DESIGN AND DEVELOPMENT OF DRUGS' MANAGEMENT AND INVENTORY SYSTEM FOR MULAGO REFERRAL HOSPITAL

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UNIVERSITY

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DECLARATION

I, **ELUPE MESHULLAM** and **KYOSIIMIRE DEBRAH**, declare that this piece of work is original and has never been submitted to any university for any award.

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APPROVAL

This is to satisfy that our approval has been given for this research proposal to be submitted to the school of Computer studies as a requirement for the partial fulfillment for the award of a Diploma in computer science of Kampala international university.

AKITENG IMMACULATE
(SUPERVISOR)
Signature..
Date......16th - 08 - 2012 .... 82 %

DEDICATION

This book is dedicated to our beloved parents **Ejoku John Bosco, Irupia Anna Ejoku** and **Ahimbisibwe Medard, Efransi Ahimbisibwe**. We also dedicate it to our brothers and sisters for the guidance and financial assistance they rendered to us during the study.

We further dedicated this to all the personnel staff of Kampala international university especially those dealing with computer studies and our beloved supervisor **Ms. Akiteng Immaculate.**

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Finally, we owe our attribute to God who has enabled us through all kinds of situations.

May Almighty God reward you all?

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LIST OF ABBREVIATIONS

IT:	Information Technology
ITAA:	Information Technology Association of America
IS:	Information System
DB:	Database
DBMS:	Database Management System
DASDs:	Direct Access Storage Devices
DML:	Data Manipulation Language
DDL:	Data Definition Language
MS:	Manual System
FPS:	File processing System
DBA:	Database Administrator
MSVB:	Microsoft Visual Basic
MSA:	Microsoft Access
SDLC:	System Development Life Cycle
SSADM:	Structured System Analysis and Design Methods
ERDs	Entity Relationship Diagrams

CHAPTER ONE

INTRODUCTION

1.0 General Introduction

Mulago Hospital is a National Referral and Teaching Hospital with a bed capacity of 1500 beds, government owned and operated. The hospital constitutes of several Units. Departments such as (Obstetrics & Gynecology) and Directorates each with its own facilities and this has helped the hospital to offer state of the art medical care to its patients.

The Hospital operates in collaboration with many other Hospitals and organizations outside Uganda that provide support in form of exchange programs, funding of some activities and programs, to mention but a few. Some of the Institutes operating under the Hospital include the Heart Institute, the Cancer Institute, Infectious Disease Institute, the Burns and Plastic Surgery Institute, and so many others. This is what makes Mulago Hospital the main referral hospital in the whole country.

Their operation is directed and controlled by a team of trained, experienced and helpful qualified nurses, doctors and customer service staff, enabling them to deliver services, which meet all Public and Private patient requirements.

Mulago Hospital was founded in 1913 and suffered a phase of decline posed by the Socio-Economic effects that resulted from the national political upheavals of the 1970s and 1980s. Since mid1980s, Mulago has undergone a series of rehabilitation work, development of the Human Resource, procurement of equipment in the numerous service centers including the remodeling of Theatre Suite, installation of ICT, furniture and other medical systems aimed at improving service delivery. A Tele-Medicine Centre at Lower Mulago was recently installed through Pan- African collaboration between the Indian Government and Government of Uganda.

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1.1 Background of the Study

The department of Obstetrics and Gynecology at Mulago hospital is a place where Patients come in for general healthcare services like:-

Consultation, Diagnosis for diseases, treatment, admission (providing beds, nursing, medicines etc.), Immunization and provision of drugs

There are various operational works that are done in the Hospital to meet the above services provided and they include; recording information about the drugs that are given to patients and this is done at the registration desk on paper, Generating bills done by the accountants(paper based and calculator) which is error prone, recording information related to diagnosis given to Patients and this is also paper based, keeping record of the Immunization provided to children/patients and keeping information about various diseases and drugs available to cure them. The retrieval of information involves perusing through a number of files to access the required file which wastes a lot of time.

However, due to growing numbers of drugs at the department and tiresome paper based transactions, there rose need to improve service delivery to the patients and this called for an automated system to help save time in conducting transactions.

1.2 Statement of the Problem

The information generated by various transactions took time and efforts to be accessed, retrieved, stored and updated making changes difficult.

1.3 Main objective

The main objective of this study was to develop an efficient and effective computer based application/software that would aid in the management of information about drugs at the department of Obstetrics and Gynecology at Mulago hospital.

1.3.1 Specific Objectives

To develop a system:

- For registering and storing drugs information
- To provide quick and efficient retrieval of information
- To assign drugs to specific patients

1.3.2 Research Question

    i.   How can a system be developed to ease drugs' registration and information storage?

    ii.   What is the best way to ensure quick and efficient information retrieval?

    iii.   How could patients assigned to specific drugs?

1.4 Scope of the Study

The researcher carried out a study at the drug store of Mulago hospital specifically in the department of Obstetrics and Gynecology in the following units:

    i.   Day surgery unit

    ii.   Emergency gynecology assessment unit

    iii.   Maternity wards

1.5 Significance of the study

The new system enabled the automation of the activities of record management thus elimination of inaccurate information and redundancy. The system restricted unauthorized persons from accessing confidential information.

The system created flexibility in generating reports whenever needed. It also enabled easier backup of important information.

Data consistency was achieved since the data would be stored in a central place.

- **Accuracy:** - The level of accuracy in the developed system was achieved. It benefited both the hospital and the community because all operations were done correctly

- **No Redundancy:** - In the developed system, care was taken to make sure that no information was repeated anywhere, in storage or otherwise. This benefited Mulago hospital in ensuring economic use of storage space and consistency in the data stored.

- **Proper storage and immediate retrieval of information:** - The developed system provided proper storage and a quick retrieval of data. The hospital benefited in a way that any type of information was available whenever required.

- **Easy to Operate:** - The system added on knowledge to the current system which made it easy to operate. The system had also been developed within a short period of time and fitted in the limited budget of the user.

