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PARIRENYATWA GROUP OF HOSPITALS MEDICAL DIAGNOSES AND PRESCRIPTION SYSTEM

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PARIRENYATWA GROUP OF HOSPITALS MEDICAL DIAGNOSES AND PRESCRIPTION SYSTEM

BY

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DECLARATION

I Juliet Goromonzi hereby declare that I am the sole author of this thesis. I authorize The University of Midlands State to lend this thesis to other institutions or Individuals for the purpose of scholarly research.

Signature _____ Date _____

APPROVAL

This dissertation/thesis entitles “Parirenyatwa group of hospitals medical diagnoses and prescription system” by Juliet Goromonzi meets the regulations governing the award of the degree of Information Systems of the Midlands State University, and is approved for its contribution to knowledge and literal presentation.

Supervisor …….

Date …….....

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I would like to give thanks and praise to the almighty God for his undying love and helping hand for making this project a success. I pray he will always be with me till the end. I also want to extend my deepest gratitude to Mr. Mtembo my Supervisor for his contribution and assistance in coming up with this project. Without his patience this project would not have been a success. His dedication, assistance and patience led this project to be a success. Further thanks go to my friends for their undying effort and patience in assisting me. I would never forget mentioning my family for their role in contributing positively to my welfare and financial support, may the good lord bless you in your endeavors

Dedication

I would to dedicate this project to my sister Penelope an aspiring medical doctor.

CONTENTS

Chapter 1: Introduction

Chapter 2: Planning phase

Chapter 3: Analysis phase

Chapter 4: Design phase

Chapter 5: Implementation phase

List of Acronyms

NPV – Net Present Value

ROI – Return On Investment

PHP – Hypertext Pre-processor

MySQL – myStructured Query Language

RAM – Random Access Memory

GB – Gigabyte

HHD – Hard Drive

USD – United States Dollar

DFD – Data Flow Diagram

ISP – Internet Service Provider

DBA – Database Administrator

ER – Entity Relationship

GUI – Graphical User Interface

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION/LITERATURE REVIEW

1.1 Introduction

The proposal will highlight more about the company as well as the system that is being proposed, which will include the background of the company under study, the problem to be solved, objectives of the proposed system as well as the evaluation of the alternatives that are available. This stage will also include the schedule of the project, in terms of the duration that the project will take from the planning phase to the maintenance phase. The proposal will also take into consideration the information gathering techniques or methodologies to be used in finding the required information.

1.2 Background

1.2.1 Background of Organisation

Parirenyatwa General Hospital is the largest medical centre in Zimbabwe. Located in Harare, the hospital was formerly known as the Andrew Fleming Hospital, and was named after the principal medical officer to the British South Africa Company.

Following independence in 1980, the hospital was renamed in honour of Tichafa Samuel Parirenyatwa (1927-1962), a close associate of Joshua Nkomo and the first black Zimbabwean to qualify as a doctor of medicine.

As well as its general medical and surgical sections, the hospital includes MbuyaNehanda, a maternity section; SekuruKaguvi, which specialises in eye treatment; and an annex for psychiatric patients and several specialist paediatricwards.It has in excess of 5000 beds and 12 theatres in the main hospital complex alone.As well as its general medical and surgical sections,

The College of Health Sciences of the University of Zimbabwe is based at Parirenyatwa.This is where the university's medical students train from 3rd year onwards.

The hospital has less than 1000beds, hospital has a school of nursing located within the complex which has got three intakes of General Nurses per year for a three year Diploma in Nursing and some post-basic courses in intensive/Theatre nursing, community and primary care nursing as well as Ophthalmic Nursing.

Parirenyatwa hospital is one of the teaching hospitals in the country for Medicine and Nursing from University of Zimbabwe and any other colleges (offering health courses) around the country and world at large.

It has introduced a quality management program in hospitals in 2005 led by Chief Executive Officer Thomas Zigora, Dr. Sydney Makarawo, Dr Max Hove, and the Quality Assurance/Clinical Audit Officer Mr. Kennedy Gombe which proved a difference in the way of thinking in delivering health care services. The program is currently coordinated by Mr Godwin Mseka.

1.2.2Organisational Structure

Parirenyatwa hospital is large with many wards and surgeries for health services. It is situated in the capital city Harare. The Organizational chart below illustrates the organization from the Cooperative membership going on.

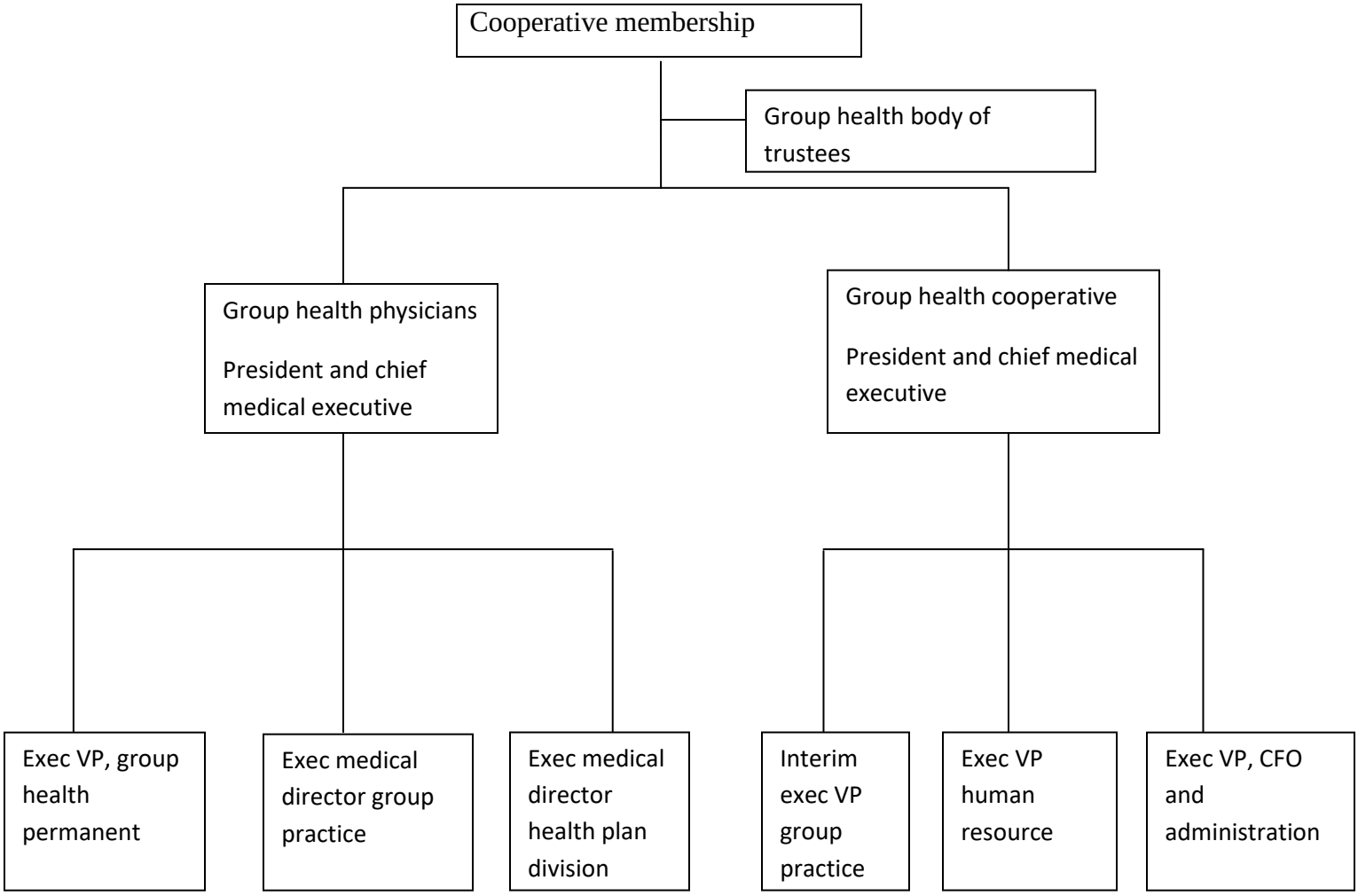


Fig 1.1 Organisational Structure

1.2.3 Vision

Parirenyatwa's vision states: An excellence in the provision of medical services and ensuring a reliable supply of medicines.

1.2.4 Mission Statement

To have a generation of health people who are well catered for all their medical needs.

1.2.5 Core Values

- Professionalism
- Commitment
- Honesty
- Patience
- Teamwork
- efficiency and effectiveness
- commitment and loyalty

Cause

To deliver health with commitment and honesty

Calling

To save lives through teamwork and patience

1.3 Problem Definition

The following problem of the current system which the hospital is using to carry out all its transactions is partly manual and partly automated and this has led to difficulties in diagnosing and treatment.

The current system has many limitations which has been encountered. Large amounts of costs have been produced due to the work which was being done manually that is all records were being filled. It also caused the patients to stand in queues for a long time due the paperwork which has to be done for every patient. The current system forced the hospital to hire many doctors so that the patient to doctor ratio can be reduced. The file based system has caused difficult to access data that is available (eg. from two files – Patients medical history).Duplication of data will be experienced which will cost time and money to enter data more than once, additional storage space is needed and Inconsistencies of data will be experienced .Changes to an existing structure are difficult to make and Incompatible file formats and programs are written in different languages, and so cannot easily access each other's files.

1.4 Aim:

- To develop a computerized Parirenyatwa group of hospitals medical diagnosis and prescription system

1.5 Objectives of the Proposed System

The objectives are as follows:

1) To develop a system that can diagnose a patient after stating her medical problems

2) To develop a system that prescribes the medicines and printout the prescription

3) To provide security mechanism through the use of a computerized system

4) To provide ad-hoc reports

5) To provide a system which manages data resources and easily accessible to the people within the organization when and where it is needed

1.6 Hypothesis

Having identified the problems of the current system and objectives of the emerging system, a new system that addresses the problems and accomplishes the objectives is therefore proposed. The organization may make use database applications such as Oracle, WAMP and Ms Access

The following software solutions will be used:

- **PHP (Hypertext Pre-processor) -** PHP supports the creation of dynamic, customised websites. It is supported by many platforms that include Windows, UNIX and Linux; it's simple and also efficient.

- **HTML** - It offers the capability of incorporating new web development technologies such as PHP.

- **Macromedia Dreamweaver 8 –**this is a simple easy to use professional HTML editor for designing, coding and developing websites, web pages, and web applications and allows us to drag and drop objects to a web form.

- **MySQL -** a multi-threaded SQL database server with a client/server implementation. It's fast, robust, and easy to use and this makes it a popular database for sites with dynamic content.

