An Automated System for Patient Record Management

(A Case study of St Francis Hospital Nsambya)

By
IM020-09

Track: Patient Information Management

DEPARTMENT OF INFORMATION TECHNOLOGY
FACULTY OF COMPUTING AND INFORMATION TECHNOLOGY

A Project Report submitted to the Faculty of Computing and Information Technology
For the study leading to a project in partial fulfillment of the requirement for the award of
degree of bachelor of information technology Makerere university

Supervisor

EILU EMMANUEL

Department of information technology

Faculty of computing and information technology, Makerere University

eiluemma@cit.mak.ac.ug +256-41-540628 Fax +256-414-540620

June, 2009

DECLARATION

We IM020-09 hereby declare that this Project Report is original and has not been published and/or submitted for any other Degree award to any other University before.

GROUP MEMEBERSHIP

#	Names	Reg_Number	Signature
1	DROMA FAHAD	06/U/11160/PS	
2	BULYABA HANIFA	06/U/11154/PS	
3	SSEBWATO JOSEPH	06/U/11385/PS	
4	NAKAWOOYA KUBRA	06/U/11292/PS	
5	K CANDELLAH MUSAH	06/U/17541/PS	
6	ONGORO DOREEN ANYANGO	06/K/4409/PS	
7	SUUNA COLLINS	06/U/11389/PS	
8	NDEGE RICHARD	06/U/11070/PS	

Date...

Approval

We hereby submit this Project Report for Examination with the approval of the project supervisor.

 Signed............................... Date................................

Mr. EILU EMMANUEL

[BTM, Msc IT]

Department of information technology

Faculty of computing and information Technology

Makerere University

DEDICATION

We wish to dedicate this entire project report to our beloved mothers and fathers for their tireless support they accorded to us ever since we were children. We thank them for the spirit of hard work, courage and determination they had instilled in us through out our school days till today. We also honor and owe our dear sisters and brothers for the happiness and appreciation for the guidance protection and financial support they offered us.

ACKNOWLEDGEMENT

First and fore most, we would like to express our sincere thanks to the Almighty ALLAH for the gift of life, wisdom and understanding he had given to us, a reason for our existence. And to our families for the love and support they had provided through out our life.

We also thank the staff of St Francis Hospital Nsambya for having given their time at will during our System Study and Analysis stage they had been particularly helpful in providing the necessary data about the manual patient record management system.

Special thanks go to Mr.Ssentongo Lawrence for initiating the ideas for our research topic hence establishing a framework for the project proposal; he too has been good and understanding.

Mr. Eilu Emmanuel whom we regard as our mentor and supervisor, we thank him for the expertise and intelligence he has displayed while supervising this project. We believe this good work is a result of his good guidance and cooperation.

We cannot forget our friends in the Faculty of Computing and Information Technology for the academic interactions and company they have accorded to us especially Mr. Mutanji Hashim, Mr. Feta Geoffrey and Mr. Kasumba Dennis among others; they shall always be remembered as having been good friends in a life time.

Lastly, we would like to convey our gratitude to the lecturers in our Faculty for the good job done during the 3 year period of our course. May the good lord bless them and keep them safe. We love you all.

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ABSTRACT

Patient record management systems in hospital today necessitate a competent administration when handling patients, generating reports from cashier, patient details which serves as a key factor for the flow of business transactions in St Francis Hospital Nsambya. Unfortunately the current Record management system leads to misplacement of drug details, payment details, and late release of reports and insecurity to records. This research project is aimed at computerizing all the records about patients, staff and drug suppliers. In order to achieve this goal, a thorough System Study and investigation was carried out and data was collected and analyzed about the current system using document and data flow diagrams. The concept of report production has been computerized hence, no more delay in report generation to the hospital manager. Errors made on hand held calculators are dealt out completely The method used to develop the system include iterative waterfall model approach, dataflow, logical and entity relationship diagram were used to design the system and finally the language used were MySql, php, HTML, Css and JavaScript.

LIST OF ABBREVIATIONS

Terminology	Meaning
ERD	Entity Relation Diagram
ERM	Entities Relationship Model
RAM	Random Access Memory
ERM	Electronic record managements
MYSQL	My Structured Query Language
IT	Information Technology
HTML	Hyper Text Makeup Language
OLP	On Line Password
SFHN	St Francis Hospital Nsambya
ERD	Entity Relation Diagram
DFD	Data Flow Diagram
SFHPRMS	St Francis Hospital Patient Record Management System
PIMS	Patient Information Management System
GUI	Graphical User Interface
DBMS	Database Management System
CDs	Compact Disks
JDBC	Java Database Connectivity
MB	Mega Bit
GHZ	Giga Hertz

DEFINITION OF OPERATIONAL TERMS

Hospital: is defined as the entity that provides the medical services to the patient in questioned at a given period of time which is basically curative and preventive and is offered in clinic unit x-ray/ ultra sound, laboratory and dental unit in the hospital.

Patient Record Management System: It is a system that can manage multiple administrators and can have the track of the right assigned to them. It makes sure that all the Administrators function with the system as per the rights assigned to them and they can get their work done in efficient manner.

Medical Form: it refers to the medical document describing the patient initials, diagnoses and treatment of a particular patient in question that can be used for future reference incase of no improvement in the health condition of the patient hence changes can be carried out accordingly.

Consultations Fee: is the money paid by the patient in question at the receptionist desk before any medical attention.

CHAPTER 1
GENERAL INTRODUCTION

1.0 Introduction

Generally Automation plays an important role in the global economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications.

The Patient Information Management System (PIMS) is an automated system that is used to manage patient information and its administration. It is meant to provide the Administration and Staff, with information in real-time to make their work more interesting and less stressing.

1.1 Background of the Study

The scope of the service in Nsambya hospital is basically curative and preventive and is offered in clinic unit x-ray/ ultra sound, laboratory and dental unit in the hospital. Other services include admission (ward) inpatient (where drugs are issued), physiotherapy and family planning.

The hospital offers 24 hours services to its staff and the entire population. The records of patients in Nsambya hospital have over time been run down due to large numbers of patients, this led to poor record keeping since it's a paper based system. The reason why the current system used is manual has led to a variety of problems and these include; un necessary duplication of the data especially for inpatients and outpatients, inconsistence may occur since data is held more that once and hard to analyze the data hence difficult to trace the flow of patient past medication data. There are several departments in the new extension of Nsambya hospital which includes medicine surgery,

psychiatry, public health, ear, nose and throat, casualty, obstetrics and gynecology among others.

According Jantz (2001) the emergence of computer based information system has changed the world a great deal, both large and small system have adopted the new methodology by use of personal computer; to fulfill several roles in the production of information therefore computerizing the documentation of patient record to enable easier manipulation of the input process and output will bring us to this existing new world of information system.

Patients records and disease pattern documentation is concerned with documentation of information obtained from patients and their particular health system in order to function properly. If this information is not documented perfectly causing some data to get misplaced, the health system will not be efficient.

According tang (2001) In examine the document system that in existence at the hospital that is mostly manual much importance has been placed on creating a system that document the inpatient record using a computerized database system with a secure procedure for accessing it.

One of the unit of the std/aids control program (STD/HCP) a server doctor at consultant level who is assisted by 3 doctors, a secretary, 5 medical assistance7 nurses trained consolers and part time statisticians and 2 laboratory technologists head of units. The various diseases managed at the unit include the following syphilis, virgin its, molluscus, scabies', pubic lice, gonorrhea, trichomoiasis, gentle mart etc.

Patient information past and present is extremely vital in the provision of patient's care which guides the physician in the making of right decision about the diagnosis. The rapid growth of information technology and system made to choose the health care industry to borrow a page from the air industry for the sake of patient's safety. Pilots have instant access to the data they need in whether condition and mechanical function to make information decision about navigation and delay.

1.2 Problem Statement

The absence of a well established information system to serve patient and staff has led to inconveniences. This has tantamount to the loss of patient and staff records.

This is basically because of the weakness of the existing system which includes over reliance on paper based work. Paper files consume a lot of the office space, slow recording, processing and retrieval of patient details. Accessing and sharing of information by different departments is difficult due to poor information management.

1.3 Objectives of the Study

1.3.1 Main Objectives

Our major objective is to develop an operational Patient Information Management System for St Francis Hospital Nsambya

1.3.1 Specific Objectives

i. To review literature on related systems and analyze the existing manual system.
ii. To collect data and identify the system's requirements
iii. To design an automated Patient Information Management system.
iv. To implement the system.
v. To test and validate the system.

1.4 Scope

This project is basically designed for St Francis Hospital Nsambya hospital. This hospital provides a lot of services to patients which includes; Daily treatment of patients, Admission of patients, Keeps records about inpatients and outpatients respectively, Billing of patients by use of a billing system and other services, with departments that include radiography and ultra sound, pathology, pharmacy, inpatient and outpatient, causality and dental which information will be used for making reports for researchers in various departments, drug/ stock taking unit at the central pharmacy and medical practitioners.

The following are the language confined within the system to enable development and implementation.

The database implementation was achieved using Mysql for the database development, server side scripting was done in java embedded in html, and java web server wills facilitate simultaneous processing.

