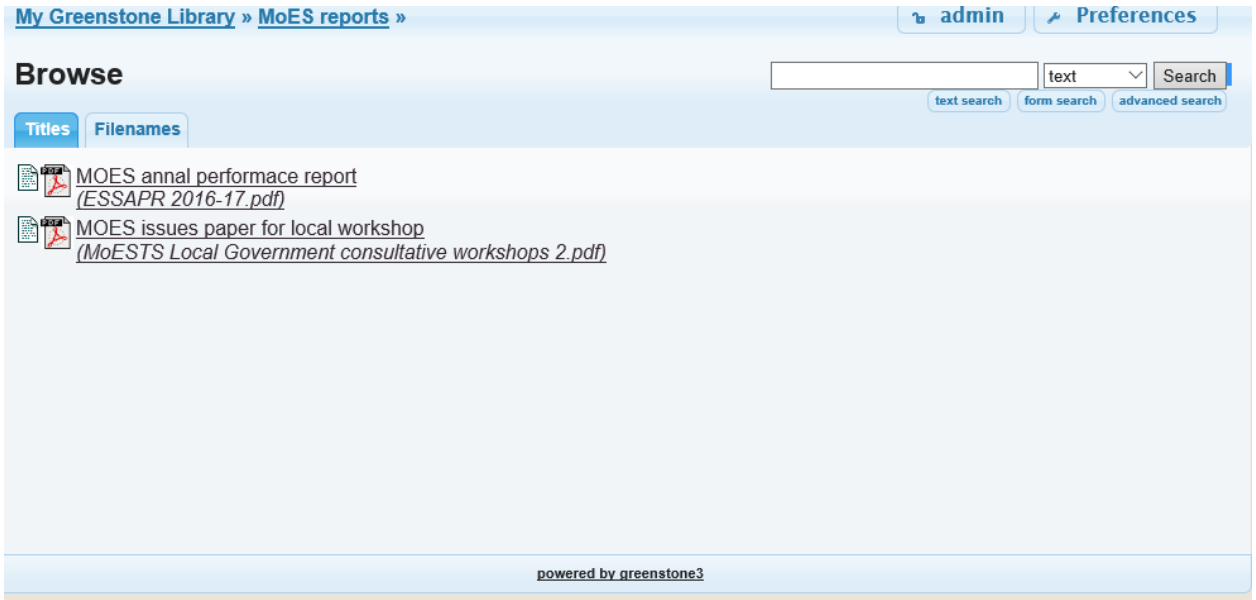


Figure 5.11 above shows the collection preview in the web browser. The user retrieves the document by searching either by using advanced search or text search.

## 5.6 SYSTEM MAINTENANCE

Maintenance of the system entails the keeping of the system in a safe functional mode. The storage and retrieval system will be maintained by upgrading the system design software, backing up documents restricting authorized users and updating user requirements.

# CH**APTER: SIXSUMMARY, CONCLUSION AND RECOMMEDATIONS**

## 6.1INTRODUCTION

This chapter presents the summary,conclusions and recommendations of the study

## 6.2 SUMMARY

The project purpose was to design and develop an information storage and retrieval system for MoES. The project objectives were to: Examine the current information storage and retrieval system, Assess the challenges associated with the storage and retrieval system used in the Ministry of education and sports, Determine the requirements for designing an information storage and retrieval system for the Ministry of education and sports and Design and develop an information retrieval and storage system for the Ministry of Education and sports in order to facilitate storage and retrieval

The study focused on a population of 40 respondents from which a sample size of 36 respondents was selected using a simple random sampling technique. The study adopted a qualitative research design in incorporation with the interview, questionnaire and observation methods to collect data from respondents

The study found out that the dominant means of storage and access to information resources at the resource center was the use of library shelves, the means of access to information resources was through the manual procedural process that involved user-staff involvement and paper documenting, the main system requirements were the ability to support electronic information resource storage, quick access and retrieval of the stored resources, the users agreed with the design of the new ISRS to streamline information storage and retrieval at the resource center.

The study concluded that shelves were the means of storage of information resources at the ministry resource center, storage access and retrieval of information resources were a challenge, ability of the new ISRS to support electronic storage, quick access and retrieval were the requirements anticipated by the respondents, the new ISRS was greatly desired for at the ministry resource center to solve challenges experienced with the current manual ISRS

The study recommended that other means of information storage should be thought of to reduce over reliance on the use of shelves, a manual ISRS should be replaced with automated means of storage and retrieval to solve challenges in storage, access and retrieval, the new system should be in support of electronic storage, access and retrieval of information resources as key requirements of an ISRS, the new ISRS should be implemented and that user training and education should be done to orient users on how to interact with the system

## 6.3PROJECT FINDINGS

The project found out that:

The most dominant mode of storage of information resources was the use of library Shelves. Users would access and retrieve materials from the library shelves because the library shelves were easily reached than other storage facilities.

Access to information resources involved a series of procedures. A user was required to register with details of user-ID, number of resources borrowed in the borrowers book.

The biggest challenges experienced at the resource center were long time of access and retrieval of information materials and limited space to support vast storage of information resource materials.

Users spent a lot of time locating information materials from the resource collection. This was attributed to the poor storage mechanism provided with the current manual system in the management of resources.

Users anticipated the new ISRS to carry out electronic storage of information resources and to also support access and retrieval of information resources.

Used also proposed which much expectations that the new IRS should supports access and retrieval of information resources managed at the resource center using the metadata generated on each of the resources stored in the ISRS.