1.7 Justification

The computerization of the Parirenyatwa group of hospitals medical system will bring the hospital in the world of computers that's the world of technology, this will the hospital to be able to diagnose patients even without the help of a doctor that will lead to less doctors needed. An Information System is a vital component in giving all levels of management the information and tools to help them with their sound decision making process. This will improve diagnosis and the time of serving one patient will be reduced.

1.8Conclusion

After the system has been implemented fully it should allow doctors' and nurses to diagnose patients and prescribe them required medicines from what the patient has told them about how he/she is feeling. Doctors and nurses are the ones who will be using the system; they will access the system logging into the system using specified username and password.

CHAPTER 2

PLANNING PHASE

2.1 Introduction

The previous chapter looked at the problems faced by the existing manual system, hypothesis and justification of the proposed system. Chapter two will focus on the following:

- Operational value
- Feasibility study
- Risk analysis and management
- Work plan

The results from these studies will determine whether or not to continue building the system. Stages of the System Development Life Cycle including identifying business value, risk analysis and a work plan will also be covered in this phase.

2.2 Why Build the System

New system will offer fast and efficient communication between patients, general practitioners and social care professionals. There are some notable benefits that will be brought by the new system. In combination, these promote the meaningful and enabling integration of medical data at the clinician's desktop, providing support for the reliable exchange of information, reductions in avoidable readmissions, as well as improved opportunities for appropriate therapies and interventions. However the involved stakeholders (Hospital Clinicians, General Practitioners, and Patients) have certain benefits that the system can achieve for them effectively

There will be significant error-reduction particularly in the encoding and transfer of clinical data and the timely delivery of clinical information will be improved.

2.2.1 Hospital workers and patients wants to:

• Avoid manual rewriting of information by electronically incorporating as much relevant data as possible from appropriate, existing sources, including both clinical and administrative information.

• Reduce overhead administrative work involved when attending to a patient

• Improve the patient care in the community through better sharing of information with hospitals and other community care providers.

2.2.2 However, they do not want to:

• Increase the time spent by clinical staff on non-clinical or administrative duties.

- See timely and reliable delivery (i.e. less time spent chasing missing/late discharge summaries)
- Be assured of more complete and accurate information, especially for priority data (e.g. Changes in medication follow up action, etc.).

• Maintain control of which parties receive and have subsequent access to their personal information

• Ensure their nominated primary healthcare provider is in possession of all relevant information regarding their hospital stay upon their next presentation.

• Be confident that their information will be protected from inappropriate or unauthorised access.

2.3 Business value

Inefficiency of the current system has triggered the need to come up with a new system. The new system addresses the problems that are in the current system and also adds some business value to the Parirenyatwa group of Hospitals in the following ways:

- Auditors and regulators may be able to more efficiently conduct analyses.
- Administrators may be able to manage hospital and community care resources more effectively, and more efficiently

- insurers may be able to move yet further away from the ideal of sharing the cost of seriously ill and injured people across the population, and hence increasing profits and/or lowering costs
- Marketing department will be able to more precisely target their offers to consumers.

2.4 Feasibility Analysis

The feasibility analysis analyses possible alternative solutions to a problem and a recommendation on the best alternative. It can decide whether a process be carried out by a new system more efficiently than the existing one and influence a decision on whether to carry on with developing the system or not. Under this section we will explore whether it is possible to develop a system in-house under the prevailing economic, financial, organizational and technological constraints and whether the costs of the system compares favourably with the benefits.

2.4.1Technical Feasibility

The technical feasibility answers the question as to whether the system can be built given the apparent constraints in terms of resources and time amongst many other factors. We look at the hardware and software required for the project to progress and availability of the technical expertise that will be required for the software to be developed. ParirenyatwaHosipitalhas recently acquired state of the art infrastructure, thus the required infrastructure is available. The current networking technology is very suitable for the system to be developed. The system would be accessible over the Internet such that all branches are able to communicate efficiently and easily.

2.4.1.1Hardware

The Hosipital has up-to-date computers but there is a need to purchase new servers in-order to achieve the anticipated system efficiency. The hardware to be used:

- Personal Computers with at least 1GigRAM, 20GB Hard drive and minimum speed 700 MHz.
- A server with at least 100GB HHD and 6GB ram

2.4.1.2Software

The software is already available and is fully licensed. The software to be used:

- Windows 7 Professionals
- Visual studio 2010
- Sql 2008
- Dev Express tools

2.4.1.3Technical Expertise

Looks at:

- Familiarity of users and developers with system
- Familiarity of users and developers with the technology involved
- The project size

Familiarity of users and developers with the system

- Users: most of the employees have been using computer facilities within the organization and it's expected that they will have few problems in using the system though there is still a need for user training.
- Developers: the analyst is familiar with the software applications involved in the project.
- Familiarity of users and developers with the technology involved
- Developers: the developer has dealt with web-based systems and this system is not expected to pose any serious problems.

2.4.2 Economic Feasibility

For any system if the expected benefits equal or exceed the expected costs, the system can be judged to be economically feasible. In economic feasibility, cost benefit analysis is done in which expected costs and benefits are evaluated. Economic analysis is used for evaluating the effectiveness of the proposed system.

By use of the potentials of Information Technology the implementation of the system will lead to qualitative improvement of the healthcare treatment and therefore attract more people to seek medical treatment from the group ‘s institutions and hence adding economic value to the Group.

In economic feasibility, the most important is cost-benefit analysis. Cost benefit assessments and forecasts show the potential for value for money, or lack of it. Cost benefit assessments include the main data needed for financial assessments and forecasts. After adjusting these financial forecasts for items such as depreciation and transfer payments such as value added tax (VAT) to fit the standards of annual financial statements and balance sheets, they provide the foundation for affordability requirements. The benefits can be analysed from 2 angles which are:

2.4.2.1 Intangible benefits

Intangible benefits are those benefits that are related to the qualitative aspect which the system is expected to produce. Below is the list of the intangible benefits

- Increase competitive advantage
- Increased security - it must ensure that only trusted and verifiable people can access an account, that the information viewed remains private and cannot be modified by third parties, and that any transactions made are traceable and verifiable.
- Improved organizational standards and professionalism.
- Effective decision making by management
- administrators may be able to manage hospital and community care resources more effectively, and more efficiently;
- Auditors and regulators may be able to more efficiently conduct analyses, and more readily detect waste and fraud.
- Health insurers may be able to move yet further away from the ideal of sharing the cost of seriously ill and injured people across the population thereby increasing profits and/or lowering costs
- Marketing team may be able to more precisely target their offers to consumers.

In short, the benefits of e-health arise to only a very limited extent in the area of enhancements of health care for patients. The primary purposes are resource-efficiency

2.4.2.2 Tangible Benefits

- Reduction in labour costs
- Increased profits
- Improved staff productivity
- Increased business volume
- increase in Client Base

Reduction in manual labour hours	6000USD
Reduction in stationary costs	2500 USD
Estimated saved expenses	9000 USD
Total Benefits	17500 USD
Development Costs	
Training	200 USD
Development labour	3000 USD
Additional Hardware and Software	2000 USD
Software licence	100 USD
Total Developmental Costs	5300 USD
Operational Costs	
Hardware Maintenance	600 USD
Software Maintenance	100 USD
Other Maintenance	200 USD
Stationary and Computer consumables	500 USD
Total Operational Costs	1400 USD
Total Costs	6700 USD
(Benefits) less (Expenses)	10800 USD

Table 2.1 Tangible benefits

The following will be realized

Investment ratios also helped in determining the decision of the management

This calculation of return on investment (ROI)

$$ROI = \frac{\text{total benefits} - \text{total cots}}{\text{Total benefits}} * 100\%$$

$$= \frac{17500 - 6700}{17500} * 100\%$$

$$= 61.7\%$$

This seems to be higher return on investment which the management has o consider strongly. The decision tool has the disadvantage that it does not consider the true value of the money ROI can not give the overall decision. The net present value (NPV) has to be considered.

$$NPV = \frac{\text{total benefits-total costs}}{(1+ r) n}$$

R = interest rate (15%)

N= number of years

$$\text{NPV after 3 years} = \frac{17500 - 6700}{(1+0.15)3}$$

$$= \$3130$$

2.4.3 Social Feasibility

The system will bring plenty of benefits to the local community i.e.(the people) as is will facilitate quality and efficient health care and reduce mortality rates significantly by flushing out wrong diagnosis and treatments. The essence of the system, is reliable transaction delivery in a

fast-changing environment involving people, processes, and an operational or business infrastructure.

2.4.4 Operational Feasibility

Operational feasibility is mainly concerned with issues like whether the system will be used if it is developed and implemented. Whether there will be resistance from users that will affect the possible application benefits? The essential questions that help in testing the operational feasibility of a system are following.

- Are the users not happy with current business practices? Will it reduce the time (operation) considerably? If yes, then they will welcome the change and the new system.
- Have the users been involved in the planning and development of the project? Early involvement reduces the probability of resistance towards the new system.
- Will the proposed system really benefit the Hosipital? Does the overall response increase? Will accessibility of information be lost? Will the system effect the customers in considerable way?
- Does management support the project?

The proposed system has been placed in line with the mission statement of the organization which has been clearly outlined in the proposal phase. With the organization's much placed emphasis on quality service provision to its clients, this system goes a long way in ensuring that this attribute is met.

In order to achieve this, consultations with several members of staff were made and through these problems within the current system were identified.

2.4.5 Risk Analysis

There are a number of risks that may be faced during the new system development. Risk analysis identifies the important risks associated with the project.

2.4.5.1 Stakeholders' Risks

- They will welcome this move since it's a strategy for increasing the company's accountability and simplify their business as they are concerned with paying out claims

Management

- They carry out the budgeting of resources that will be allocated to the project such as time and money. Their support will encourage other stakeholders to at least view the project objectively.

Users

- Other users might welcome this change because using the new system is less tedious, easy to use, and offers quick response time to their requests.
- Some users might resist the change since it will eliminate any corrupt activities that were taking place.

2.4.5.2Technical Risks

- Design problems in the proposed system due to minimal time allocated and the project design maybe rushed thereby overlooking important design requirements and specifications.

- The system may not meet the set expectations in terms of the interface considering that the users would have used different types of systems with different interfaces before.
- The user might face problems of system maintenance. The system will need backup and to be fully supported till they can comfortably run it.
- Deployment of the system is going to require parallel conversion in implementing the new system. The two systems will operate at the same time till the risk of failure has been well cushioned. Therefore the technical risks would be of no further importance considering that there is a fall back plan in case the new system fails to deliver.

2.4.5.3 Social Risks

There is a high chance that the proposed system may face significant social rejection as patients might feel insecure to have their personal health information accessible to different people who are not doctors. Other social risks involve hospital clinicians who might feel that the system may eliminate their jobs and others might be reluctant to adapt to new things and environments.