1.5 Significance of the Study

Currently the hospital operates a manual records system. With the introduction of an automated system the following will be achieved;

i. The system is a land mark in the field of modern technology since its automated it becomes a quick access to the required information as it is only 'one click away.

ii. In the field of ICT, decision support and information availability which is required by the administration. This is because it is able to generate reports daily, monthly and yearly. This makes it simple for managers to make decisions.

iii. Electronic security is maintained as the staff and management are able to login and access the system depending on their privileges. They are also able to work on the policies and claims more effectively and efficiently.

CHAPTER: 2
LITERATURE REVIEW

2 Introductions

In this section the research, location and analysis of the existing knowledge related to the subject of inquiry are explored and cited. It also sells at the relationship of the proposed research for purposes of good representation and critical review of the existing literature.

Martin (1976) data within an organization is increasingly being regarded as a basic resource needed to run the organization. As with other basic resources, professional management and organization of data are needed. The importance of efficient use of data for planning, predicting and other functions will become so great in a computerized organization that it will have a major effect on growth and survival of co-operations. In relation to the above argument, the presence of an automated data management system in Nsambya hospital's efficiency, timely decisions and responses will be achieved.

2.1 Previous Studies from St Francis Hospital Nsambya

For the last few years the hospital employees have been able to collect data from agents by providing them with a piece of paper with required fields to fill. Its routine for every health worker to collect data, this should be processed and stored completely. They avail the right information and knowledge to the right person and institution in the form at the right time and place. The information ranges from individual patient reports to disease rebalance to mortality rate in the right persons and institutions which include the counties that use the health service, the service provider at local level, ministry of health and the donors.

The company's employees and patients are straining to process lots of policy documents every day. Integrating and streamlining policy

Application and document processes would ease administrative headaches for patients and greatly strengthen relationships with their customers

Streveler (2004) grouped the component making HIS into 2 which are information processing and management. Information processing involves data collection, transmission, processing, analysis and presentation of information for use in patient care and health care management decisions. Health management system cannot exist alone but as functional unit aimed at improving the health of individuals and that of the community.

2.1.1 Types of Information System

According to FCIT (Tutor2u.net 2005) there are various types of information system of which the following are inclusive:

Transaction processing system (TPS): these are systems that perform and record daily routine transactions necessary for businesses. As this implies, TPS are designed to process routine transactions effectively and accurately.

Knowledge work system (KWS): these are systems that aid in the creation integrations of new knowledge in to an organization. KWS exists to help businesses create and share information. These are typically used in an organization where employees create new knowledge and expertise which can then be shared by other people in the organization to create further opportunities. Good examples include firms of lawyers, accounts and management consultants. KWS are built around system which allows efficient categorization and distribution of knowledge. For example, the knowledge itself might be contained in word processing documents, spreadsheets, power point presentation, internet pages or whatever. To share knowledge, a KWS would use a group of collaboration systems such as an intranet.

Office Automated System (OAS): these are systems designed to increase the product of data workers in an organization. Office automation system   improves the productivity of employees who need to process data and information. Perhaps the best example is the wide rage of software systems that exist to improve the productivity of employees working in an office (e.g. Microsoft office) or system that allow employees to work from home or whilst on the move.

Management information system (MIS): these are systems that serve planning, control and decision making through routine summary and reports. They are mainly concerned with internal source of information. MIS usually take data from the transaction processing systems and summarize it into a series of management reports.

Decision support system (DSS): these are systems that combine data, model and analysis tools for non routine decision making

DSS are specifically design to help management make decisions in situation where there is uncertainty about the possible outcomes of those decisions. DSS comprises tool and techniques to help gather relevant information and analyze the options and alternatives. DSS often involves use of complex spreadsheet and database to create "what if models".

Executive support system (ESS): these are systems that support non routine decision making through advanced graphics and communications. They gather and summarize the key internal and external information used in an organization.

2.1.2 Qualities of a Good Information System

According to Comptroller (1995), an information system includes the following:

Efficiency: a good information system should allow for input and output by providing an objective for recording and aggregation information. It

should be able to quickly collect and edit data, summarize results, and adjust as well as correct errors promptly.

Effectiveness: a good information system should be able to attain its goals or the goals of the organization. To simplify prompt decision making, an organization's information system should be capable of providing current information to appropriate users.

Performance: A good information system should be able to enhance communication among employees, deliver complex material throughout an organization.

Time lines: Information system should be designed to expedite capturing, storing and reporting information in a real time scale when needed.

Consistency: A good information system should be reliable. Data should be processed and compiled with consistency and uniformity. Variations in how data is collected and reported can distort information and trend analysis.

2.1.3 Function of Patient Record Management System

According to Melongoza (2002) these are incorporated in the technical (clinical) and business (administration) component of health service these are divided into three (3); transactional control reporting, operating planning and strategic planning.

- Transactional functions: handle day to day operational and administrative task of the organization example of this include the following; order entry, service scheduling, treatment and other personal staffing and scheduling.
- Control reporting and operating function: provides summarized data about the operation of the organization to the manager and health care professional that permits the monitoring of various activities. These tasks include medical record tracking, medical audit and peer review.

- Strategic planning function: provides a frame work from decision making with long range implications which include patient care strategy like level of care, occupancy and service demand, requirement and project cost.

Thus the patient management information system in this study ideally consists of integrated approach to maintain patient related administrative and clinical data considering the continuum of care dependent on the services provided.

2.1.4 Related Case Study

Pioneering secure on line Patient Record management and collaboration between doctors clinical and hospital using secured internet transmission according to Mennel (2006).

In this project doctors are able to view patient medical records immediately at their private offices using secure internet transmission. The project aimed at increasing competitiveness of the medical profession by improving the accuracy of medical records and efficient retrieval and usage of medical records.

Patient medical records are very critical for doctors to establish their diagnosis, with detailed and on-hand patients' medical records; doctors can make appropriate medical decision efficiently.

Security was a critical issue in the storage and transferring of patient medical records between hospitals and doctors' offices. All clients were authenticated with a 2 patient identity number.

2.2 State of Art of Patient Record Management System

Llan (2002) defined a medical record as confidential information kept for each patient by heath care professional or organization. It contains the patients' personal details such as name, address, date of birth, a summary of the patient medical history and documentation of each event

including symptoms, diagnosis, treatment and outcome. Relevant documents and correspondence are also included.

Traditionally, each healthcare provider involves in patient care kept an independent record usually paper based, the main purpose of the medical record of the summary of a person's conduct with the health care provider and treatment provided to ensure appropriate health care, information from medical record also provide essential data for monitoring patient care, clinical audit and accessing patterns of care and services delivered. The management information system enables the medical record to form a first link in the information chain producing the depersonalized aggregated coded data for statistical.

2.2.1 State of Electronics of Patient Record Management System

According to Murphy (1999), an electronic heath record (EHR) is a medical record or any other information relating to the past, present or future physical and mental health or condition of a patient which resides in the computer that captures, transmits, receives, stores, retrieves, links and manipulates multimedia data for the primary purpose of providing health care and health related services. It also includes patient demographic, SOAP notes, problems, medications, and vital sign posts medical history, immunizations, laboratory data and radiology reports. An EHR automates and streamlines the clinical workflow. The EHR has ability to generate a complete record clinical patient encounter as well as supporting other care related activities directly or indirectly via interface including evidence based on decision support, quality management and outcome reporting.

Patient information system has benefits which accrue in the long run. According to Wang (2003) the long term benefit of the health electronic

record (HER), the united states of used it to minimize a cost benefit per provider for having used an (HER) system over a five (5) year period was estimated to be at $87000 and $330900 over a ten (10) year period. The implementation of this project was likely to reduce the cost in the long run.

Advantages

According to Gordon (2006), the following are what he identified as the advantages of computers- base information system.

- They are user friendly and the navigation is very easy.
- They help in organizing and managing documents effectively. Since the data is stored in a highly organized manner, accessing necessary data is very easy.
- It helps save time. People are able to access data needed in real time thus enabling them access detailed information.
- Accurate, current and reliable data is provided. As data can be analyzed correctly and plans made can be implemented at astounding speed due to proper automated systems.
- They are installed to improve internal efficiency of the organization.
- They increase security and protect the data from being misused.
- They are extremely useful, especially during disaster recovery, as paper documents can be lost, causing a business millions of dollars in losses.

Weakness

- Hackers: information sent by use of the internet can easily be hijacked and terminated by unauthorized persons before reaching its destination.
- Virus: this can destroy files by replicating themselves in the document hence losing the meaning of the file.

2.2.2 Administration of Patient Record Management System

The patient Record Management System is a system that can manage multiple users of the system and can have the track of the right assigned to them. It makes sure that all the users function with the system as per the rights assigned to them and they can get their work done in efficient manner. It is a Customizable and strong administration system i.e. changes of password of users at the administration point.

The information management system will be able to capture information about an old patient the information captured will be easily managed by the administrators more easily.

2.2.3 Problems of Administering Patient Management System

According to Gordon the following are possible problem to encountered while administering PRMS

- It is not suitable for computer illiterate people
- The user must be a member in order to make use of the system.
- The systems do not do away with paper work completely; the papers are still used at some point.

CHAPTER 3
METHODOLOGY

3.0   Introduction

This is a description of methods chosen to achieve the objectives of the proposed system. It will go on to describe the techniques of data collection that will be employed in the research study of the proposed systems.