Conceptual frame work
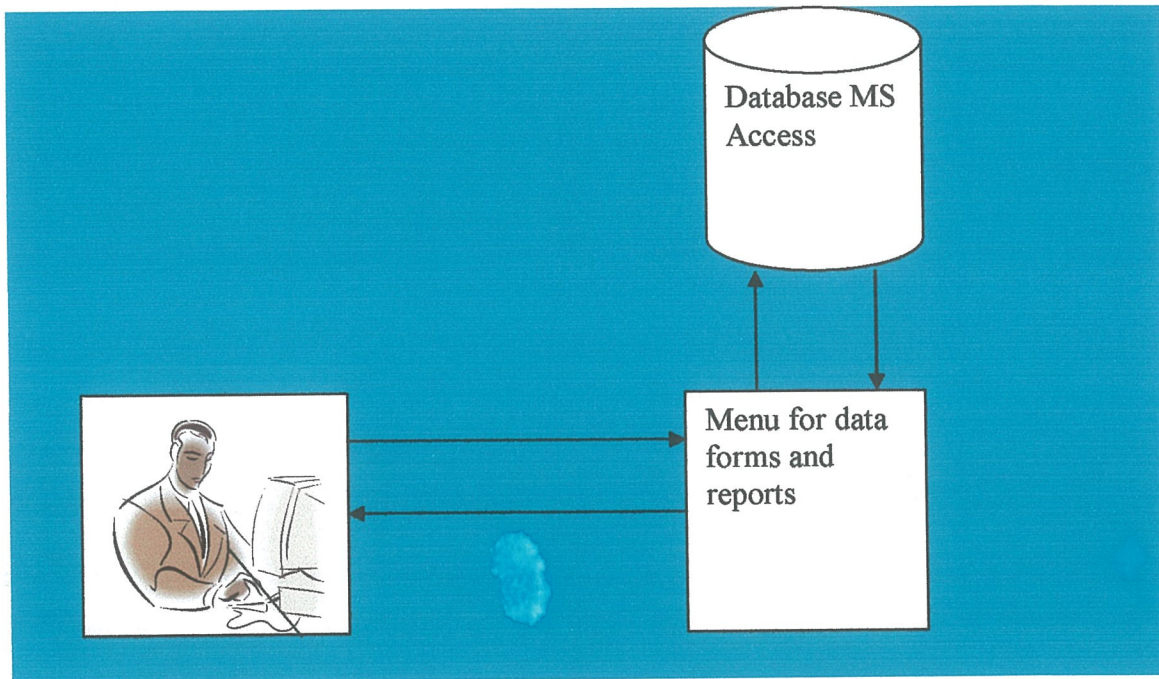
Explanation of how the new system works

The system is installed on a standalone computer. The user interacts with the database via a menu that consists of all data forms and reports of the new system. The different forms are connected to the respective tables using the command buttons. It is these tables that make up the database of the system

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction.

This chapter explains the concept and the magnitude of information technology, information system and the components of a system. It also addresses the structure of Database System, Database Management System, File Processing and Manual System with their effects in the processes of data resource management as viewed and documented by different authors.

2.1 Information Technology (IT).

Information technology is defined by the Information Technology Association of America (ITAA), as "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and securely retrieve information.

Information Technology is also a general term describing any technology that helps to produce, manipulate, store, communicate, and/or disseminate information

2.2 An information system (IS).

It can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making, coordination, and control in an organization.

In addition it supports decision making, coordination, and control. Information systems may also help managers and workers to analyze problems, visualize complex subjects, and create new products

2.2.1 A system

A system is a group of interrelated components working together towards a common goal by accepting inputs and producing outputs in an organized transformation process

Components of a system

- Input. It involves capturing and assembling elements that enter the system to be processed. For example, raw materials data and human effort must be secured and organized for processing.

- Processing. It involves transformation processes that convert input into output. For example, it can be manufacturing process or mathematical calculations.

- Output. It involves transferring elements that have been produced by a transformation process to their ultimate destination. For example, finished products, human services, and management information must be transmitted to human users

2.3 A database (DB)

A database is a collection of data which organized to serve many applications efficiently by centralizing data in one location and minimizing data redundant rather than storing data in separate files for each application

A database is managed by a database management system that provides assistance in managing database in order to be shared by many users. With the database approach, a single database can serve a number of applications. For example, instead of a hospital to store drug information in separate information systems and separate files for personnel, payroll and benefits, the hospital can create a single Human Resource database.

2.3.1 Advantages of Database.

Sharing of data- A DB belongs to the entire organization and can be shared by all authorized users. In this way, more users share more of the data.

Reduce data redundancies- In a file management, some of the same data fields are repeated in different files. In a database, the information appears just once and the same information is available to different users. Moreover, a reduced data redundancy reduces the expenditure on storage media and hardware as the data is more concise.

Consistency of Data- By eliminating data redundancy, it greatly reduces the opportunities of data inconsistency. This is because; in the database approach each record is stored once in order to avoid the consistency of data.

Reduced program maintenance- In database, new data item types can be added, data formats are changed, new storage devices or access methods are introduced and so on without modifying the application programs. Whereas in traditional file based system, these changes require modifying the application programs that access the data.

Improved data integrity- Reduced data redundancy increases the chances of data integrity, data that is accuracy, and the consistence in data. This is because; each updating change is made in only one place.

2.3.2 Disadvantages of Database approach.

New specialized personnel- Frequently organizations that adopt the database approach are required to purchase a database management system (DBMS) which encourages the hiring or training individuals to maintain the new database software, to develop and to enforce new programming standards.

Need for explicit backup-To ensure that data are accurate and available whenever it is needed, either a database management software or additional procedures have to be provided for essential capabilities.

Interference with shared data- The concurrent access of shared data against several application programs can lead to some problems. First, when two concurrent users both want to change the same related data, inaccurate results can occur if access to the data is not properly synchronized. Second, when data are used exclusively for updating, different users can obtain control of different segments of the database and look up any use of the data (so-called deadlock). DBMS must be designed to prevent or detect such interferences in a way that is transparent to the user.

Security problems-A database must have sufficient controls to ensure that data are made available to only authorized users and that the adding, deleting and updating in the database are accomplished only by these users. Security considerations should include means of controlling physical access to terminals, tapes and other devices. Security considerations should also include the non-computerized procedures associated with the database such as forms to control the updating or deleting of records and procedures for storing source documents.

2.4 Database management systems (DBMS)

Database management systems are programs that are written to store, update, and retrieve information from a database. There are many databases available in the market and the most popular ones are the Ms Access, Oracle and SQL Server (www.management-hub.com)

A database management system provides the ability for many different users to share data and process resources. But as there can be many different users with different database needs, the question here is: How can a single unified database meet the different requirement of so many users? A DBMS minimizes these problems by providing two views of the database data: a physical view and a logical view.

The physical view- This deals with the actual physical arrangement and location of data in the direct access storage devices (DASDs). Database specialists use the physical view to make efficient use of storage and processing resources. Users however, may wish to see data differently from how they are stored and they do not need to know all the technical details of physical storage. After all, a business user is primarily interested in using the information not on how it is stored.