The majority of the risks, however, impinge on patients. Patient risks are of a variety of kinds, including the following:

- discovery of the person's location, which may be a treatment facility, or a home address or telephone-number;

- Use of sensitive personal data to bring psychological pressure to bear on the person, up to the level of blackmail and extortion.

- embarrassment;
- violation of personal space;
- publication of sensitive personal data;

2.4.5.4 Economic Risks

This risk is largely associated with the cost of the project.

- The project is at risk of termination at any given time due to the poor economic situation the country is currently facing. If the organization really needs the system, it has to budget for it to avoid shortfalls in the development process. All the resources must be available first and on time and fully functional.
- To avoid this risk the Hospital has to allocate a supplementary budget in the event that the prices continue to escalate.

Governments and regulatory bodies have the rationale, the power and the opportunity to improve competitive conditions by promoting standards, lessening network externalities at the community level, and sharpening the private-market competition among providers

2.5 Develop work plan

The work plan records and keeps track of all tasks that need to be accomplished over the life of the project. It identifies the tasks and their expected durations. The System Development Life Cycle will be used to model the activities that are going to be followed in the development of the project. The project time allocation for each phase is shown below with their respective dates in the Gantt chart that follows.

Task	**Start**	**Finish**	**Duration (Wk)**
Project Proposal	**11/01/12**	**02/02/12**	**3**
Project Planning	**03/02/12**	**17/02/12**	**2**
Project Analysis	**18/02/12**	**02/03/12**	**2**
Project Design	**03/03/12**	**01/04/12**	**4**
Coding/Construction	**02/04/12**	**20/04/12**	**2**
Testing	**21/04/12**	**28/04/12**	**1**
Test Implementation and Training	**29/04/12**	**05/05/12**	**7**

Table 2.2 Work Plan

Gantt chart

Task no	Task Description																			
11	System Documentation																			
10	Maintenance Evaluation																			
9	Staff & User Training																			
8	System Changeover																			
7	System Testing																			
6	System Implementation																			
5	Detailed Design																			
4	System Design																			
3	System Analysis																			
2	Feasibility Study																			
1	Project Proposal																			
	Week No	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*7*	*8*	*9*	*10*	*11*	*11*	*12*	*13*	*13*	*13*	*14*	*15*	*16*

Table 2.3 Gantt Chart

2.6 Conclusion

After carrying out the feasibility studies, including the cost benefit analysis table**,** with costs and benefits clearly outlined, it has been revealed that the project is practically feasible. Thus a proper planning of the project coupled with skilled management would guarantee project success.

CHAPTER 3
ANALYSIS PHASE

3.1 Introduction

This phase provides an insight of how the current system operates, and what users require in the proposed system. The description of the operations of the current system is also given at this phase, how processes are linked within the current system and how activities are going to be coordinated in the proposed system. Information gathering methodologies will be used to collect data to help find out how the system works. Collected data is analysed highlighting the strengths and weaknesses of the current system and alternative solutions to the systems weaknesses are evaluated and analysed.

3.2 Information Gathering Methodologies

Information gathering requirements is usually more than simply asking the users what they need and writing their answers down. This process's requirements have a clearly defined process of its own depending on the complexity of the application. Its purpose is to gather all the important facts about the current system in order to allow its strengths and weaknesses to be discovered the analyst used three information gathering techniques which clearly highlighted the weaknesses in the current system and also its strengths that need to be retained in the new system. Information gathering methodologies that were used are:

- Interviews
- Questionnaires
- Observation and Document Review

3.2.1Questionnaires

It consists of a series of questions and other prompts to serve the purpose of gathering information from respondents. Questionnaires can be used to collect both qualitative and quantitative data and are often designed for statistical analysis of the responses. Questions were prepared for particular staff members in relation to the roles they play in the organization and were given out to the members of staff for them to fill and return them within two weeks.The analyst noted some advantages and disadvantages that this information gathering technique brought about.

3.2.2 Advantages

- The staff members were easy to arrange and conduct compared to interviews as there was less need of personal monitoring.
- The staff members gave respondents ample time to think about the questions before responding and hence allowing them to give comprehensive answers.
- plenty of time was saved as they were distributed to many respondents con-currently
- Anonymity was maintained therefore enhancing the chances of receiving genuine responses, there was no room for intimidation from other employees or senior staff members.
- The data was easy to compile as it was gathered in a standardised form

This technic has its own disadvantages.

3.2.3 Disadvantages

The questionnaires handed in did not match that which was given out and the return rate was very slow.

- The respondents left some of the questions unanswered or gave poor responses leaving some areas grey and making it difficult to come up with conclusions
- Questionnaires are time consuming as the responses did not come immediately as in the case with interviews

3.2.4Interviews

An interview is a formal discussion consisting of at least two parties in which information is exchanged. The interviews provide immediate answers to questions that could not be answered by the former technique.

Findings from the Interviews:

Interviews were carried out with particular members of staff from the hospital, these interviews involved mainly nursing staff, receptionist, accounts clerk and other staff members who manage and operate the current system. The interviews evaluated staff responsiveness, attitudes and perceptions

3.2.5 Advantages

- Data collection was immediate as the facts were noted down as soon as the responded gave an answer.
- Questioning directly enabled for probing to certain answers**.**
- Analyst had direct conversations with the respondents which gave them the chance to clarify some questions that were not clear.
- Body languages and facial expressions were noted and they allowed the analyst to observe the interviewee's non-verbal communication and also gather information by merely looking.

- Analysts allowed the interviewer to motivate the interviewee to respond freely and openly.
- The interviews permitted the analyst to customize questions for the employees in relation to their respective departments and positions.
- Interviews gave room for direct interaction with the people who manage and operate the current system, hence the analyst could get first-hand information of :

  The existing problems

  How the system operates?

  Opportunities to improve performance

3.2.6 Disadvantages

- Few interviews can be contacted because of cost constraints Interviews are time consuming and therefore costly.
- Probability of gathering biased data was significantly high as the interviewer might have significantly influenced the user's responses.
- It is very difficult to rely on results obtained as they are highly depended on one interviewer.

3.2.7 Observation

A fact-finding technique in which one is interested in behaviour rather than perceptions of the users. Tasks which are complex are sometimes difficult to clearly explain in words but through observation, the analyst could identify tasks that had been missed or inaccurately described by other fact-finding techniques. The data describing the physical environment of the task i.e. physical layout was also obtained.

3.2.8 Advantages:

- Observations allowed observer to discover relevant information on his/ own without probing for it from somebody else.
- The observations did not interrupt the work of the organizations employees as work continued smoothly.

3.2.9 Disadvantages:

- Not all activities were observable
- The observed personnel could have changed their normal way of doing business when they became aware that they were being observed resulting in wrong and biased conclusions from the observer.

3.3 Analysis of existing system

By using the data obtained by the use of the three information gathering methodologies mentioned above the analyst obtained the following processes in the current system. When a patient visits a hospital the administrative staff accesses the patient's file if he or she has been treated before at that particular centre. If it's the patients first visit at the centre the receptionist captures the patient's personal details into some paper forms and files them.

The patient then pays the registration fee and is then referred to the nursing staff who carries out his/her own diagnoses to determine the extent of the illness and also enters his/her diagnoses results in a form. If it's a minor issue or one that is within his/her scope treatment or a prescription is offered but if it's beyond the nurse's scope, the patient is then put on a waiting list or schedules an appointment to be attended by a general doctor.

The doctor attends to the patient he requests for the patients file which contains all the patient's details including the medical history and personal data (age, sex, contact details etc) and a receipt

for consultation fee payment. All this data is filed and kept in the health file that is stored in a shelf by the records clerk. The doctor then can work with the health record to help with his/her diagnosis if the illness is within his scope the patient can be admitted or treatment can commence immediately if the illness is beyond his scope he\she writes a referral letter to a specialist who can deal with that particular illness.

3.4 Process analysis

This looks very closely at how the current system operates. It involves the identification of inputs, processes and the outputs of the currents system.

3.4.1Activity Diagram of current system

Activity diagram is used to visualize the process flows within the healthcare centres in the organisation. It shows the stepwise activities and actions with support for choice, iteration and concurrency. The diagram below helps illustrate the processes that take place when a patient visits a health centre.

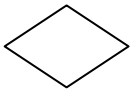
Symbol	Description
	Initial State
	Decision
	Activity/Process
	Control of data
	Final State

Table 3.1Process diagram key

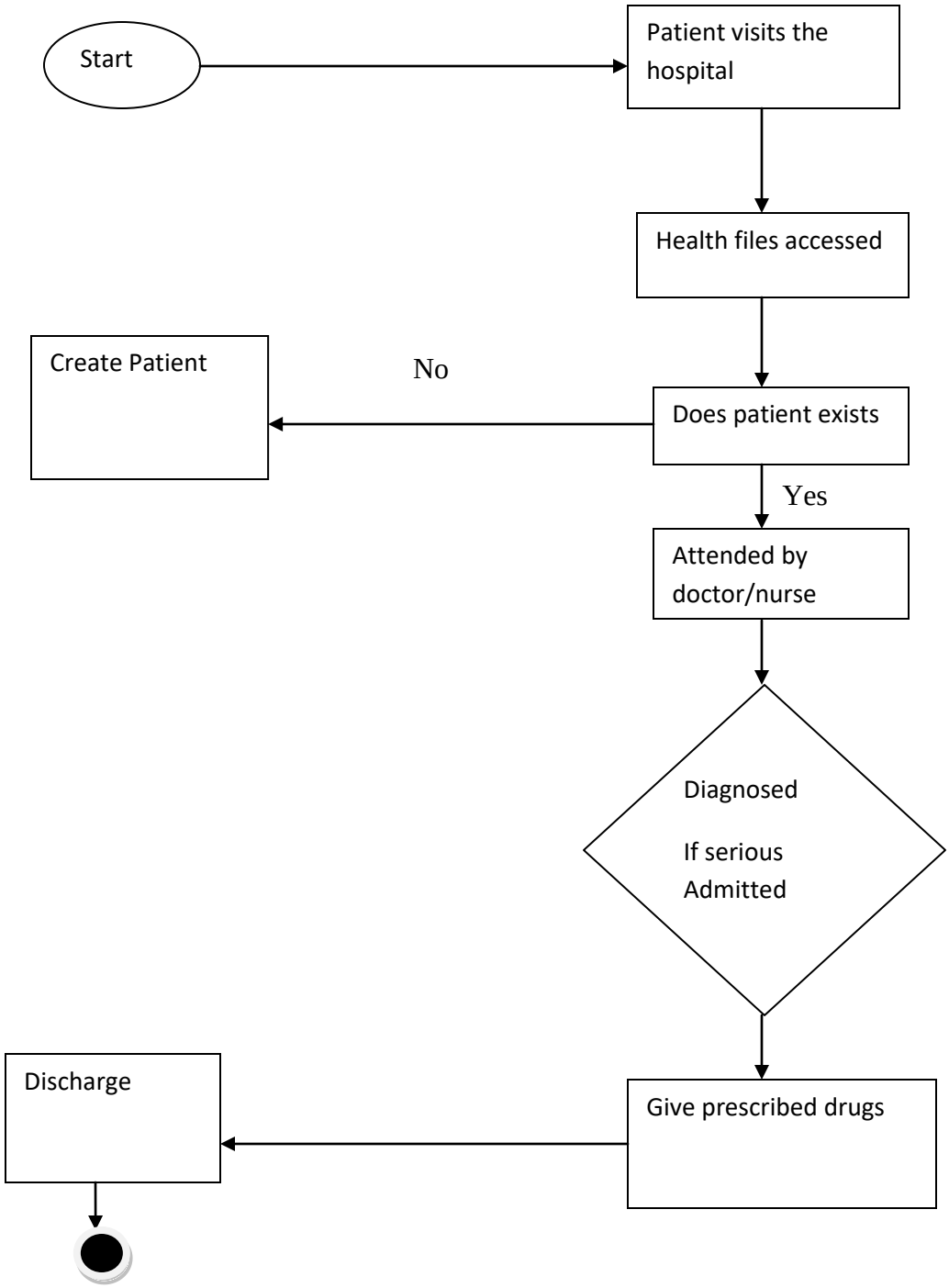


Fig3.1Process diagram of existing system

3.4.2 Inputs

The data that is input into the current health system (though all the processes are manual) and keeps the business flowing but with very little efficiency and lots of human errors.