The methods that will be applied to achieve the specific objectives are namely: Literature review, Oral interviews, system analysis, system design, Data modeling and Black box testing. The tools that will be used to implement the system are MySQL, HTML and PHP.

3.1 Approach for the Development of PRMS

The system development life cycle (SDLC) we chose to use the iterative waterfall model. In this model, the system follows a series of events from the requirement definition, system and software design, implementation and unit testing, integration and system testing and operational maintenance. We also used different aspects from other models like prototyping which helped us come up with system definition and analysis, data flow diagrams (DFD) and entity relationship diagram (ERD). The ERD was used to show the relationship between entities while the Data Flow Diagrams were used to show the flow of data in the system.

Iterative waterfall model divides the system development lifecycle into phases. During each phase of the lifecycle, a set of well defined activities are carried out for instance at the Analysis stage (structured analysis of requirement) was specifically carried out in focus of the functionality of dataflow at St Francis Hospital Nsambya. The system and structured analysis was then transformed into software design (software

architecture to decompose the system into modules and representation of relationships among the modules, data structures and algorithms for the modules to be designed.

3.1.1 Data Collection Methods

We used the following methods during data collection: Observation, Interviewing and Questionnaires as our research methods. Through this we were able to collect raw data on PRMS at St. Francis Nsambya Hospital where existing reports on the current system were obtained. Verbal interview techniques were used to interview employees from the hospital.

3.1.2 Observation

We went to the hospital and observed their daily as regards their current system and they were manually recording the patients' records as specified by the receptionists, doctors, pharmacist and cashier. A follow up was made to determine the time it took to carry out the patient record management. We observed the system's weaknesses like it was vulnerable to errors.

3.1.3 Interviewing

In this method, there was interaction between us, the researchers and the Staff. Interviews will be conducted with the medical supridendant and some potential employees to find out what difficulties they encountered with the existing system. These interviews were held to verify the information collected using the questionnaires since there was room to search for further information during the interview.

3.1.4 Questionnaires

The efficiencies and inefficiencies of the current system were reviewed by issuing questionnaires to the users of the system. This helped us to establish the requirements of the proposed system.

3.2 Database Design.

A relational database design was used to design the database. A relational database management system (RDBMS) is an excellent tool for organizing large amount of data and defining the relationship between the datasets in a consistent and understandable way. A RDBMS provides a structure which is flexible enough to accommodate almost any kind of data. Relationships between the tables were defined by creating special columns (keys), which contain the same set of values in each table. The tables can be joined in different combinations to extract the needed data. A RDBMS also offered flexibility that enabled redesign and regeneration of reports from the database without need to re-enter the data.

Data dictionaries were used to provide definitions of the data used; these included the final data structures for the various tables and their corresponding data fields, description and sizes

The user application programs and interface were developed using PHP, CSS, HTML, and Java Script with support of structured query language (SQL) and MYSQL.

SQL is a language used to create, manipulate, examine and manage relational databases. SQL was standardized in 1992 so that a program could communicate with most database systems without having to change the SQL commands. Unfortunately one must connect to the database before sending SQL commands and each database vendor has a different interface as well as different extensions of SQL. Though SQL is well suited for manipulating database, it is unsuitable as a general

application language and programmers use it primarily as a means of communicating with databases, another language is needed to feed SQL statements to a database and process results for visual display or report generation.

The advantage of PHP and HTML is that you can run their programs on any enabled platform without even recompiling the program.

3.2.1 System Implementation

This describes the tools used to implement the graphical user interface and the database. MySQL was used to create and connect relational tables to the database. HTML was used to develop the GUI. PHP was used to process queries and request flash to integrate sounds and interfaces was done to develop the model that meets all the requirements of this system.

3.2.2 Systems Testing and Validation

Testing was done after the system was put in place. This was done in two ways:

Implementation and Unit testing was carried out on individual modules of the system to ensure that they are fully functional units. We did this by examining each unit which we checked to ensure that it functions as required and that it adds clients' data and other details and also ensured that this data is sent to the database. The success of each individual unit gave us the go ahead to carryout integration testing. All identified errors were dealt with.

We carried out integration and system testing after different modules had been put together to make a complete system. Integration was aimed at ensuring that modules are compatible and they can be integrated to form a complete working system. For example we tested to ensure that when a

user is logged in, he/she is linked to the appropriate page, and could at the same time access the database.

As one of the final specific objectives of this study, validation of the system was very important. Validation of the system was done by comparing it to the questions asked by the users at St.Francis hospital. Most of their answers matched what the system can do.

3.2.3 Development of the System

This section describes what is evolves to come up with the system and how the system works.

- Front end: Html (hyper text makeup language) enable the construction of easy and intuitive user interface for accessing the database and any browser can display and html document.

- Middle end: php enables links of the text entered in the created graphic user interface to be sent to the database

- Back end: Mysql its easy to use, inexpensive database language it can run on a variety of operating system such as window,linux,unix.os/2 and others , its secured with technical support widely available on the internet but most of all it support large database.

CHAPTER 4

SYSTEM ANALYSIS AND SYSTEM DESIGN

4.0 Introduction

The chapter describes the system study, analysis, design, strengths and weaknesses of the current system, Context level diagrams, Entity Relationship Diagrams, Architectural design

4.1 System Study

The study was carried out at St Francis Hospital Nsambya the main purpose of the study was to find out how the process of recording patient's data is carried out. The system that is currently being used in St Francis Hospital Nsambya is entirety manual. When a patient requests drugs from the staff, all the information is recorded manually from the drug dispenser similarly when the supplier delivers drugs all the information from the dispenser to the account on drugs is recorded manually. For cases that cannot be resolved are posted to the respective staff to handle them and the status is sent to the concerned receivers.

4.2 System Analysis

During the system study phase, requirements of PIMS were categorized into user requirements, system and hardware requirements.

4.2.1 Existing Patient Record Management Systems

Refer to the literature review, observation, interviews and questionnaires as explained in chapter 3 it should be noted that at St Francis Hospital Nsambya we were able to analyze existing systems as discussed below.

The current system was manual where data is written on different papers and transferred to the different departments, human errors were vulnerable since it was paper based and retrieval of files was time consuming as they had to manually locate files some of which were even

lost and thus finding such information was hard. Per the statistics carried 90% of the users were not contented with the system reason that it was not secure in terms of security and storage as it was prone to damages like loss of important information, worn out papers, out break of fire, The speed of recording and retrieval patients' information was average yet 10% were some how okay with the system reason that the paper work can used for future reference.

The users recommended that the proposed system should be user friendly, multipurpose enough to handle a number of users at a go, could generate feedback when request is submitted and use of passwords which could deny access to unauthorized users of system which ensured security. Context diagrams, Data flow diagrams and Entity Relationship Diagrams (ERDs) were used in the analysis and design of the system.

4.2.2 Requirements Specifications

After analyzing the data collected, we formulated a number of requirements namely user requirement, system hardware software attribute. These were grouped as user, functional, non-functional and systems requirements.

4.2.3 User Requirement

During data collection, the we investigated and found out how the current system operates, not only that but also tried out which problems are faced and how best they can be settled. The users described some of the basic requirements of the system this includes Search for patients, Register staff, Update, staff records, patients and View all types of reports

4.2.4 Functional and Non Functional Requirements

The following is the desired functionality of the new system.

Accept of submissions in form of raw patients, staff, and drug supply at submit point, Perform analysis of financial, drug inventory, patients, and drug supply, To authenticate the users of the system.

And non functional requirement include the following

The system must verify and validate all user input and users must be notified in case of errors detected in the course of using the system, The system only allows the administrator to delete records in the database, The system should allow room for expansion.

4.2.5 System Requirement

This section describes the hardware components and software requirements needed for effective and efficient running of the system

Table 4.0 Hardware Requirement

Hardware	Minimum System requirement
Processor	2.4 GHZ processor speed
Memory	128 MB RAM (256 MB Recommended)
Disk space	80 GB (including 20 GB for database Management system)
Display	800 x 600 colors (1024 x 768 High color- 16 bit Recommended)

The table above shows hardware components of the machine that allows the system to function as required for using PIMS

Table 4.1 Software Requirements

Software	Minimum System requirement
Operating System	Windows2000 or later

Database Management System	MYSQL
Run-time Environment	Apache/tomcat5 server

The table above shows software requirements recommended to enable the system to run as required for using PIMS

4.2.6 Proposed Features for the New System

- The system should captured patients initials at the receciptionist that can be used by all departments of the hospital.
- The system should generate patient's identity number automatically.
- The system should identify treated and untreated patients at doctor and pharmacist control panel concerning drug issuing.

4.3 System Design

After interpretation of the data, tables were drawn and process of data determined to guide the researcher of the implementation stage of the project. The tools, which were employed during this methodology stage, were mainly tables, Data Flow Diagrams (DFDs) and Entity Relationship Diagrams (ERDs). The design ensures that only allows authorized users to access the system's information.