The logical view/user's view.-In this, a database program represents data in a format that is meaningful to a user and the software programs that process this data. The logical view tells the user in user terms on what is in the database. The importance of a DBMS is that, while there is only one physical view of the data, there can be an endless number of different logical views which allows users to see database information in a more

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business-related way rather than from a technical processing viewpoint. Thus the logical view refers to the way user views data, and the physical view to the way the data are physically stored and processed.

2.4.1 Advantages of Database management system

Organizes data-Data is organized or structured according to the specifications of the data definition language. The specifications are introduced by the data-base administrator at the time the database is established. In addition, data is organized in the manner that is suitable to each application.

Control of data- Data security can be maintained by preventing unauthorized users from viewing or updating the database. Through using passwords, users are allowed access to the entire database or subsets of it called sub schemas. For example, an employee database can contain all the data about an individual employee, but one group of users may be authorized to view only payroll data, while others are allowed access to only work history and medical data.

It allows users to define the database, usually through a Data Definition Language (DDL). The DDL allows users to specify the data types and structures, and the constraints on the data to be stored in the database.

It allows users to insert, update delete and retrieve data from the database, usually through a Data Manipulation Language (DML). Having a central repository for all data and data descriptions allows the DML to provide a general enquiry facility to this data, called a query language. The provision of a query language alleviates the problems with file-based systems where the user has to work with a fixed set of queries or there is a proliferation of programs, giving major software management problems.

Data independence- When the database is managed by a DBMS, programs can be written independently of the actual physical layout of the data or even of the overall logical structure of the data. DBMS "knows" these structures and can provide the

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mapping from the data named in a given application to the actual physical items located on the storage device. This means application will remain unaffected if the physical layout of the data is changed.

Recovery services-DBMS provides the mechanism of recovering the database in the event that the database is damaged in any way such as system crash, media failure, hardware and software failure that may cause the system to stop from operating. In all these cases, the DBMS must provide a mechanism to recover the database to a consistent state.

2.4.2 Disadvantages of DBMS

Resource problems- A DBMS usually requires extra computing resources. This enforces the company to find out the additional computing resources that are needed. For example, more terminals may be needed to put managers and other users on-line to the database. Additional hard disk systems may be needed to permit more data to be on-line and available to managers. It may even be necessary to increase the size of the Central Processing Unit (CPU) in order to run the extra software that is required by the DBMS.

Size-DBMS is a very big piece of software, occupying many Megabytes (MB) or Gigabytes (GB) of the disk space and running substantial amount of memory to run efficiently.

Cost of conversion- The cost of DBMS and extra hardware may be insignificant compared to the cost of converting existing application to run on the new hardware and the DBMS. These costs may include; costs of training staffs to use the new system, employing specialist's staff to help with the conversation and running of the system.

2.5 File Processing and Manual system.

In a manual system (MS), the data files are decentralized whereby each department has a separate file or files to support its operations and all records are stored on paperwork in form of memos, reports and transactions.

In File processing system (FPS), each computer application is designed with its own set of files and data are organized, stored, and processed in independent files which often duplicate the data that is already stored in other files.

Although the system works, it has a number of disadvantages that limit its efficiency and effectiveness to the company. These are;

- Managers cannot easily obtain the summary of information that is required for decision making.

- Duplication of data is often exists, which resulting into storing the same data in different programs. This results into wasted space and potentially different formats for the same item.

- The system cannot easily provide answers to complex operational questions For example, answering the question, "What invoices are outstanding for order number 123 from customer ABC?" would probably require some research on the part of the order department.

- Data dependence. In FPS, programs and their associated data files are dependent on each other. This means that changes in the format and structure of data in a file requires that changes to be made to all of the programs that use that file. Thus this program maintenance effort is a major burden of file processing systems as it is difficult to do it properly and it results into inconsistency in the data files.

- Separation and isolation of data. File organization also leads to difficulty in accessing data from different application. When applications are uniquely designed and implemented, data files are likely to be organized differently, stored in different format and often physically inaccessible to other applications.

- Limited data sharing. Since each application has its private file, users have little opportunity to share the data outside of their own application.

- Poor enforcement of standards. Every organization requires standard procedures that it may operate effectively. Within information systems, standards are required for data names, formats, and access restrictions. Unfortunately, data standards are difficult to make known and enforce in a file processing system, mainly because the responsibility for the system design and operation is decentralized. In

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addition, there is inflexible whereby users cannot request data in a new format without writing for new application programs.

2.6 Database administrator (DBA).

Is a person who knows, manages, and makes decisions regarding an organizations database. The DA is responsible for all operations involving the DB. Standards, documentation, testing, backup and recovery techniques and procedures are important to facilitate what a data administrator do.

2.7 Microsoft Visual Basic (MSVB).

Is a program that allows its users to create new programs? It is especially well suited to the creation of programs for supporting business operations, and it has gained considerable acceptance in companies around the world.

2.8 Microsoft Access (MSA).

Is a computer application that makes it possible for you to construct powerful systems for organizing information called databases? An access database allows you to record data, maintain it, edit it, and add to it using simple commands and procedures.

However, we strongly believe that the use of a computer based application running on a well established database will reduce the loss of drug information. This will also provide timely approaches or measures for drug safety, effective retrieval of information and error reduction.

2.9 Conclusion

The books and articles above show the research findings that have been conducted to see the impact of development of new system and influence of technology in the management of drugs' information in hospitals.

CHAPTER THREE

METHODOLOGY

3. 0 Introduction

This chapter explains the methodology used in the development of the assessment instrument in the study, research technique, research design, target population, the sample size, the source of data, research technique, data collection method, data analysis and system development technique..

3.1 Area of Study

The study was conducted at Mulago hospital in the department of Obstetrics & Gynecology as its case study. The researcher targeted problems encountered during the management of drugs' information in the hospital specifically at the store to acquire detailed information about the current system and such information was used to determine the requirements of the developed system.

3.2 Research design

The researcher used qualitative and descriptive research design methods. Qualitative design was used to assess the impact of computer based applications on drugs' information management while descriptive design was used to understand how the current system works and how it could be improved.

3.3 Target population

The researcher accessed basic information from doctors, nurses and drugs that provided a detailed account of the current system. This information was used to determine the requirements of the developed system.