- Patient's diagnosis results which is compiled by a general practitioner.
- General practitioner compiles discharge summary after patient has received treatment and is ready to be discharged .it is a general summary of all the procedures that were carried out when patient was being treated including how the patient responded to the treatment.
- Patients' data such as personal information that include identity information and contact addresses. This data is kept in filed records or medical cards.
- Medical bill that has the overall cost for the medication, procedures and other clinical/hospital costs.
- Ambulatory services report that contains all the procedures, medication given to, the patient and the responses the patient made from point of pick up to the health care centre.

3.4.3 Processes

The data that is input goes through a number of processes some of them are listed below

- Updating and Creation of Patient Records.
- Creating discharge summaries
- Providing patients with prescription records
- Recording and processing of the medical bills.
- Admitting and discharging patients.

3.4.4Outputs

This is what the system brings out at the other end after going through all the above mentioned processes

- Patient diagnosis record.
- Patient prescription record.
- Patient payment receipts
- Up to date patient records

3.5 Data Analysis

For further investigate and clarify of how the current system in the organisation works the analyst chose to use a context diagram which clearly shows the relationship between the system under investigation and the external entities.

3.5.1Context Diagram of the Current System

A context diagram is used a method of representing processes, data inputs and outputs of the current system. Below is a context diagram

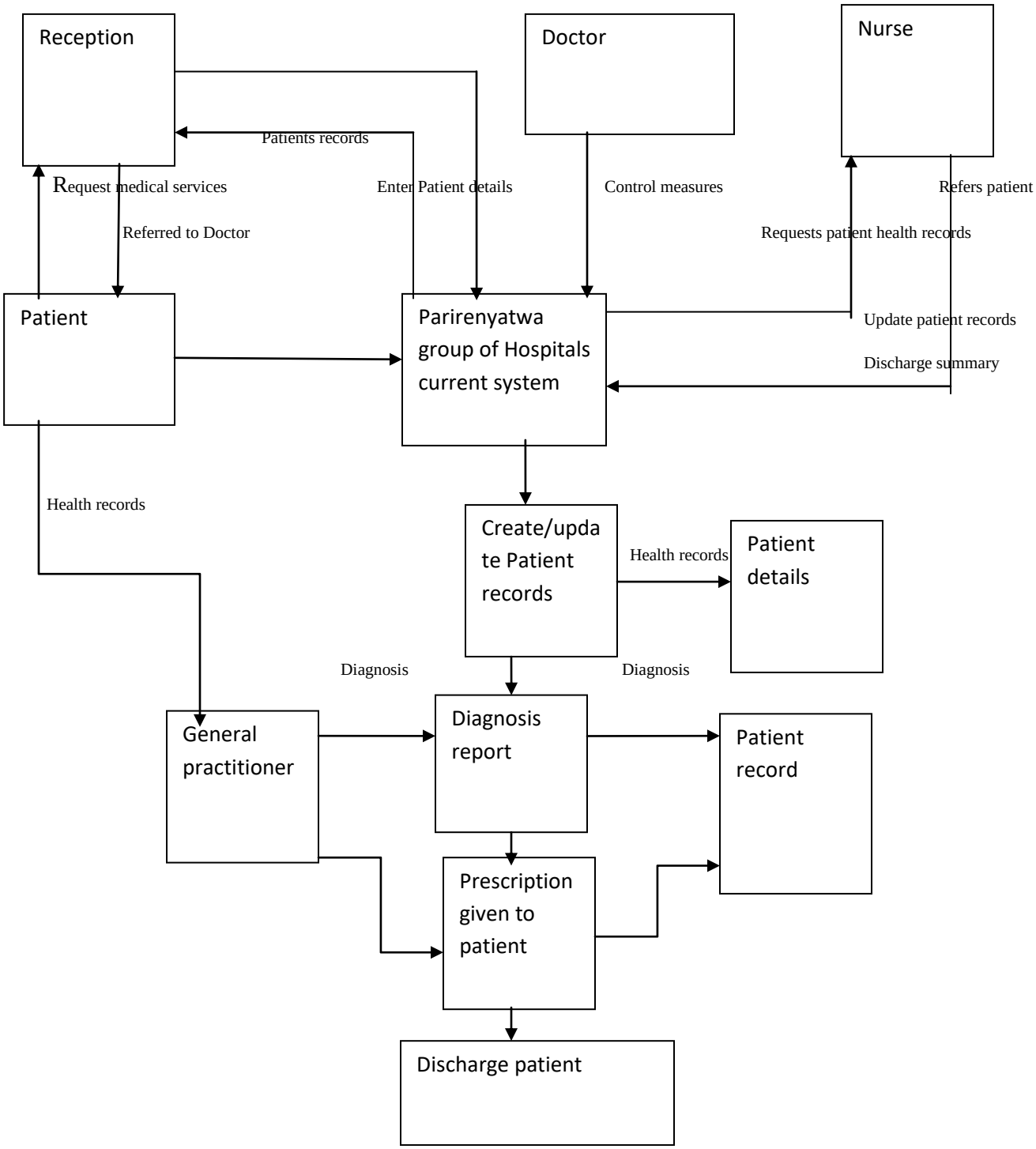


Fig3.2 Context Diagram of existing system

3.5.2Data flow diagram

Data flow diagrams are data modelling tools provide a clear representation of any business function. The technique starts with an overall picture of the business and continues by analysing each of the functional areas of interest. The data flow diagram of the current system is shown Fig 3.3 below.