4.3.1 Logical Model

This figure shows the logical flow of events in the system, it caters for the time when the user logs in and signs out from the system.
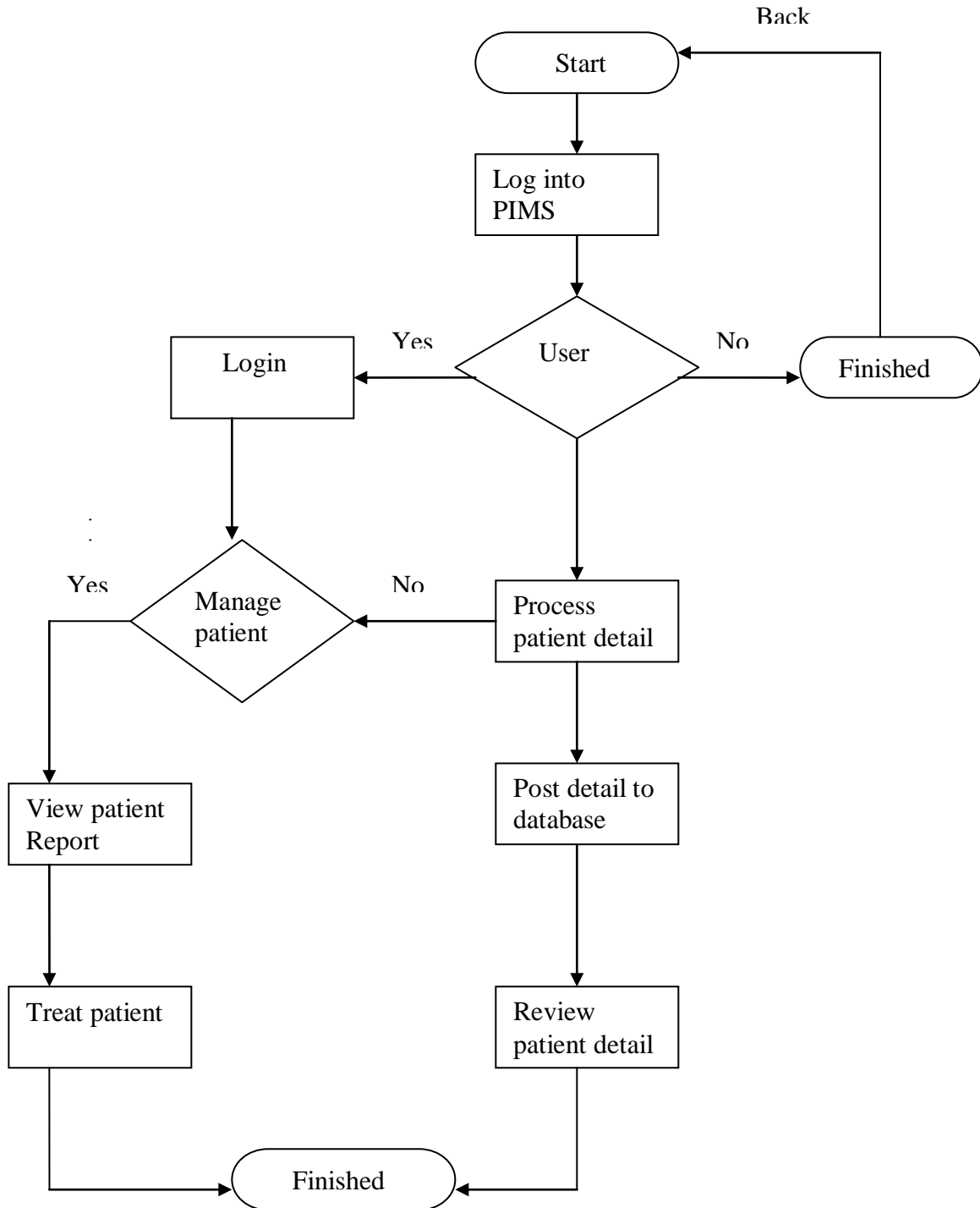
Figure 4. 0 Logical flow of data in PRMS

4.3.2 System Architecture

This gives a high level view of the new system with the main components of the system and the services they provide and how they communicate. The system is implemented using a three-tier architecture that comprises of user interface, process management and DBMS as illustrated below.
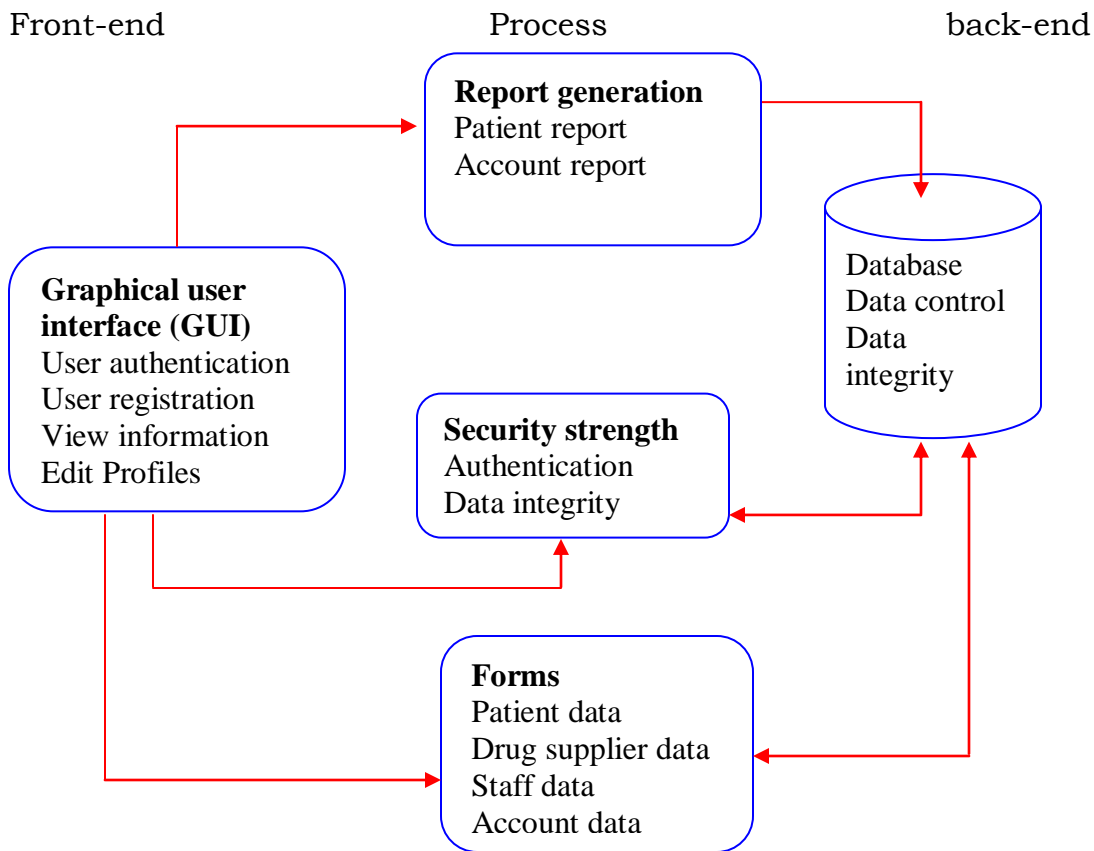
Figure 4.1 System Architecture of St Francis Hospital Nsambya

4.3.3 Entity Relationship Diagrams

Entity Relationship diagrams is a specialized graphics that illustrate the interrelationship between entities in a database. Here diagrams always use symbols to represent different types of information.
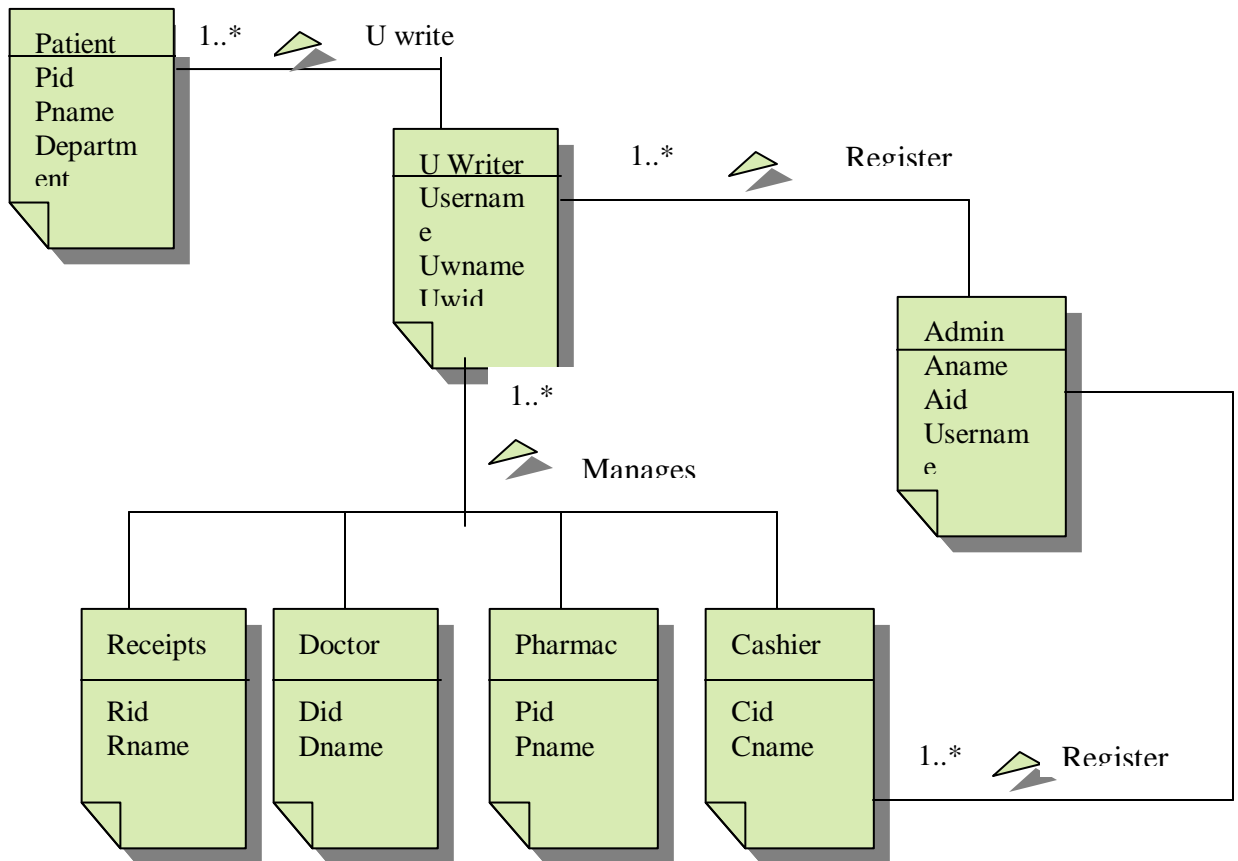
Figure 4.2 Entity Relationship Diagram