3.4 Sample size

The researcher took 2doctors, 2 midwives and 3 patients and the drugs used for interviews. 4 doctors, 5 midwives and 7 patients also participated in filling the

questionnaires summing up to 23 people. The researcher also took his own observation on the performance of the current system.

3.5 Source of data

The researcher collected data from two sources which included the primary and secondary sources. Primary sources included the questionnaires that were designed to collect data from respondents and interviews. This data was used to draw conclusion about the problem under study. Secondary data source included the text books, journals, articles, and internet.

3.6 Research Techniques

The research was conducted using both qualitative and quantitative research methods in order to get accurate and reliable information from relevant respondents. The departments availed strategic and more relevant information to the researcher.

3.7 Data Collection Methods

Library researches, observation, documentation and in depth interviews were used to collect data. The study used triangulation by data source method, by use of library research, observation, questionnaires. Key informant interviews were used as a means of improving data validity in addition to information from documentation, questionnaires that were held for the department. In depth unstructured interview guides were used for the key informant interviews. This was supplemented with observation which helped to improve the information gathered and to analyze it.

3.7.1 Interviews and Questionnaires

The researcher used Interviews as a research instrument which involved oral exchange of Questions and answers between the researcher and the interviewees concerning the topic above. The researcher used interviews as a tool of data collection because it was flexible and could be adjusted to meet many diverse situations. It provided the opportunity to observe non verbal behavior of the respondent and reduced biasness from the respondents since not all of them would be asked exactly the same questions.

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3.7.2 Observation

The researcher observation method was to understand and to get a real feel of how the current system worked. This technique involved seeing various activities like how the computers perform certain tasks that occurred, other than the interviews that would be conducted and the results too. This enabled the researcher to obtain first hand information

3.8 Data Analysis

After data had been collected, organized, and edited. It was classified into logically related data. After processing the data, the researcher used connectivity diagrams, and data flow diagrams to establish the strength and weaknesses of the manual system and to make specifications for the new system

During data analysis, the researcher analyzed the drawbacks of the current system and departmental needs to determine how data, people and processes communicated and how information technology could best accomplish the improvements for the management tasks. The researcher had to analyze the data collected using questionnaires and interviews for accuracy and consistency in order to solve the problems of the existing system and meet the organizations needs.

During system design, the researcher had to meet the business system requirements and constraints by translating them into a technical solution. This involved the design of system architecture within different units, databases to store information, and also design of user interfaces in order to meet the user's requirements. While designing the system, the researcher had to consider the following parts of the system: output requirements, input requirements, processing and networking requirements, system controls and backup.

3.9 Data flow diagrams

The data flow diagrams were used to develop a functional design (detailed design) of the system. The functional design is a detailed illustration of how the system works.

3.10 Entity relationship diagrams

Entity relationship diagrams were used to design the structure of the system database

3.11 System development technique

The researcher used the system development life cycle (SDLC) to logically develop the system including its requirements, validation, training, and user ownership. The researcher applied structured system analysis and design methods (SSADM) based in SDLC which was the systems approach to analysis and design of the management systems.

The researcher went through all the phases of system development life cycle (SDLC). These phases were applied in the system development that helped the researcher to come up with a clear and complete system and below are the stages/phases

✓ **Database planning**

Management activities that allow stages of the database system development life cycle to be realized as efficiently and effectively as possible

This phase has a mission statement that defines major aims of the database and mission objectives that is meant to identify particular tasks that a database must support.

✓ **System definition**

It helps to define the scope and boundary of database system including the user views.

✓ **Requirement collection and analysis**

It also handles the process of collecting and analyzing information about the organization to be supported by the database system and using this information to identify the requirements for the new system. It includes a description of the data used, details of how that data is used and any additional requirements.

✓ **Database design**

The process of creating a design that supports the organization mission statement and objectives for the required database system. It has two phases i.e.

Logical phase that identifies the important objects that need to be represented in the database and their relationships

Physical phase that describes how the logical design is to physically implemented (as tables) in a target management database system

✓ **Database management system selection**

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This is the selection of an appropriate DBMS to support the database system.

✓ **Application design**

This is where the design of the user interface and the application programs that use and process the database are applied.

✓ **Prototyping**

This is a process of establishing a working model of a system. Its benefits are:

It's to identify the features of a system that works well or that are inadequate

To suggest improvement to give new features

To clarify user's requirements

To evaluate visibility of a particular system design

Prototyping has two strategies i.e.

Requirement prototyping

It determines the requirement of a proposed DBS and the prototype is discarded.

Evolutionary prototyping

It's used for the same purpose but the prototype is not discarded and with further development becomes the working database system. Evolutionary prototyping was used to come up with the working database of the system.

✓ **Implementation**

It is the physical realization of a database and application designs. The DDL is used to create database schemas and to empty database files.

✓ **Data conversion and loading**

It refers to transferring any existing data into a new database and converting any existing application running a new database. It only applies when a new DBS is replacing the old one. The common DBMS has a utility that loads the existing files into a new database. Data was finally converted and loaded into the new system.

✓ **Testing**

It's a process of running a database system with the intention of finding errors. We use realistic data to test the system.

✓ **Operational management/maintenance**

It's a process of monitoring and maintaining the DBS following installation. The activities that are involved in the operational management include:

Monitoring the performance of the system

Maintaining and upgrading the DBS when required

Incorporate new requirements into the DBS.

These phases applied in the system development that helped the researcher to come up with a clear and complete system

3.12 Design Tools

Microsoft Access was used to design the database as well as to design the user interface of the working system.

3.13 Conclusion

In this part of the report, we have looked at the methods and techniques that were used to collect data, analyze the data and design the new system. In the next chapter, we look at the actual analysis, system specification, and how various design tools were used.

CHAPTER FOUR

ANALYSIS, DESIGN AND DISCUSSION OF FINDINGS (RESULTS)

4.0 Introduction

This chapter covers data interpretation, systems analysis to gain a better understanding of the problems with the current system. It also shows how the researcher specified and designed the new system. ERDs and system flow charts were used to design a computer based application.

4.1 Areas of major interest in the systems analysis

The researcher pointed out the following areas as key to gaining a better understanding of the old system. These include the following; on information Management System. Respondents' bio data regarding the Drugs, level of education of the staff, positions held at the departments and knowledge of computer and management systems, problems associated with an Information management system and finally the possible solutions to those problems.

4.1.0 Respondents Bio data

The researcher found it necessary to identify the respondents bio data concerning Drugs, level of education and positions held.