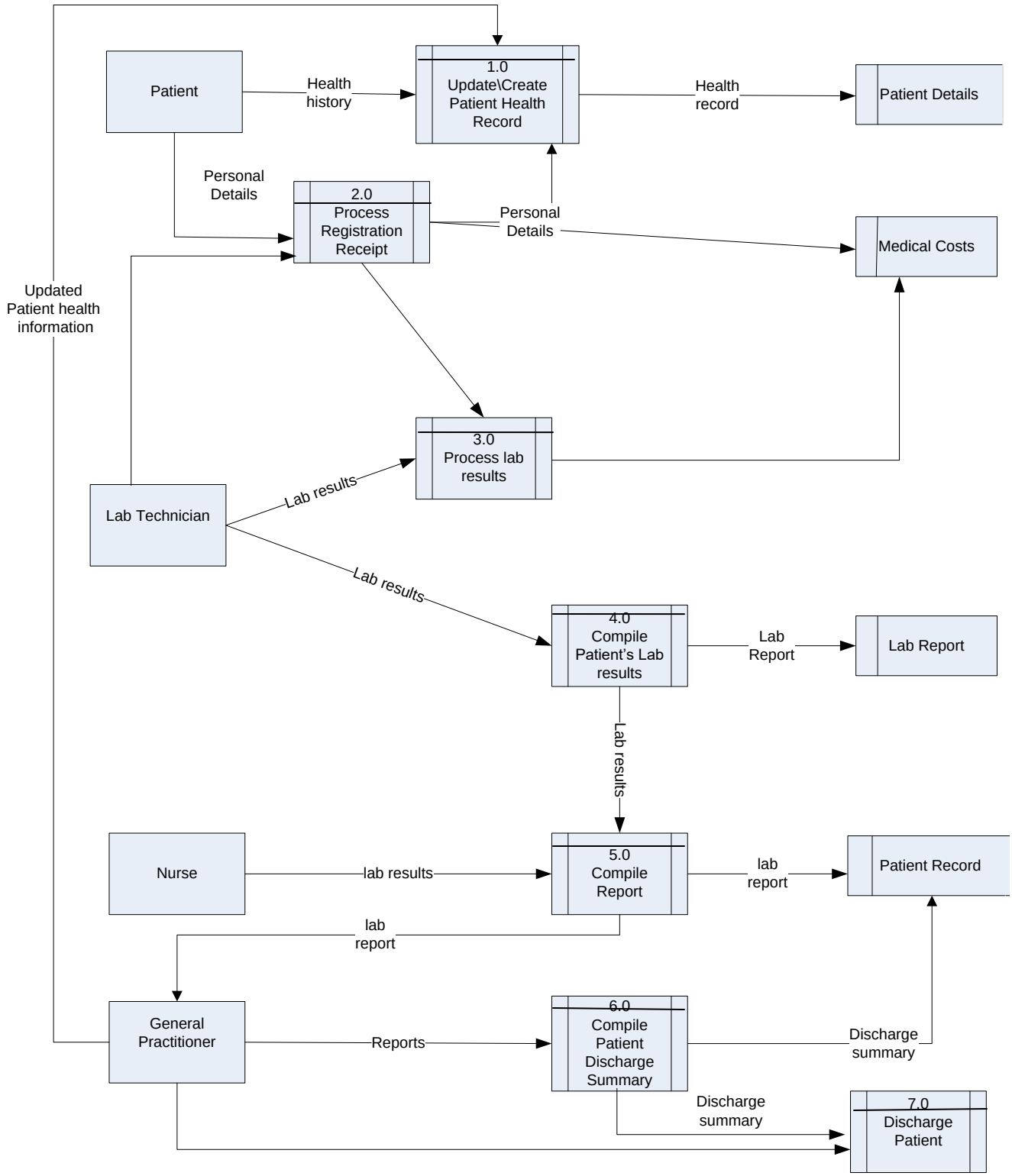


Fig 3.3 Data Flow diagram of the existing system

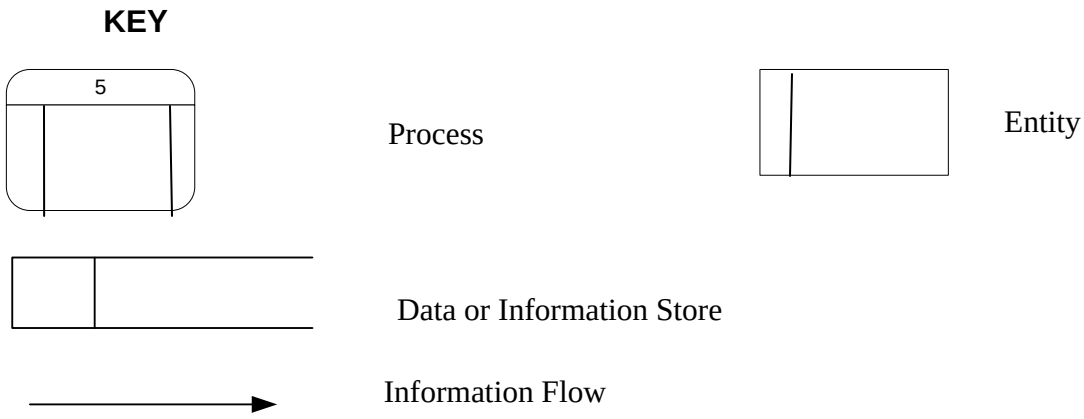


Table 3.2 key Data flow diagram

3.6 Weaknesses of current system

- Unavailability of up-to-date patient's health records and most recent discharge summaries in critical cases due to the slow updating process.

- Poor security as patient files can be easily misplaced or damaged to due to constant use in situations which involve chronically ill patients.
- It takes time to make claims from medical aid societies since bills are slowly calculated.
- System is not cost effective since a lot of stationary is used and this includes the cost of paper, manual files and pens.

- Slow access to one's health records especially for patients that need immediate attention.

- Work is quite stressful especially for the records department employees who have to deal with numerous volumes of data manually and move around files on a daily basis.

- Referrals are handed over to patients for them to hand over to specialists increasing the risk of these documents being lost and also violating patient health record confidentiality as they may reach the wrong hands.

- Specialists receive handwritten referrals which might not be legible and hence interpret information wrongly leading to wrong medical procedures.
- There is no feedback mechanism from specialist back to General Practitioner.

3.7 Evaluation of Alternatives

After clearly defining the processes involved in the current system and also outlining the way data flows in the analyst had a much clear perspective of what was required in the new system, other alternative solutions were weighed out in-order to find the most suitable solution. Alternatives that were considered are outlined below:

3.7.1 Outsourcing software

This is buying software that is a ready-made product that seeks to quickly address the problem that is being faced.

3.7.1.2 Advantages

- Requires less technical staff.
- There are no development costs
- The process of changing the current system would take a shorter time to implement.

3.7.1.3 Disadvantages

- These packages are very expensive.
- They might have high maintenance complications especially if the vendor of the software does not offer efficient support for the software.
- High maintenance results in more costs being incurred thereby defying the purpose avoiding unnecessary costs by applying an efficient and reliable system to our problems.
- They are Fixed and Rigid. Packages cannot be customized to the current activities.

3.7.2 Improving the Current System

- Improve patient filing system, the files can be labelled and arranged in an alphabetical order and records can be indexed for easy reference.
- Addition of more hospital clinical staff on to ease the pressure and also make the system a bit more efficient as it access to patient files is a bit faster.

3.7.2.1 Advantages

- The development of the new system, which would be time consuming, and resource straining is avoided and the organization will save on financial resources.
- Procedures and policies continue to work in the normal way, which is familiar to everyone.

3.7.2.2 Disadvantages

- Improvements on the manual system would be very limiting when applied. Most of the problems evident in the current system cannot be solved manually.
- Costly. Hiring new staff would mean that more money is going to be used to pay salaries hence straining the budget.
- Technological features cannot be incorporated in the manual system.

The system will continue to function unreliably and inefficiently

3.7.3 In house development (Developing a new system)

This is producing software that is tailor made for specifically for the organisation and therefore meets all or attempts to meet all the requirements that would have been identified.

3.7.3.1Advantages

- Offers control over system development
- Optimum configuration is possible and is limited to what is needed
- It reduces the amount of manual work involved
- Reduces data redundancy
- Improves data consistency and integrity
- Reduces cost of stationery that is currently being incurred.
- Solves unique user requirements and can be tailor made to function in a way all users can understand.
- It also offers more effective user training

3.7.3.2Disadvantages

- The system might be faced with resistance from employees.
- Development of the system will take time as compared to other alternatives.
- It is expensive to develop the system though it has good advantages in the long run.

3.8 Requirements Analysis

After thoroughly investigating the functions and process flows of the current system, the next step is establishing the requirement needs of the current system. Requirements are divided into functional and non-functional requirements. Functional requirements are tasks the system must support, whilst non- functional requirements are constraints on various attributes of these tasks

3.8.1 Functional Requirements

The functional requirements consists of various inputs, processes and outputs that are expected of the new system. The system's functional requirements should include:

- Creating, Editing and Deleting user accounts.
- A Health forum.(this is where General Practitioners, Specialists and other health professionals can upload health information (on diseases, fitness solutions, first aid procedures, healthy diet) and also allow general users (patients, staff members) to post questions on particular illnesses and their experiences and also allow them an anonymous input mechanism to prevent stigmatization.
- Centralized database to enable real time access of health information (might be Patient health record) and also reduce data redundancy.
- Mechanism to facilitate integrity checks to allow for data verification for the data that has been captured in the system.
- Validation and verification

3.8.2 Use Case

The use case is a description of sequences of actions performed by the system to produce a result for an actor. They specify the expected behaviour and not the exact method of making it happen. Use cases are created based on identified functional requirements but are not mapped one-to-one to requirements.

Use Case for the Doctor

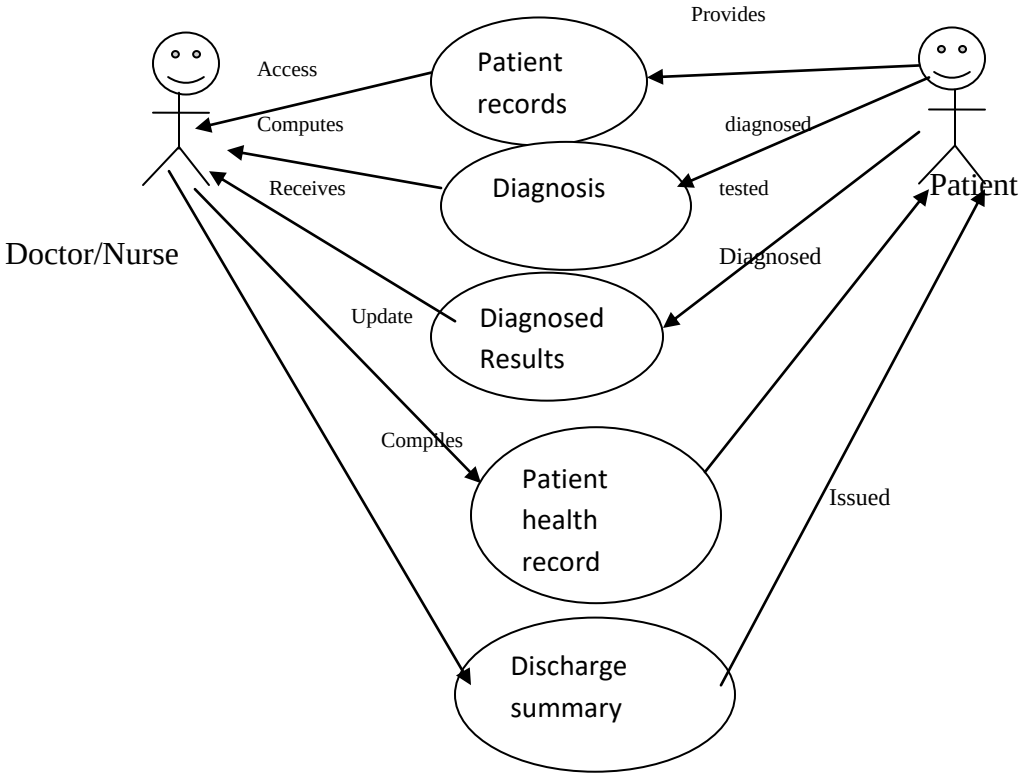
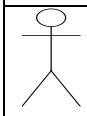
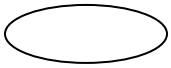
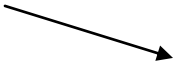


Fig 3.4 use case

Key

Symbol	Description
	**Actor**
	**Use Case**
	**Communicator**

T able 3.3 key Use case

3.8.2 Non-functional requirements

The analyst when determine non- functional requirements of the new system they look at constraints that they face as they develop the system. The functional requirements of the proposed system range from the needs of general users to the needs of the organizations senior management.

3.8.3 User Interface and Human Factors

- The user interface should be almost self-explanatory.
- The system should allow for error recovery.
- The system should be simple and easy to learn.
- The system must be user friendly.

Error Handling

The system should have error handling for

- Data and or user details analysis.
- Data capture.
- Exporting of data to other formats. e.g. exporting to excel, sending in email format.

3.8.4 Security Issues

The proposed system must be more secure through;

- Access levels should vary with different users to protect information.
- Passwords must be more than seven characters.
- The use of secure authentication mechanisms such as passwords and access rights to system users.
- Capturing the details of the user currently logging on to the system.

System efficiency and throughput

The proposed system is supposed to;

- Improve faulty logging process.
- Eliminate job assignment duplication
- Allow for quick retrieval as well as availability of data whenever required.
- Improvement of the services provided in terms of response time, efficiency and reliability.
- Reduction of operational costs due to minimization on overtimes.
- Provide for backups.

3.8.5 Technical constraints

The development of the system the following maybe encountered during the different stages of development

- Technical staff will be needed to help develop the modules of the system.
- The system may become a bit complex and may need experts for support in the future.

3.9 Conclusion

This study has actually shown us that some features of the current system can be adopted in the proposed system. Through the requirements analysis used to determine the functionalities of the proposed system and aided with the use of Use Case diagrams. The current system was also analyzed through generating alternatives that included Software Packages, Outsourcing, Improving the current system and or In-house development. From the analysis, In-house development is relatively cheaper than all other alternatives. Therefore as the Developer I carry on to the Design stage of the system development life cycle. Therefore the next step is the actual design of the proposed system.