The diagram above is an entity relationship diagram that is a major data modeling tool that helped database analysts to organize data into entities.

4.4 Database Design

The DBMS used was MySQl and this section includes details of the database design. The conceptual and physical database design and the data dictionary are described below. 4.6.2 Conceptual Database Design

After system investigation and analysis, the concept of the new system was designed and all the relevant entities involved in the system were identified. Therefore the following entities were chosen to capture this information

i. Staff and payment.

ii. Patient details

4.4.1 Strength of the Current System

These were introduced to solve problems with the existing manual systems. The automated Patient information Management system has many advantages over the manual system. This can be explain as follow

- The major benefit with this is that it helps the staff to accomplish their daily functions more efficiently. No more need for paper work.

- Quick access to the required information as it is only 'one click away.

- It solves the problem of time consuming, hence customers are served on time.

- It also enhances security as access to the system requires authentication. This means that only authorized users can access that system.

4.4.2 Weakness of the Current System

After a thorough investigation of the present system, the following loopholes were identified.

Regular complaints by patients, hospital administrators, staff and drug supplier concerning misplaced or lost financial payment forms.

The hospital administration finds it tiresome and time consuming when computing patient, drug supplier and staff payment receipts and voucher

cards respectively, this leads to late release of reports concerning the performance in the hospital

The hospital Administration currently uses health record files for storing patients', drug suppliers', staffs' records on payment respectively. This system of information storage is susceptible to security problems such as illegal modification and update of records.

CHAPTER 5

SYSTEM IMPLEMENTATION AND TESTING

5.1 Introduction

This chapter emphasizes the actual system implementation. The system was transformed from user requirement into a workable product. The purpose of system implementation was to make sure that the correct application is delivered to the end user. Besides that, this chapter also emphasizes on how the testing is done to confirm to meets the user requirement.

5.1.1 User Requirement

For effective use of the system, it is important that users are fully involved and are given opportunities to participate as much as possible This rectifies numerous problems associated with change management, users getting accustomed to using new way of doing things as opposed to traditional system of patient records management system. During data collection, the researcher investigated and found out how the current system operates, not only that but also tried out which problems are faced and how best they can be settled. The users described some of the basic requirements of the system as;

- Search for patients
- Register staff.
- Update, staff records, patients
- View all types of reports.
- Assign access rights and privileges to the system users.

5.1.2 Functional Requirement

The following is the desired functionality of the new system.

- The system should accept have submissions in form of raw patients, staff, and drug supply at the submitting point.

- The system should perform analysis of financial, drug inventory, patients, and drug supply.
- The system should authenticate the users of the system.
- The system should generation of reports on request.
- The system should only allow the administrator to delete records in the database.

5.1.3 Non Functional Requirement
- The system should must verify and validate all user input and users must be notified in case of errors detected in the course of using the system.
- The system should allow room for expansion.
- A system should have a high performance and reliability level.

5.1.4 Software Requirements

PHP (hypertext preprocessor)

PHP is a server-side scripting language designed specifically for the web. The goal of the language is to allow web developers to write dynamically. PHP allows interfacing to many different database systems that provides an *open database connectivity standard* (ODBC) such as. MySQL, Oracle, Microsoft products and others. Other advantages are low cost and availability. PHP is portable across multiple platforms and is created as an open-source

MySQL (My Structured Query Language)

MySQL is an open source relational database management system (RDBMS) that uses Structured Query Language (SQL), the most popular language for adding, accessing, and processing data in a database. MySQL is noted mainly for its speed, reliability, and flexibility. It is fast, robust and scalable relational database management system. My SQL is

a true multi-user, multi-threaded SQL (structured programming language) database server.

Apache web server

The apache web server is the software that responds to client requests by providing resources, such as XHTML documents. Apache has other powerful features included in a large set of modules, including mod Perl, and many authentication modules.
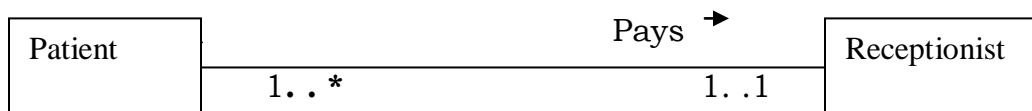
5.2 Context Diagram for the Proposed System

Describes the system data flow from the users to the administration that is the final user stage of the system.
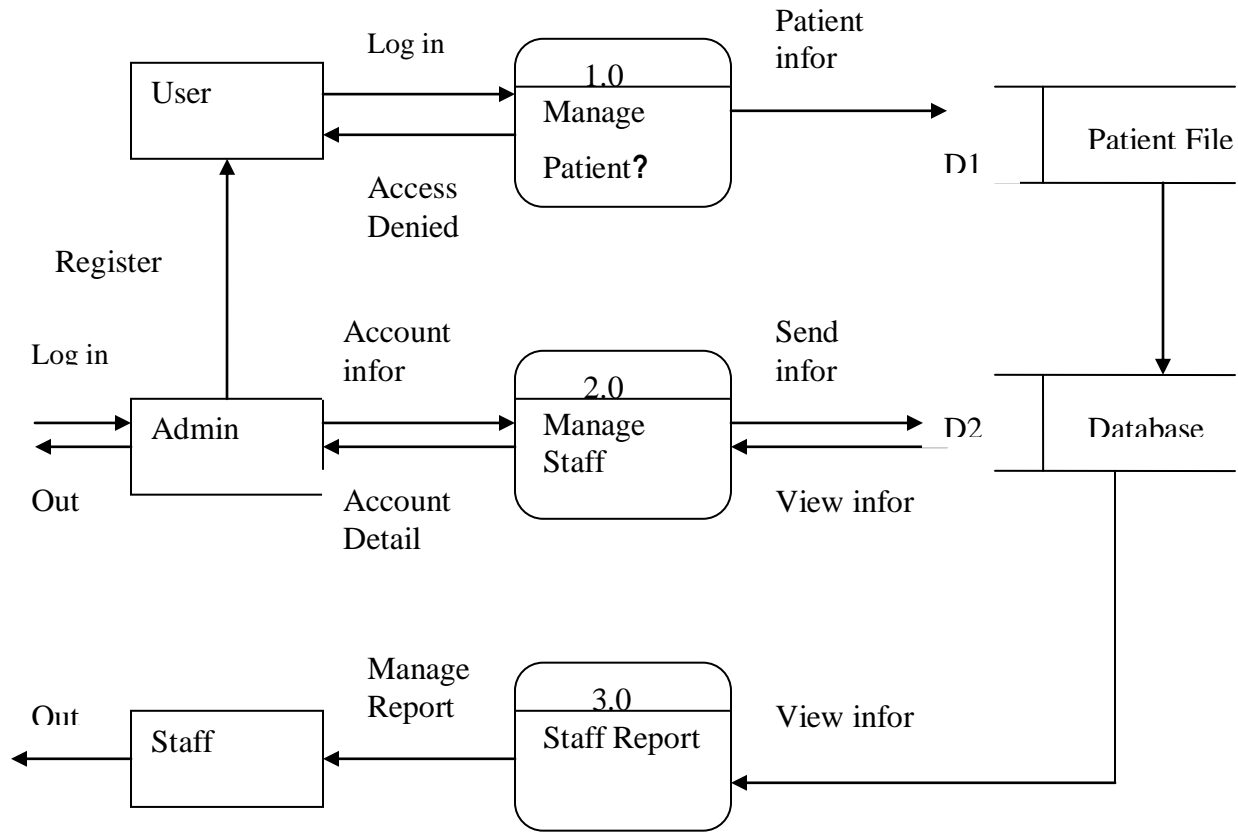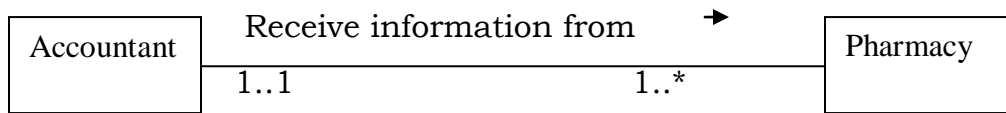