Majority of the respondents agreed with the design of the new ISRS. This was attributed to a thought that the ISRS intended at addressing challenges experienced with the current manual system.

Librarians expected improved service delivery at the library while using the new ISRS. This was driven on the basis that information storage and retrieval systems streamline information management functions including information storage and retrieval.

## 6.4 CONCLUSIONS

The study concluded that:

Shelves were the most used storage means that the library staff used to store resources and that users easily reached to access resources at the resource center.

Access to information resources stored at the ministry resource center entailed a manual procedural process. This is because the system called for much user-staff involvement and paper documenting.

Limited space to support storage of information resources was the biggest threat to the management of information resources at the resource center with the manual system.

The manual system was time wasteful to users. This is because of the procedural processes a user must adhere to before accessing the materials and the difficulties in locating information materials due to the absence of a classification scheme.

The new ISRS will have requirements including support of storage, information retrieval, information access to all information resources that the system will assume to manage.

There was need for a new ISRS that will meet the anticipations of the library staff and users' at the resource center

Information Service delivery is a key issue of concern at the ministry resource center.

## 6.5 RECOMMENDATION

The study recommended that:

The resource center at the ministry should promote extensive means of other storage mechanisms to reduce the over reliance on the use of shelves. This can be done by implementing an information storage and retrieval system that supports electronic storage

Automated means to improve the way users access information resources from the storage facilities should be thought of in an attempt to eradicate the manual procedural process of accessing materials.

Automated means should be adopted to replace the manual means of access and to limit the time users spend in trying to access information materials with the manual system

The proposed ISRS should be capable of information storage, information access, information retrieval and support of other added functionalities that the users anticipate.

An ISRS should be developed to meet the user anticipations of the system, this should be followed by Training both library users and the staff, the use of new ISRS the resource center..

The library administration should respect users' suggestions and views in regards to service delivery.This can be done by considering to develop a new system should be capable of streamlining information service delivery to users at the ministry resource center

## 6.6 AREAS FOR FURTHER STUDY

Further study should be conducted in the following areas:

i. Adoption and use of information storage and retrieval systems to manage information resources in libraries
ii. A circulation management system forMoES resource center
iii. The impact of the information storage and retrieval system in managing information resources at MoES resource center

iv. A records management system for managing records at MoES

v. Limitations of newly developed information storage and retrieval system at MoES resource center.

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## APPENDICES

### APPENDIX 1: QUESTIONNAIRE FOR LIBRARY USERS

Dear respondent

My name is Kisule Nicholous. I am an undergraduate student at East African School of library and Information Science (EASLIS) of Makerere University. I am currently conducting a project study on "an information storage and retrieval system for Ministry of Education and Sports" in which I will later design system for storage and retrieval to ease storage and quick retrieval of the information materials.

NOTE: The information given will be only for academic purposes and be kept confidential.

I humbly request and seek for your cooperation I my data collection process.

**Instructions (Tick in the box(es) and where necessary answer in the space provided)**

1. GENDER

Male ☐ Female ☐

2. What is your position in the Ministry of Education and Sports?

Liberian ☐ Staff member ☐ User ☐

3. How often do you use the library?

……

……

4. Have you accessed the information materials before at the Ministry of Education and Sports?

Yes ☐ No ☐

If yes, how did you access the information materials?

……

……

……

……...

5. What comments do you give about the current method of retrieving and storage the information?

……

……

…….....

6. Do you face challenges while using the current system of storage and retrieving?

Yes ☐ NO ☐

If yes list them below

……

……

……

……

7. Do you think designing a storage and retrieval system will solve the challenges in accessing information materials?

Yes ☐ No ☐ Not sure ☐

If yes state why?

……

……

……

8. State how you and the organization will benefit from the storage and retrieval system

…….....

……

……

……

……

*(Thank you for your time and cooperation)*

## APPENDIX 2: OBSERVATION GUIDE

1. Observe the state of storage and retrieval at the ministry of education and sports.
2. Observe how often the users use the resource centre of ministry of education and sports.
3. Observe the procedures involved in the storage and retrieval of information at the ministry of education and sports.
4. Observe the challenges faced by the librarians in storage and retrieving of information materials in the ministry of education.
5. Observe the challenges faced by the users in retrieving information materials in the ministry of education and sports.

## APPENDIX 3: INTERVIEW GUIDE FOR THE LIBRARIANS

Dear respondent

My name is Kisule Nicholous. I am an undergraduate student at East African School of library and Information Science (EASLIS) of Makerere University. I am currently conducting a project study on "an information storage and retrieval system for Ministry of Education and Sports" in which I will later design system for storage and retrieval to ease storage and quick retrieval of the information materials. I humbly request and seek for your cooperation I my data collection process.

NOTE: The information given will be only for academic purposes and be kept confidential.

1. How long have you worked in the Ministry of Education Library?
2. What system or mechanism is in place for storage and retrieval of information materials?
3. What services are offered in the Ministry of Education Library?
4. What kind of information materials are found in the Ministry of Education Library?
5. How do you retrieve information materials for the user in the Ministry of Education Library?
6. Do you find any challenges with the system used? If yes please mention them
7. What plans or preparations do you think can be used to solve the challenges mentioned above?
8. Do you think an information storage and retrieval system can help solve the challenges faced in the management of research reports at the school?

I. If yes, please state the reasons why?

In your views, what do you think the new storage and retrieve should have or provide.