CHAPTER 4

DESIGN PHASE

4.1Introduction

This phase is mainly concerned with the design of input and screen output interface for the system. It involves the development of the objectives of the proposed system. It also look at how the system is going to work. That is, both the logical and physical design is going to be tackled and done in this design phase. It looks into the actual system design and clarifies how the system is going to work. It also looks into the Architectural, Physical, Database and program design of the system. Initial interface designs are developed in this phase making sure that all requirements proposed in the previous chapter are followed.

4.2 System Design

This system should have following characteristics:

-Security: The system must provide privacy and confidentiality. It should also be usable by those who are authorized.

-Efficiency: The system should enable the user to process jobs in a small number of commands and in the shortest possible time and should be simple enough to allow users to easily find their way around the system quite easily.

-Reliability: In an environment where there are constant power outages and load shedding, the system should be able to maintain a certain level of reliability as most of the computer systems are victims of failure. A transaction should not be lost in the case of power failures and database transactions should not interfere with each other thereby reducing data integrity. The transactions should not be affected by the failure of the system, after the failure has been resolved it should be possible to return to the recent state.

-User friendliness: The system must be used with minimal support and consultation.

-**Maintainability:** The system should be easy to maintain and update in line with technological changes in the environment or changes in the business need.

4.2.1 Description of the proposed system

The packages involved and their inputs, processes and outputs to help clarify how the new system is going to work. Their inputs, processes and outputs are tabulated in the table below:

Package	Package Description	Inputs	Processing	Outputs
Patient health Records	Records created And modified	-Patients's personal details -health records -results of the test	-updating health details And personal details	Updated personal details and health records

Table 4.1: System packages

4.2.2 Context and Data Flow Diagram of Proposed system

A context flow diagram of the proposed system's process flows are no longer manual and new entities and other entities are replaced by system processes. Entities are also incorporated to make the system work more efficiently.

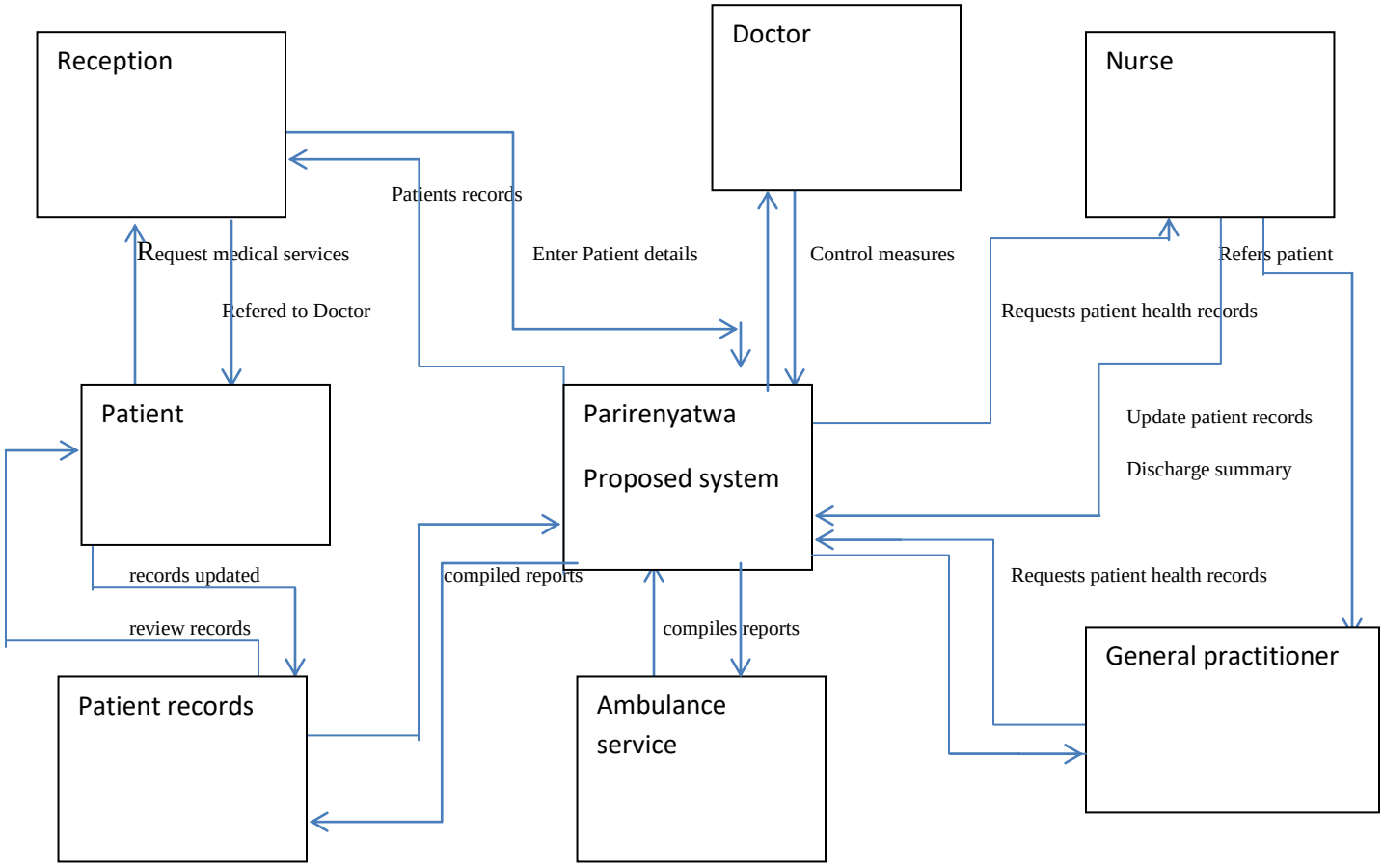


Figure 4.1: Proposed system context diagram

4.2.3 Data Flow Diagram of Proposed System

The dataflow of the proposed system has a new architecture significantly improves system efficiency and also reduces data redundancy. The data flow diagram fully highlights how the data is going to flow in the proposed system. There is only one database that is centralised in the proposed system.

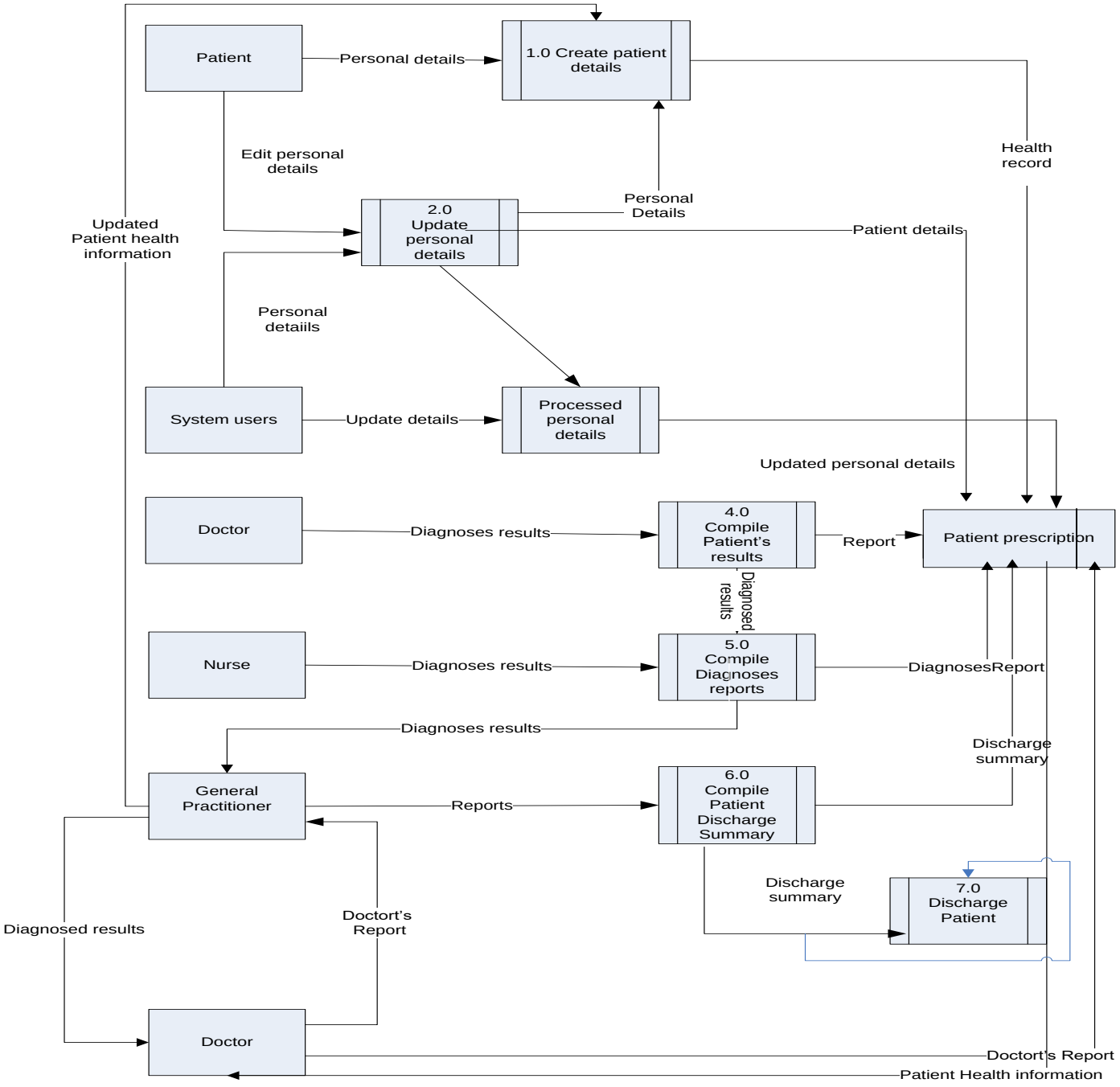


Fig 4.2 Proposed system data flow diagram

Key

Table4.2: Proposed system data flow key

4.3 Architectural design

The system components of this phase are identified including the control and data flow between them, the functions it should perform are stated including data input and output. The architecture will consist of:

Server Requirements:

- Processor speed - 2GHz minimum;
- RAM 6Gb minimum,10 Gb recommended;
- At least 500 Gb of the total disk space of the available;
- Network adapter;
- USB Port;
- DVD ROM(In case of IDE DVD-ROM to be connected to the secondary IDE channel)
- Video adapter/monitor keyboard;

Printer

- Type: - HP Laser Jet P2050

Software requirements

- Microsoft Windows 7 operating system,XP or Unix
- Eset Nod 32 Anti-virus
- Microsoft Office 2007
- Zend Server for php
- Microsoft SQLServer 2005
- Browser - Internet explorer 8.0 or higher. Mozilla Firefox 3.0.18 or higher or any other browser compatible with these browsers.