Figure: 5.0 Context diagram for the proposed system

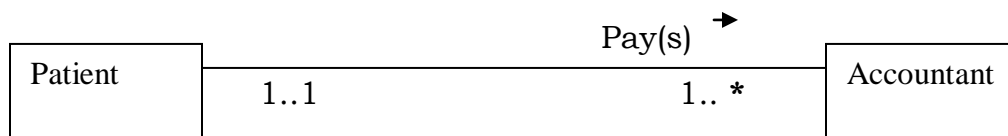## 5.2.1 Entity Relationship and their cardinality

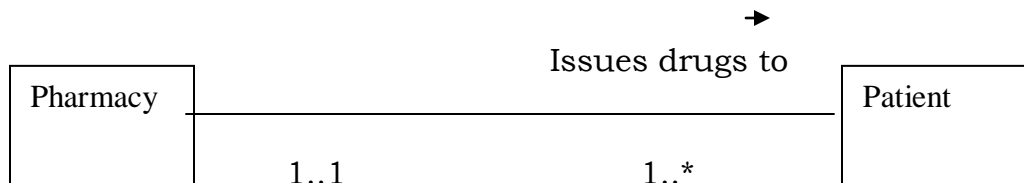This section demonstrates the binary relationships between two entities of the system.

Patient pays a consultation fee to the receptionist in order to
Be attended by the doctor.

```
┌──────────────┐   Receive information from    ➤   ┌──────────────┐
│  Accountant  │──────────────────────────────────│   Pharmacy   │
│              │   1..1                    1..*    │              │
└──────────────┘                                   └──────────────┘
```

The accountant receive patient payment details from the
Pharmacy in order to clear patient.

```
┌──────────────┐                  Pay(s)   ➤        ┌──────────────┐
│   Patient    │──────────────────────────────────│  Accountant  │
│              │   1..1                  1.. *     │              │
└──────────────┘                                   └──────────────┘
```

The patient pays from the accountant in order receive drugs from
The pharmacist desk

```
                                           ➤
┌──────────────┐        Issues drugs to            ┌──────────────┐
│   Pharmacy   │──────────────────────────────────│   Patient    │
│              │   1..1              1..*          │              │
└──────────────┘                                   └──────────────┘
```

The pharmacy issue drugs to the patient after confirming payment
From the·accountant.

5.2.2 Data Dictionary

This section contains different relational tables, entities, attributes and
data types

Table 5.0 Patient Request Table				
Patient name	Varchar	The name for the patient	20	
Patient	Varchar	Patient identification number	10	Primary key
Drug code	Varchar	The code assigned to the drug	10	

31

Password	Varchar	User's name who sold drugs	20	Foreign key
Qnty	int	The amount of drugs sold	11	
Unitprice	int	Price per unit of drug sold	11	

The table above shows the structure of the patient request table in the database.

Table 5.1 Payment Table

vounum	varchar	The number on the voucher	10	Primary key
password	varchar	The type of the user who paid	10	Foreign key
recofficer	varchar	The officer receiving salary	20	
paydate	date	The date when payment is done	20	

The table above shows the structure of the payment table in the database.

Table 5.2 User Table

Title	varchar	Position of the user	20	
fname	varchar	The first b name of the user	10	
telephone	varchar	User's phone contact	15	Primary key
username	varchar	The user type	20	
password	varchar	User password	20	Primary key

The table above shows the structure of the User table in the database.

5.3 System Implementation

This describes the tools used to implement the graphical user interface and the database. MySQL was used to create and connect relational

tables to the database. HTML was used to develop the GUI. PHP was used to process queries and integrate interfaces was done to develop the model that meets all the requirements of this system.

5.4 Systems Testing

Testing was done after the system was put in place. This was done in two ways namely Unit Testing and integration testing.

5.4.1 Test Plan

The Software Test Plan (STP) is designed to prescribe the scope, approach, resources, and schedule of all testing activities. The plan will identify items to be tested, the features to be tested, the types of testing to be performed, the personnel responsible for testing, the resources and schedule required to complete testing. The purpose of the software test plan is such as:

- To achieve the correct code and ensure all Functional and Design Requirements are implemented as specified in the documentation.
- To provide a procedure for Unit and System Testing.
- To identify the test methods for Unit and System Testing.

5.4.2 Process of Test Plan

- Identify the requirements to be tested. All test cases shall be derived using the current design specification.
- Identify particular test to use to test each module.
- Identify the expected results for each test.
- Perform the test.
- Document the test data, test cases used during the testing process.

The following explain the ways in which testing is done.

5.4.3 Unit Testing

Unit testing was carried out on individual modules of the system to ensure that they are fully functional units. We did this by examining each unit, for example the Underwriter's page. It was checked to ensure that it functions as required and that it adds patient's data and other details and also ensured that this data is sent to the database. The success of each individual unit gave us the go ahead to carryout integration testing. All identified errors were dealt with.

5.4.4 Integration Testing

We carried out integration testing after different modules had been put together to make a complete system. Integration was aimed at ensuring that modules are compatible and they can be integrated to form a complete working system. For example we tested to ensure that when a user is logged in, he/she is linked to the appropriate page, and also could access the database.

5.4.5 System Validation

As one of the specific objectives of this study, validation of the system was very important. Validation of the system was done by comparing it to the questions asked by the users at St Francis Hospital Nsambya. Most of their answers matched with what the system can do. JavaScript was used to validate user input and the respective input. For example the system does not accept blank field; the system also discriminate between numerical and numerical characters.

5.5 Presentation of results

The presentation of the results of PRMS is analyzed in terms of the interfaces of the system and output from the backend of the system. This includes activities of the users. The following are the results after the implementation of the PRMS.

5.5.1 System Interfaces

All system interfaces in this chapter were created in Dream weaver and PHP coder while creating HTML and PHP interfaces.

5.5.2 Login Form for the Different Users

Only authorized user with the right user name and password has right to access the services to particular department he or she intent to view. When wrong user name and password is used the system rejects access to the services.
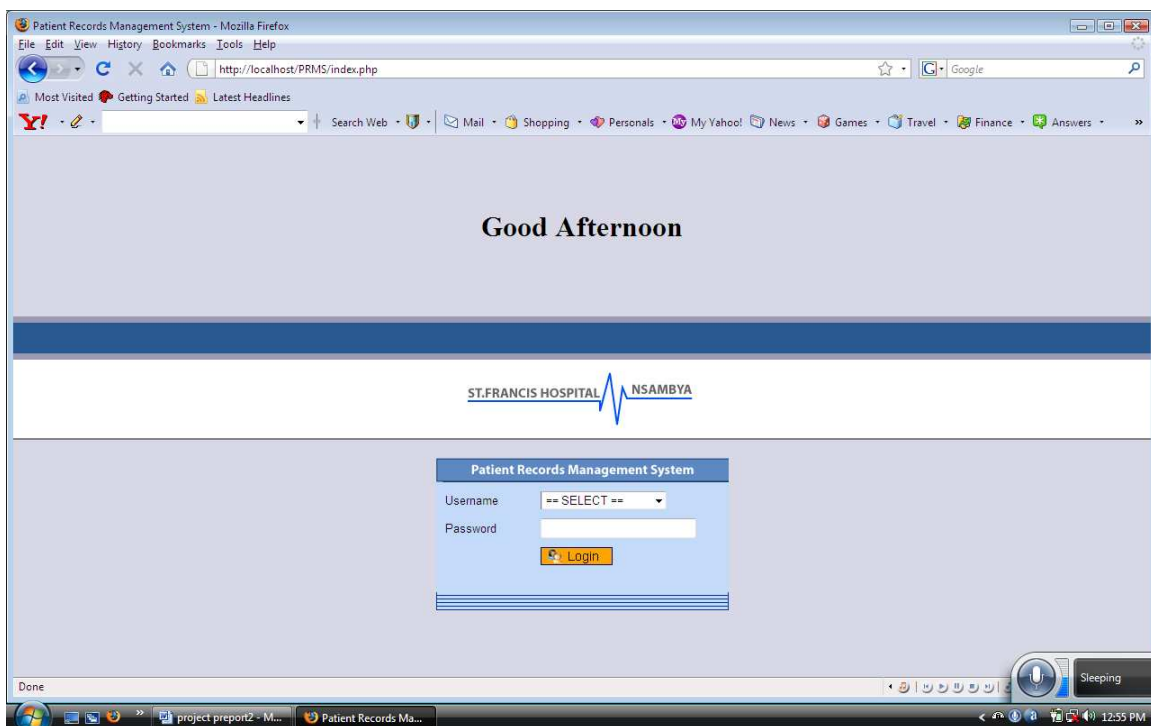
Figure 5.1 Login Form for the Different Users