Showing the respondents' statistics

Respondents' position	No of Respondents	Percentage (%)
Doctors	6	26
Midwives	7	30.5
Patients	10	43.5

4.2 Primary Source of Data;

From the above table, it can be observed that most respondents are people who have a good educational background meaning that they are competent enough to use and learn the new system which is an improvement of the old system of Managing information on drugs at the department of obstetrics and Gynecology.

4.2.0 Respondents' knowledge about using computer

The researcher was interested in finding out the respondent's knowledge about using computers and the operation of the current information management system. This was also aimed at finding out what was needed to be improved from the current system to enhance its productivity, efficiency and effectiveness. It was found out that three quarters of the staff had basic computer knowledge and had interacted with the old system before.

4.2.1 Weaknesses of the Old system

- ➤ Use of manual system to track information on drugs which always made access and retrieval of information very difficult, wasted a lot of time and sometimes caused misplacement of information.

  The system was error prone because billing was done manually basing on reports from every department.

Software requirements specification

Functional Requirements of the Proposed System

- It should have a user friendly menu from which the user can select the transaction. This acts as an interface.
- It should capture data from the keyboard
- It should be in position to process and print out reports.
- It should have a well established database where records will be stored and giving provision for expansion.
- It should not accept duplicate records.

- It should have a backup capability in case of any failures.
- It should be password protected.

Non-Functional Requirements

The users also identified the following characteristics that the system must have.

- It must be easy to use. Someone must be able to use the new system with not more than two errors per hour after three hours of orientation.
- The database must be designed using Ms Access.
- It must have a user friendly interface designed using visual basic.
- It must not fail more than three times in a day.

4.3 System Requirements

Given the above specification, the researcher needed the following tools to develop the system.

- A full computer set with at least 40 GB of hard disk, 256MB of RAM, and at least 1000MHZ of processor speed.
- Microsoft Access
- Microsoft office (word) for documentation
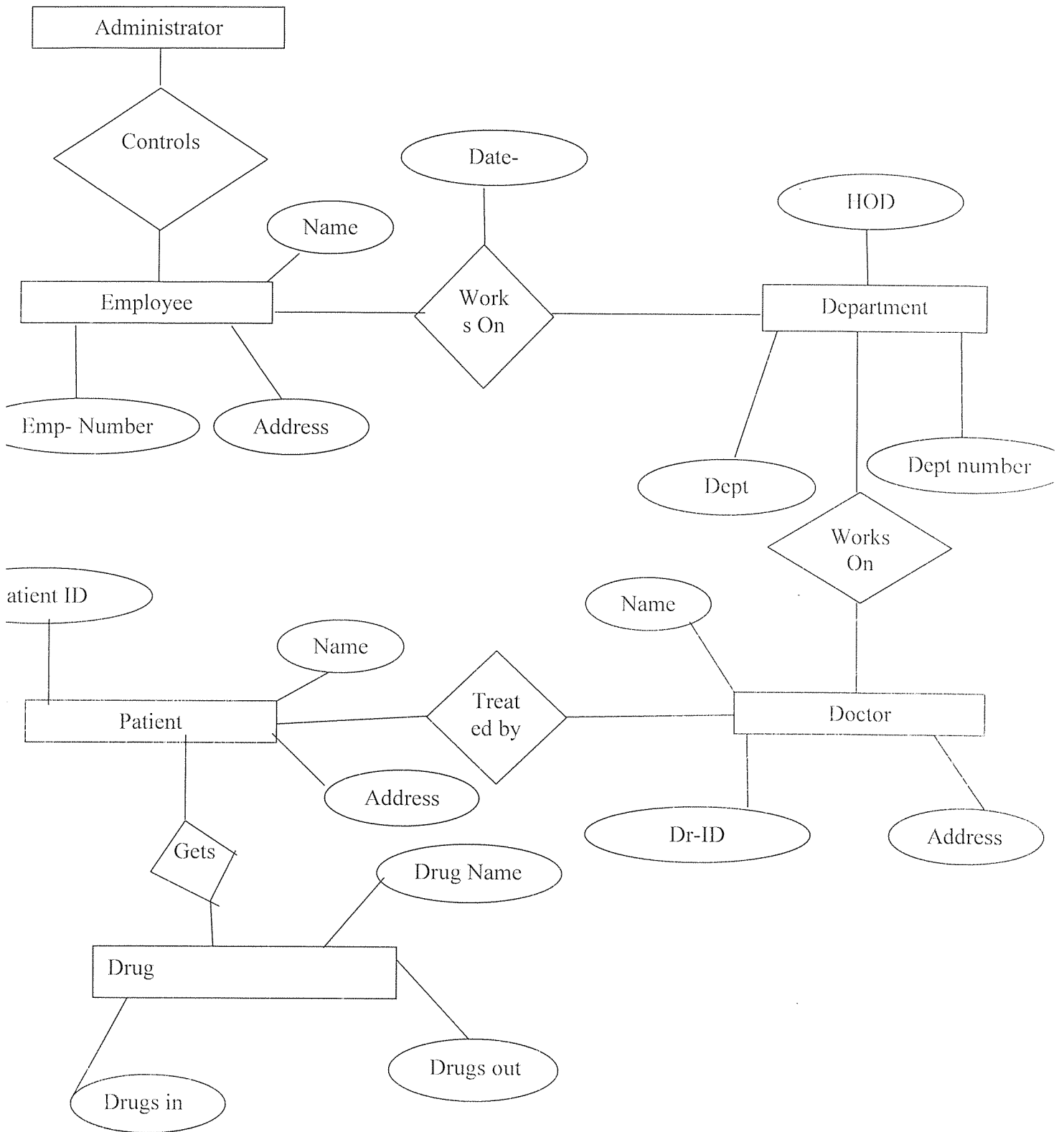
System Design