Branch Terminal Requirements

- A compatible desktop computer
- Processing speed of at least 2GHz
- A Hard Disk Drive with at least 100GB
- A Mouse
- Keyboard
- An Ethernet network adapter card
- At least 2 Gb of RAM

4.4 Physical Design

This describes the proposed system's hardware and software infrastructure that will be used. It also describes how the system will be designed to communicate with database. It describes the

technical environment of the proposed system which comprise of the hardware that is going to be used and the way it is structured i.e. location of the hardware (servers, printers) and the way in which it is going to be networked.

Physical Design of Proposed System

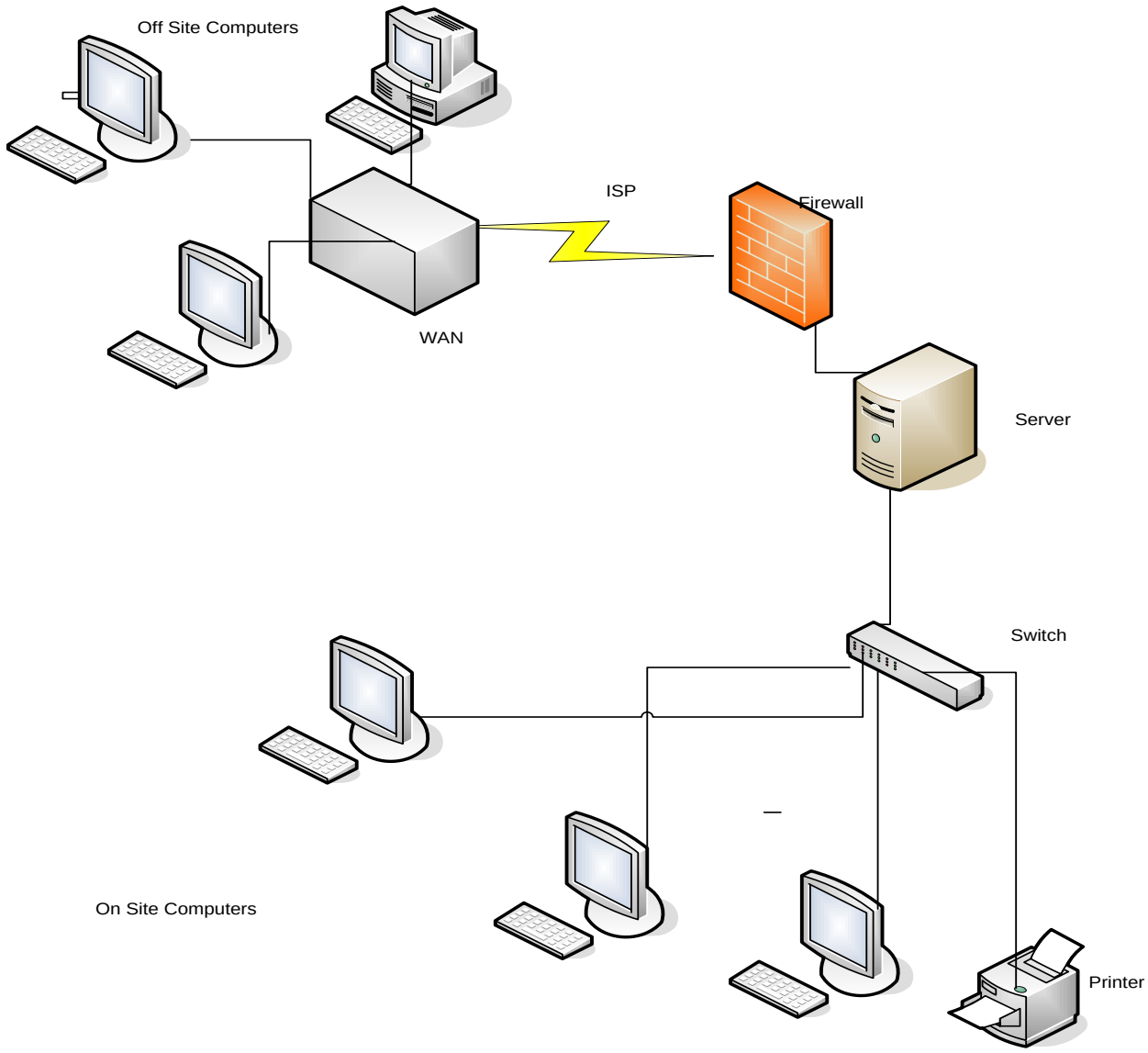


Fig 4.3 Physical design of proposed system

4.5 Database Design

The database design is focused on the data types and the relationships between the entities as shown bellow. There is the physical layer, the conceptual layer and the application layer. The schema is the description of the database which is specified during database design and the instance is the data that it stores in the database at given time. The diagram below shows the Database Architecture of the proposed system.

The diagram below shows the database architecture.

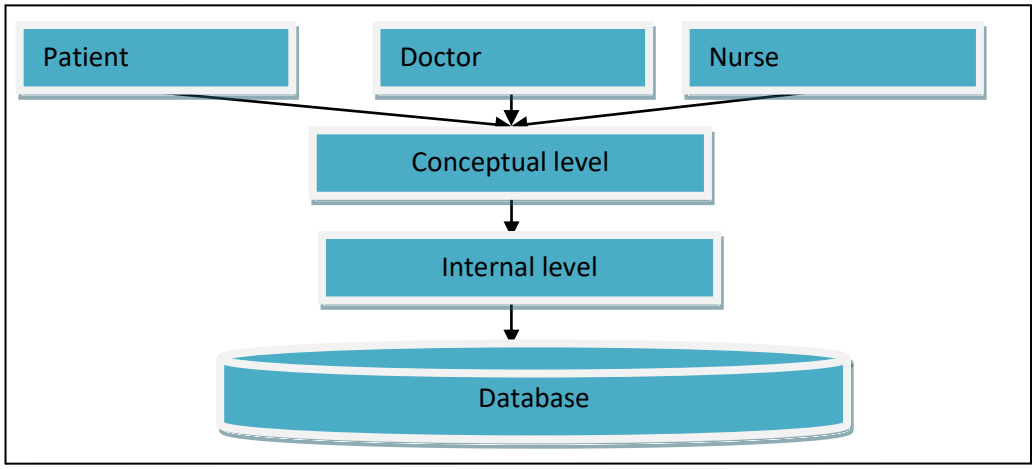


Fig 4.4: Database architecture

External level - This is the level at which users interact with the system via applications programs, a host language or data sub language.

- The data definition language (DDL) and the data manipulation language (DML) are the most common interface tools used in this schema.
- This level describes that part of the database that is relevant to a particular user. It is usual for a user to require only certain tables (or parts of them) containing specific records and logical relationships between these records.

In this case the patient can only view the data stored in his/her Patient Health Record while a Doctor (General Practitioner) can perform certain changes to the data stored in the database.

- **Conceptual level** -describes what data are actually stored in the database and the relationships that exist amongst the data. The data is stored in tables and a table's design describes what it stores, that is the tables' attributes' specific feature's (integer, string and the exact size, format). The table's field name and data type are defined. Queries are also defined in this level and how they link with each other. This level must not contain any storage-dependent details (e.g., storage structure and access technique).
- The schema can be regarded as derived from a model of the organization and should be designed with care as it is usual for its structure to remain relatively unchanged in the life of the database.

- **Internal Level** - This level mainly depicts the way the RDBMS and OS perceive the data. It describes how data is stored in the database. The internal view is described by means of the internal schema which defines the various stored record types, how stored fields are represented, what indexes exist, what physical sequence the stored records are in, and so on. It is concerned with storage details that are not part of a logical view of the database.

4.5.1 Entity Relation Diagram

ER diagrams uses symbols to represent three different types of information. Boxes are commonly used to represent entities. Diamonds are normally used to represent relationships and ovals are used to represent attributes. The diagram is a specialized graphic that illustrates the interrelationships between entities in a database.

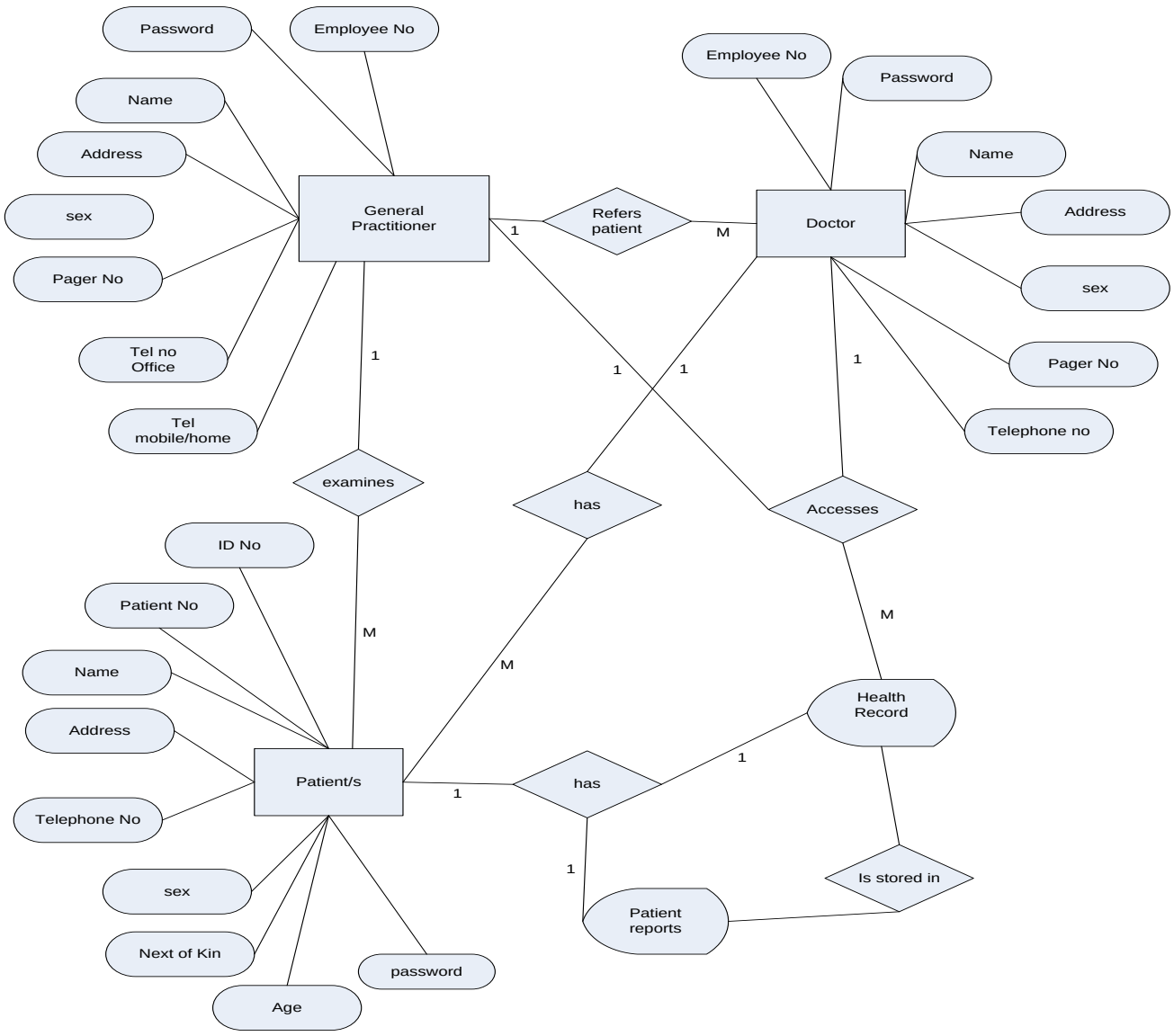
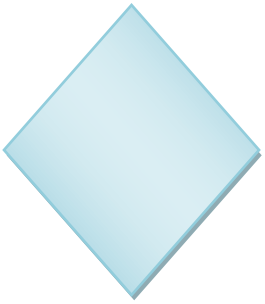


Fig 4.5 Entity Relation Diagram

KEY

Attribute



Relationship

Entity

4.5.2 Database Tables

Database tables are elements of the database where data of the system is stored.