5.5.3 System Administration Home page

The system administrator can add, edit system users and has access to view the services offered by the different departments for easier tracking incase of mismanagement in the hospital.
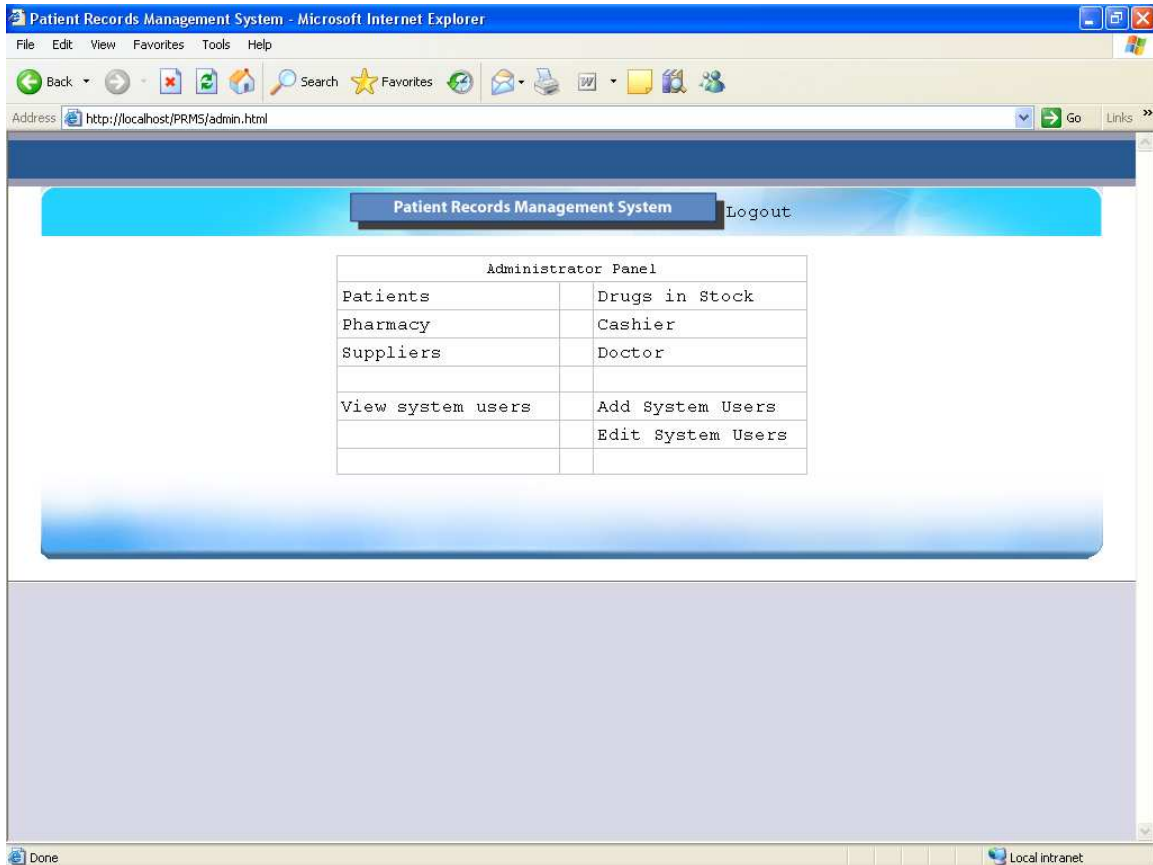
Figure 5.2 System Administration Home page

5.5.4 Pharmacist home page

The department that can accesses this panel is the system administration, doctor and cashier for flow of services and information.

Figure 5.3 Pharmacist home pages

5.5.5 Database of prms imported in phpMyAdmin

The system cannot run unless wampserver is installed in the machine (laptop or computer) then the system database is created and imported from where it's saved to the phpMyAdmin.

Figure 5.4 Database of prms imported from phpMyAdmin

5.5.6 Database of prms created in MySql Console

When the system is successfully created and imported to the phpMyAdmin, the tables can be manipulated by the system administrator into detailed in the MySql for instance he or she can be selected, described, updated, and altered tables.

Figure 5.5 Database of prms created from MySql Console

CHAPTER 6
SUMMARY, LIMITATION, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter describes discuss the objectives of the system stipulated in earlier chapter, limitation of the system conclusion and recommendation of the system

6.1 Summary

As discussed in the previous chapters the main problem that we addressed was dealing with patient medical document. It is the above situation that drove us to techniques of developing this Patient Information Management System to be used at St Francis Hospital Nsambya to enable them to handle details on policies efficiently and effectively. The project has implemented Most of the objectives stipulated in earlier chapter. The patient record management system offers a number of benefits to the user and can capture data, store, view, add and delete the records entered the data can also be posted information to the database. Problems Encountered during Data collection: sensitive information released to us, few projects and books written about patient records management system.

Problems Encountered during System Design: Limited time to finish up the work, limited numbers of computers with the internet in the faculty hence it becomes difficult down load PHP codes from the internet and In adequate financial support to facilitate the project.

6.2 Limitations

This section describes those services that are not provided by the system and those include the following.

It does not auto generate alarm to alert the pharmacist manager of the expiring date of drugs at a given period of time. Reason that we use MySql program to develop the system which can not support the triggers which can only be found in Oracle program.

6.3 Conclusions

The core reason for the establishment of computerizing patient records management system is to enable the hospital administrators in a convenient, fair and timely manner. Therefore the IT used should support the core objective of the system if it is to remain relevant to the hospital. A lot still needs to be done in the IT department in order to make available technology effective. This may involve training of the staffs on how to enter data in the right and relevant data in the system and the management to keep updating the hardware and software requirements of the system. IT and computer systems need to be kept being upgraded as more and more IT facilities software are introduced in to days IT market. The researcher acknowledges the fact this system does not handle all staffs the hospital like the security and asset section. The researcher therefore suggests that for further research, the following can be researched on. The most cost effective way of handling all staffs and interlinking St Francis Hospital Nsambya branches all over the country regardless of the world.

6.4 Recommendations

Training of all the members of the staff in the hospital to get accustomed to the system will be a priority. This being a new system, some members of the staffs management will get threatened that the computerized patient records management system will replace their jobs .I would recommend that management of the hospital educates the staff of how this system will operate and how it will supplement their efforts .For the

efficiency of the hospital, users of the system need to be thoroughly educated about the use of the passwords and staff name, not only that but also not to be careless of them. They should be kept confidential. Access to the server room should be physically guarded against unauthorized person; the server room should be dust free and should be fully protected and should have an air conditioner of 1100BTU to prevent the server from over heating. Backup media like CDs, Diskettes and Flush disks can be used for backups and storage of data.

6.5 Opportunity and Lesson Learned

During the course of this project, we were able to understand better what goes in the patient records management system in the hospital. This was effectively done through reading of literature and research. The whole process of developing the system was an opportunistic challenge. Seeing the system into a tangible system was a rewarding exercise.

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APPENDIX I

MAKERERE UNIVERSITY

FACULTY OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

Questionnaire

The purpose of the questionnaire is to identify and specify functional requirements of our proposed Patient Record Management System to be used by St Francis Hospital Nsambya.

By
GROUP No. IM020-09

APRIL, 2009

The Purpose of the Questionnaire

It's basically intended to solicit for information as regards to the patient record management. This section briefly describes the open end and close end questionnaire to be answered by the user.

Table A1 Respondent Background

NAME:
HOSPITAL:
GENDER:
CONDUCT:

Table A2 How The Current System Works

1	What type of technique is the system	manual		Computerized			
2	Is the current system secured	yes		No			
3	What is the speed of the system	slow		Medium		Fast	
4	Are you contented with the system	yes		No			

Table A3 What are the Loophole of the current

1	What are the loopholes of the system in terms of the following features	nature		Limited		unlimited	
		(a) security					
		(b) speed					
		(c) flexibility					
		(d) storage					

Table A4 Recommendation on the Features for the New System

1	Multipurpose enough to handle a number of users at a go	minimum		Maximum				
2	User friendly	To admin		To staff		To all users		
3	Password for security purposes	Not necessary		Necessary				
4	Feedback when request is submitted	Not necessary		Necessary				

The following description enables the respondent to give his/her own opinion about the patient record management system in the hospital

Comment on how the current system works…………………………..