The design phase was divided into two major phases that is; logical and Physical design.
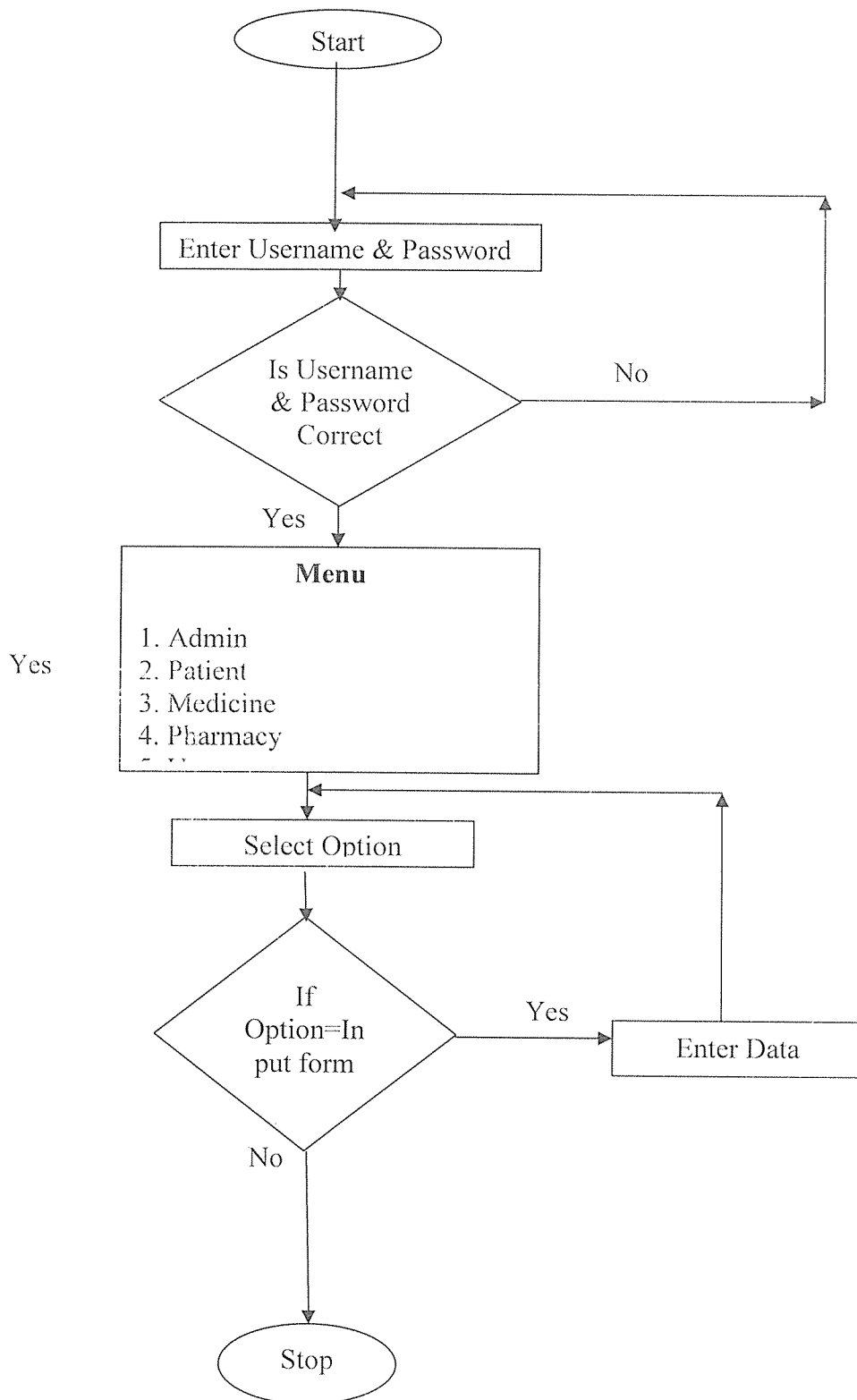
Logical design

The researcher used level ERDs, system flow chart

4.4 ENTITY RELATIONSHIP DIAGRAMS

ERDs show how the different system components are related and how they interact with one another to give a complete Management System.

The Flow chart of the new system

4.4.1 Physical Design

The physical design shows how the design is actually presented on the computer. It shows the database structure and describes how the system processes the data. This includes the system architecture which is established to reflect the basic structure of the system.

4.5 DATABASE DESIGN

Database structure

The most important task in designing database application is to identify the data that needs to be stored. Data that was collected carefully and organized made it easy to create and modify reports that provided information about the basic data operations of the department.

The general theme behind a database is to handle information as an integrated whole. A database is a collection of interrelated data stored with minimum redundancy to serve many users quickly and effectively. After designing the input and output, the analyst must concentrate on database design or how data should be organized around user requirements. The general objective is to make information access, easy, quick, inexpensive and flexible for other users. During database design, the following objectives were of concern:-

- Control redundancy
- Easy to learn and use
- More information and low cost
- Accuracy
- Integrity

The following are the interfaces which the user will interact with.