……………………………………………………………………………

What are some of the merits of the current system……………………

……………………………………………………………………………

Comment on the security of the current system………………………

……………………………………………………………………………

Recommend on the features of the new system…………………………

……………………………………………………………………………

APPENDIX II

The Organization Structure

This section describes the flow of powers of delegation in the hospital.
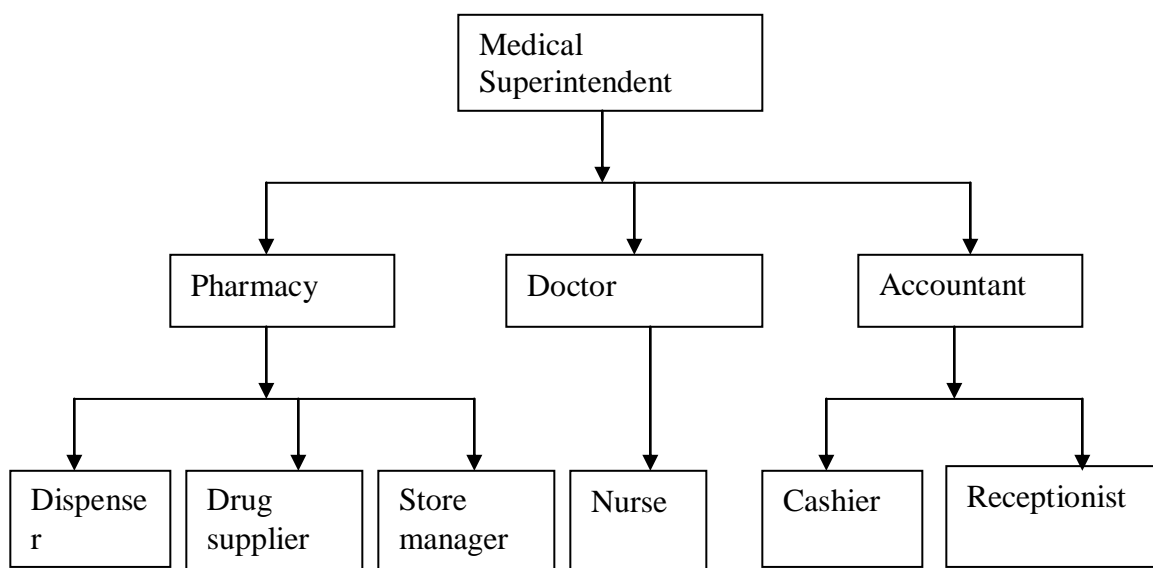
Figure A1 Organization Structure

Description of the Current Hospital Management interms of delegation of Power.

In the current hospital management system, a patient presents a copy of his/her report form bearing drug prescription from the hospital or clinic to the nurse who then enters the patient's details in patient form of which is be forwarded to Pharmacy/dispenser to issue out drugs. A patient on before issuing drugs heads to the accounts department for clearance (payment) and finally receives the drugs from the pharmacy where he or she gets the medical report.

APPENDIX III

Source Code of the System

CREATE Database PRMS;

USE PRMS;

CREATE TABLE `cash` (

  `dat` varchar(33) NOT NULL,

  `name` varchar(55) NOT NULL,

  `pid` varchar(22) NOT NULL,

  `amount` double (9, 1) NOT NULL

CREATE TABLE `consult` (

  `dat` varchar(44) NOT NULL,

  `pid` varchar (55) NOT NULL,

  `amount` double (9, 1) NOT NULL

) ENGINE=InnoDB DEFAULT CHARSET=latin1;


```html
<Html><head>
<title>Patient Records Management System</title>
<script language="JavaScript" src="gen.js" type="text/java script"></script>
</head><body left margin="0" top margin="0" bgcolor="#d7d7e5"
marginheight="0" marginwidth="0">
        <table width="100%" border="0" cellpadding="0" cellspacing="0">
        <tbody><tr height="200"><td height="133">
   <p                  align="center"></p></td></tr><tr>                  <td
background="images/topback.gif"  height="48">  <p  style="margin-top:  0pt;
margin-bottom: 0pt;" align="center">&nbsp ;< /p></td></tr>
      <tr> <td bordercolor="#666666" style="border-bottom-style: solid; border-
bottom-width: 1px;" bgcolor="#ffffff" height="88"> <p style="margin-top: 0pt;
margin-bottom:  0pt;"  align="center">  <img  src="images/j.gif"  width="254"
border="0" height="59"></p></td> </tr>
```

```html
<tr><td style="border-top-style: solid; border-top-width: 1px;">
<div align="center"><form name="my form" method="post" action="">
<Br><table style="border-left-width: 0px; border-right-width: 0px;" width="325"
bgcolor="#c3daf9" border="0" cellpadding="10" cellspacing="0"> <tbody>
<TR height="27"> <td background="images/t.gif" height="27"></td> </tr>
        <tr><td bordercolor="#336699" style="border-left-style: none; border-left-
width: medium; border-right-style: none; border-right-width: medium;"
background="imagess/login_bg.jpg"><table style="border-right-width: 0px;"
width="305" border="0" cellpadding="0" cellspacing="0"> <tbody>
<tr height="10"> <td width="85" height="10"><font size="2"
face="Arial,Helvetica,Geneva,Swiss,SunSans-Regular">Username</font></td> <td
style="border-right-style: solid; border-right-width: 1px;" width="20"
height="10"></td><td style="border-left-style: solid; border-left-width: 1px;
border-right-style: none; border-right-width: medium;" height="10"><input
name="username" type="text" id="username" size="24"></td></tr>
                <tr height="10">
                  <td width="85" height="10"></td>
                  <td width="20" height="10"></td>
                  <td height="10"></td></tr> <tr height="10">
                  <td width="85" height="10"><font size="2" face="Arial,
Helvetica, Geneva, Swiss, SunSans-Regular">Password</font></td>
                  <td width="20" height="10"></td>
                  <td height="10"><input name="password"
type="password" id="password" size="24"></td></tr><tr height="10">
                  <td width="85" height="10"></td>
                  <td width="20" height="10"></td>
                  <td height="10"></td></tr><tr height="10">
                  <td width="85" height="10"></td>
                  <td width="20" height="10"></td>
                  <td height="10"><input name="image" type="image"
src="images/login. jpg"></td></tr> </tbody> </table><br> <div align="center">
```

</div></td></tr>   <tr height="4"><td background="images/login_bottom.jpg" height="4"></td>   </tr></tbody>   </table></form><p style="margin-top: 0pt; margin-bottom: 0pt;" align="center"> </p></div></td></tr>

</tbody></table><script language="JavaScript" type="text/java script">

//You should create the validator only after the definition of the HTML form

  var frmvalidator = new Validator("myform");

  frmvalidator.addValidation ("username","req","Please enter Username");

  frmvalidator.addValidation ("password","req","Please enter Password");

   </script></body></html>

Pharmacy code

```
<Html><head>

<script type="text/javascript" src="prms.js"></script>

<script language="JavaScript" src="gen.js" type="text/javascript"></script>

<title>Patient Records Management System</title>

<script language="javascript">

<!--

function calc()

{

Var myform=document. forms[0];

var qty=myform.qty.value;

var ucost=myform.ucost.value;

Var total;

total=qty * ucost;

document.forms[0].tcost.value=total;

return true;

}

//-->

</script><link href="style.css" rel="style sheet" type="text/css">

<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1"><style

type="text/css"><!--

a {font-size: 16px;color: #000000;
```

```
} a: link {

        text-decoration: none;

}

a: visited {

        text-decoration: none;

        color: #000000;

}

a: hover {

        text-decoration: underline;

        color: #FF0000;

}

a:active {

        text-decoration: none;

        Color: #000000 ;}--></style></head><body leftmargin="0" topmargin="0"
bgcolor="#d7d7e5" marginheight="0" marginwidth="0">
<table width="101%" border="0" cellpadding="0" cellspacing="0">
<tbody><tr><td       background="images/topback.gif"      height="48">       <p
style="margin-top: 0pt; margin-bottom: 0pt;" align="center">  </p></td>
</tr><tr><td  bordercolor="#666666"  style="border-bottom-style: solid; border-
bottom-width: 1px;" bgcolor="#ffffff" height="88">
 <table width="945" border="0" align="center" cellpadding="0" cellspacing="0">
<tr><td height="45" background="images/banner.jpg"><div align="center">
 <table width="182" border="0" cellspacing="0" cellpadding="0">
<tr> <td><img src="images/t.gif" width="334" height="34" border="0"></td>
 <td><a href="index.php">Logout</a></td></tr>  </table>
 </div></td></tr><tr><td><br><form       name="myform"       method="post"
action="pharm.php"><p> </p><table       width="388"       border="0"
align="center" cellpadding="4" cellspacing="1" bgcolor="C3C3C3"><tr>
<td colspan="3" bgcolor="#FFFFFF"><div align="center"></div></td></tr>
 <tr> <td width="173" bgcolor="#FFFFFF">Drug Code </td> <td width="25"
bgcolor="#FFFFFF"><div align="center"><strong>:</strong></div></td>
```

```html
<table width="945" border="0" align="center" cellpadding="0"
cellspacing="0"> <tr><td height="45" background="images/banner.jpg"><div
align="center"> <table width="182" border="0" cellspacing="0"
cellpadding="0"><tr> <td><img src="images/t.gif" width="334" height="34"
border="0"></td> <td><a href="index.php">Logout</a></td></tr></table>
</div></td></tr><tr><td><br>
<table width="419" border="0" align="center" cellpadding="3" cellspacing="1"
bgcolor="#C3C3C3"><tr>
<td colspan="3" bgcolor="#FFFFFF"><div align="center">Administrator Panel
</div></td></tr><tr><td bgcolor="#FFFFFF">
<a href="patientr.php">Patients</a></td>
                <td bgcolor="#FFFFFF"> </td>
                <td bgcolor="#FFFFFF"><a href="drugsr.php">Drugs in
Stock </a></td> </tr><tr <td width="191" bgcolor="#FFFFFF"><a
href="pharmr.php">Pharmacy</a></td>
                <td width="23" bgcolor="#FFFFFF"> </td>
                <td width="183" bgcolor="#FFFFFF"><a
href="payr.php">Cashier</a></td> </tr><tr>
```