File Name:-MDI Form
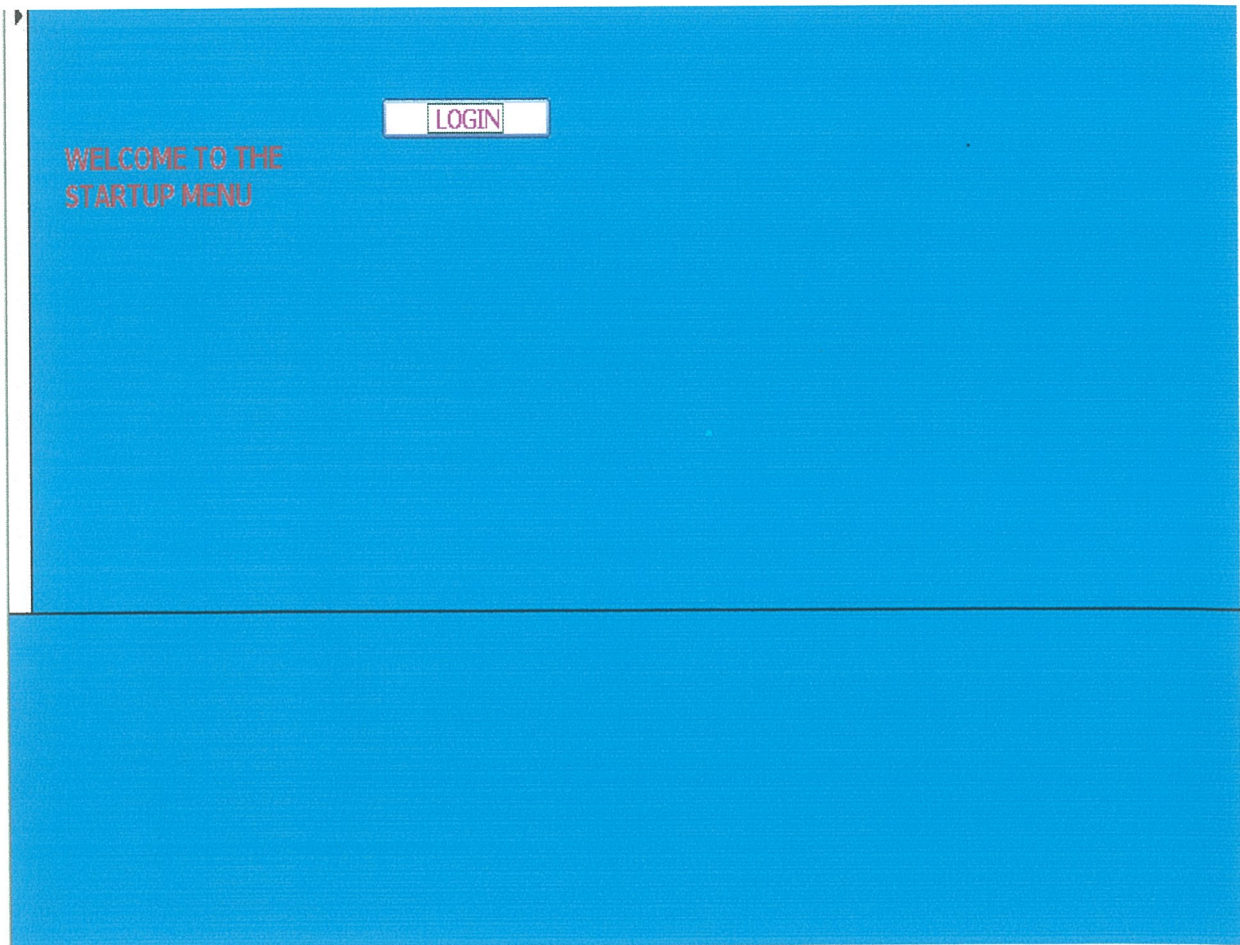
File Name: - Login

File Name: - Doctor Registration Form

File Name:-Patient Details Form

File Name:-Medicine Registration Form

File Name:-Pharmacy Detail Form

CHAPTER FIVE

SYSTEM IMPLEMENTATION, TESTING, RECOMMENDATIONS AND CONCLUSIONS

5.0 Implementation

Implementation is the stage of the project where the theoretical design is turned into a working system. It is one of the most crucial stage s in achieving a new system. It involves gaining the users confidence that the new system will work and will be effective and accurate. It is primarily concerned with user training and documentation. Conversion usually takes place about the same time the user is being trained or later. Implementation simply means converting a new system design into operation

5.2 System testing

Software Testing is the process of executing software in a controlled manner, in order to answer the question – "Does the software behave as specified"? Software testing is often used in association with the terms verification and validation. Validation is the testing of items including software in order to confirm and to ensure consistency of an associated specification. Software testing is just one kind of verification, which also uses techniques such as reviews, analysis, inspections, and walkthroughs. Validation is the process of checking users' specifications.

Software testing should not be confused with debugging. Debugging is the process of analyzing and localizing bugs/errors when software does not behave as expected.

Other activities which are often associated with software testing are static analysis and dynamic analysis. Static analysis investigates the source code of software, looking for problems and gathering metrics without actually executing the code. Dynamic analysis looks at the behavior of software while it is executing, to provide information such as execution traces, timing profiles, and test coverage information.

The techniques below have been used to test the program;

- For correctness
- For implementation efficiency
- For computational complexity

Test for correctness was carried out to verify that a program did exactly what it was designed to do. This was much more difficult than it appeared at first, even worse especially for large programs.

5.3 Test plan

A test plan implies a series of desired course of action to be followed in accomplishing various testing methods. The Test Plan acts as a blue print for the action that is to be followed. The software engineer creates a computer program, its documentation and related data structures. The software developers are responsible for testing the individual units of the programs, ensuring that each performs the function for which it was designed. There is an independent test group (ITG) which is used to remove the inherent problems associated with letting the builder to test the system that has been built. The specific objectives of testing should be stated in measurable terms, so that the mean time of failure, the cost to find and fix the defects, remaining defect density or frequency of occurrence and test work-hours per regression test all should be stated within the test plan.

The program has been tested following the levels below;

5.4 Unit testing

Unit testing was used to focus on verification effort on the smallest unit of software design — the software component or module. Using the component level design description as a guide, important control paths were tested to uncover errors within the boundary of the module. The modular interface was tested to ensure that information could properly flow into and out of the program unit under test. The local data structure was examined to ensure that data stored temporarily maintains its integrity during all steps in an algorithm's execution. Boundary conditions were tested to ensure that all statements in a module were executed at least once. Finally, all error handling paths were tested

5.4.1 Integration testing

Integration testing is a systematic technique for constructing the program structure while conducting tests to uncover errors associated with interfacing. The objective of this test was to take unit tested components and build a program structure that was dictated by design. The entire program was tested as a whole. Correction was difficult because isolation of causes was complicated due to vast expansion of entire program. Once one error was corrected, new ones appeared and the process continued in a seemingly endless loop.

After unit testing in Sell-Soft System all the modules were integrated to test for any inconsistencies in the interfaces. Differences in program structures were removed and a unique program structure was evolved.

5.4.2 Validation testing or system testing

This is the final step in testing; the entire system was tested as a whole with all forms, code, modules and class modules. This form of testing is popularly known as Black Box testing or System testing

Black Box testing method focused on the functional requirements of the software. That is, Black Box testing enabled the software engineer to derive sets of input conditions that fully exercised all functional requirements for a program.

Black Box testing also attempted to find errors in the following categories; incorrect or missing functions, interface errors, errors in data structures or external data access, performance errors, initialization errors and termination errors.

5.4.3 Output testing or user acceptance testing

The system considered was tested for user acceptance; this was meant to satisfy the firm's need. The software kept in touch with perspective system, the user at the time of developing and making changes whenever required. This was done with respect to the following points

- Input Screen Designs,
- Output Screen Designs,
- Online message to guide the user and the like.

The above testing was done taking various kinds of test data. Preparation of test data played a vital role in the system testing. After the data was prepared, the system under study was tested using that test data. While testing the system by which test data errors were again uncovered and corrected by using above testing steps and corrections were also noted for future use.

5.5 Training

Once the system is successfully developed the next important step is to ensure that the administrators are well trained to handle the system. This is because the success of a system invariably depends on how it is operated and used. The implementation depends upon the right people being at the right place at the right time. Education involves creating the right atmosphere and motivating the user. The administrators are familiarized with the run procedures of the system, working through the sequence of activities on an ongoing basis.

The systems personnel check the feasibility of the system. The actual data was input to the system and the working of the system was closely monitored. The master option was selected from the main menu and the actual data input through the corresponding input screens. The data movement was studied and found to be correct, queries option was then selected and this contained various reports. Utilities provided various data needed for inventory, it was input and the module was test run. Satisfactory results were obtained. Reports related to these processes were also successfully generated.

5.6 System Maintenance

The system was developed purposely for the department of Obstetrics and Gynecology in Mulago Hospital. For better maintenance, the users shall be thoroughly trained on how to use the system. There will also be a system administrator who will be monitoring the system and updating its components whenever needed.

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5.7 System Documentation

Getting started with Drugs' Information Management System (DIMS), follow the procedure below;

Go to start menu, my computer, and select Drugs' Information management system from the list of folders. The person attempting to use the application must have a valid login Username and Password well specified whether "Administrator" or "User".

On successful login, the Administrator or the User must ensure that the right operations are performed on the right objects of the application. This may include the correct data on the right input controls.

After the necessary operations have been performed, the user should always remember to save changes if necessary. There are two methods that have been provided to unload the application; namely;

Logoff: this does not close the application but it denies access of unauthorized users to use the system.

Exit: this is used to close the application.

Problems encountered

- Time was not enough since we had to attend other duties and attending lectures. we didn't meet all the respondents we had intended to meet
- Some respondents were biased when giving the information to the researcher.
- Financial resources, the researcher being a private student, did not get enough funds to facilitate the research work.

5.8. Recommendations

Basing on the findings, the researcher made the following recommendations:-

There is need to develop a full billing system which covers pharmacy, Patients, Departments and then they should be merged together to improve the productivity of the system.

The researcher also recommends that the department should establish a network for easy sharing of information and software from one office to another.

5.9 Conclusion

The **DRUG MANAGEMENT SYSTEM** is a great improvement from the manual system using case fields and paper for taking and storing drugs' details. The computerization of the system has accelerated the process. In the current system, the front office managements are very slow. The hospital management system was thoroughly checked and tested with dummy data and thus is found to be very reliable

APPENDIX A: LETTER TO THE PARTICIPANT

KAMPALA INTERNATIONAL UNIVERSITY – MAIN CAMPUS
COLLEGE OF APPLLIED SCIENCES AND TECHNOLOGY

Dear participant, we are students of Kampala International University, doing a research on Drugs' Management Information System in the Department of Gynecology and Obstetrics at Mulago Referral Hospital that leads to the award of Diploma in Computer Science and we would like you to take part in the study. The response given is only for this research and will be treated with secrecy. Participation is voluntary and respondent can withdraw from the study at any time, withdrawal from the study will not affect you in any way and any information gathered will only be used for the study and will be treated with secrecy. Respondent's name will not be used during the study.

The information gathered will also be submitted to the Department and will help in registration and record keeping in your department. Thank you.

If you are willing to participate in the study, please kindly sign below

Respondents' Signature...............................

If you have any questions concerning the study that you want the researcher to answer, please contact us on

Name	Telno	Email
ELUPE MESHULLAM	0775121186	emeshullam@yahoo.com
KYOSIIMIRE DEBRAH	0781450894	debrakyos@gmail.com

Appendix B: Questionnaire

SECTION A

Respondent's back ground information

1. Designation...

2. Sex. Tick where applicable

    i) Male   ☐

    ii) Female   ☐

3. Age of respondent

    i) 10 – 20   ☐

    ii) 21- 40   ☐

    iii) 41- 60   ☐

IV) 61 and above   ☐

4. Marital status

i) Single   ☐

ii) Married   ☐

iii) Widow   ☐

iv) Divorced   ☐

5. Education level

    i.   Primary   ☐

    ii.   Secondary   ☐

    iii.   University   ☐

    iv.   College   ☐

    v.   Others   ☐

SECTION B

Drugs' Information Management System

1. Do you have a computer in your office?

    Yes   ☐

    No   ☐

2. If yes, do you know how to operate it?

    Yes   ☐

    No   ☐

3. What do you use your computer for at the department? Tick where applicable.

    i)   typing office work   ☐

    ii)   internet services   ☐

    iii)   Keeping office records   ☐

    iv)   Keeping personal records ☐

    v)   Commercial purposes   ☐

    vi)   Any other   ☐

4. For any of the choices made above, give reasons.

....

....

....

5. What procedure do you follow when registering Drugs?

i) By use of registration papers   ☐

ii) By use of computers   ☐

iii) Any other means   ☐

6. What kind of information do you keep about Drugs?

....

....

....

7. How do you keep Drugs' Information? Tick where appropriate.

i)	By using personal files	☐
ii)	By use of computers	☐
iii)	By use of Counter books	☐
iv)	Any other	☐

If your answer is any other, please specify.

....

....

Why?

....

....

....

8. What do you think is the easiest method of keeping Drugs' Information?

....

....

....

9. Why do you keep the above Information?

....

....

....

10. Is it easy for you to keep the above Information?

Yes ☐

No ☐

If your answer is Yes/No, please give reason(s).

....

....

....

....

11. What is the estimate of the Drugs given per month? Tick where appropriate.

i)   30000-50000   ☐

ii)   50000-100000   ☐

iii) 100000-200000   ☐

iv)   Any other   ☐

If any other, how do you manage to serve all their needs?

....

....

....

SECTION C

Problems associated with Drug Management Information System

1. Do you have enough Computers?

Yes   ☐

No   ☐

2. Do all members of staff know how to operate computers?

Yes   ☐

No   ☐

3. How easy is it to retrieve data from the methods used to store it?

Tick where appropriate.

i)   Very easily   ☐

ii)   Not easy   ☐

iii)   Difficult   ☐

iv)   Very difficult   ☐

v)   Do not know   ☐

For any of your choices above please give reasons.

....

....

....

....

4. Give other problems associated with the current system.

....

....

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Appendix i

Research Budget

Item	Quantity	Unit cost	Cost (shs)
Pens	10	300	3000
Pencil	2	100	200
Ruler	1	500	500
Internet services		60,000	60,000
Typing and printing		200,000	200,000
Transport to and collecting data and up keep at the site		40,000	40,000
Proposal binding	4	6000	24,000
Report binding	4	10,000	40,000
Miscellaneous		70,000	70,000
Total			437,700

Appendix ii

Research Work Plan

ACTIVITY	AUGUST	SEP	OCT	NOV	JAN	FEB	MARCH
Identification of research topic							
Writing of the research proposal							
Research supervision							
Administering instruments and collecting data							
Submission of the research proposal							
Writing of research report							
Submission of the research report							