Create new employee table

Field Name	Data Type and Size	**Description**
Employee name	Varchar(30)	Employee name
Initials	Varchar(30)	Initials of employee
Surname	Varchar(30)	Surname of employee
ID number	Varchar(30)	ID number of the employee
Address	Varchar(30)	Address of the employee
Phone	Varchar(30)	Phone number of the employee
Cell	Varchar(30)	Cell of the employee
Email	Varchar(30)	email of the employee
Gender	Varchar(30)	Gender of the employee
Marital status	Varchar(30)	Marital status of the employee

Table 4.3 table to store employee details

Registering a patient

Field Name	Data Type and Size	Description
Name	Varchar(30)	patient name
Initials	Varchar(30)	Initials of the patient
Surname	Varchar(30)	Surname of the patient
ID number	Varchar(30)	ID number of the patient
Address	Varchar(30)	Address of the patient
Phone	Varchar(30)	Phone number of the patient
Cell	Varchar(30)	Cell of the patient
Email	Varchar(30)	email of the patient
Gender	Varchar(30)	Gender of the patient
Marital status	Varchar(30)	Marital status of the patient

Table 4.4 table to store patient details

Audit trail Table

Field Name	Data Type and Size	Description
Trail id	Varchar(30)	Trail id of the user
Audit date	Varchar(30)	Audit date of the login
User id	Datetime	Id of the system user
Audit tablename	Datetime	Name of the system users
Audit detail	Datetime	Details of the audit

Table 4.5Audit trail Table

Diseases Table

Field Name	Data Type and Size	Description
Disease id	Varchar(30)	Id number of the disease
Disease name	Varchar(30)	The name of the disease
Symptoms	Varchar(30)	Symptoms of the patient
Disease status	Varchar(30)	Status of the disease
User id	Varchar(30)	Id of the user

Table 4.6 Diseases Table

4.6 Program design

Program design entails the semantic design of pseudo code for the implementation of this proposed application. In this section the Analyst will detail the conceptual design of the programs that will be used to implement the functions in this application. It consists of the steps a programmer should take before they start coding in a specific language.

4.6.1Package diagram

The Package diagram illustrates dependencies of various components or modules of the system for the system.

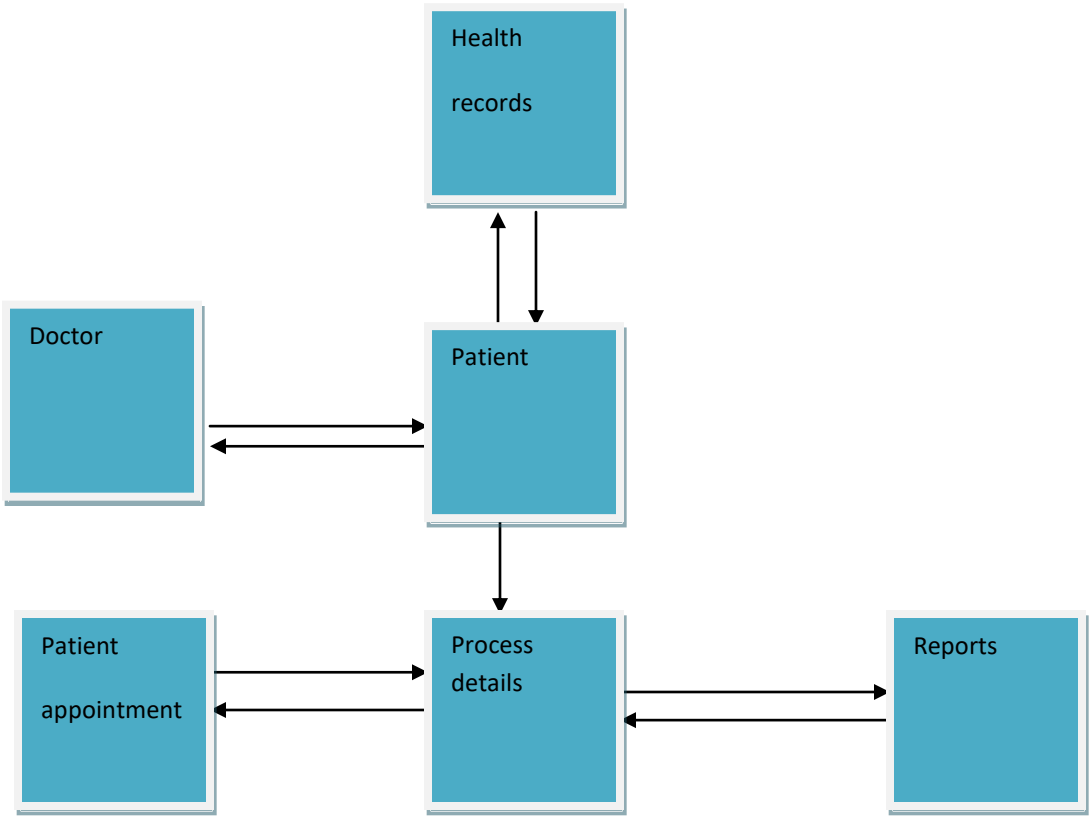


Fig 4.6Package Diagram of proposed System

4.6.2 Class diagram

Class diagrams are used to illustrate the types of objects in a system and their relationships. Class diagrams express both the persistent state of the system and the behaviour of the system. The Diagram below illustrates the expected states and behaviours of the classes of the proposed system of Parirenyatwa.

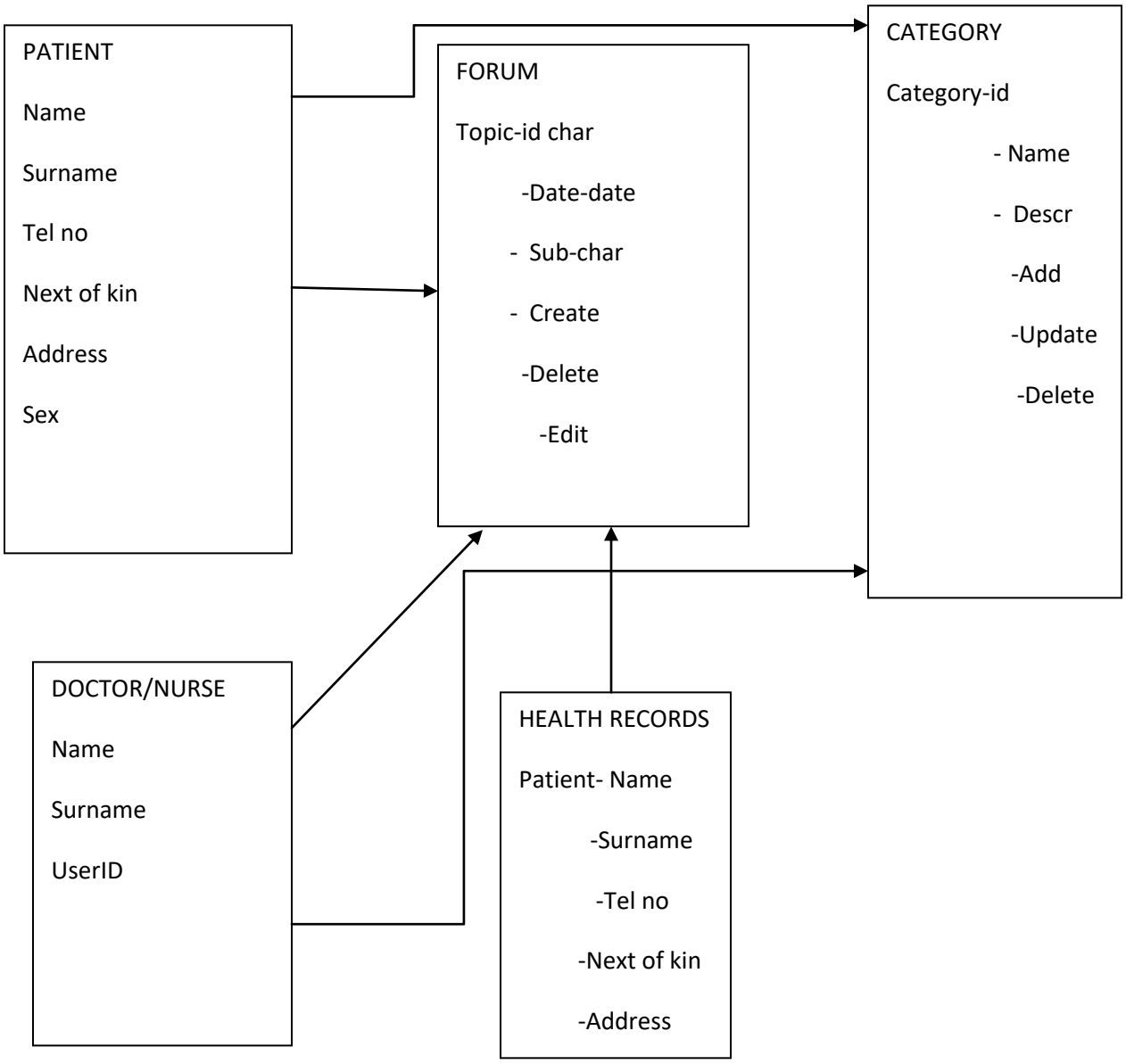


Fig 4.7 Class Diagram of proposed System

4.6.3Sequence Diagram

A sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart and it demonstrates the behaviour of objects in a use case by describing the objects and the messages they pass. The diagram models the flow of logic within the system in a visual manner and enables the developer to both document and validate the system logic

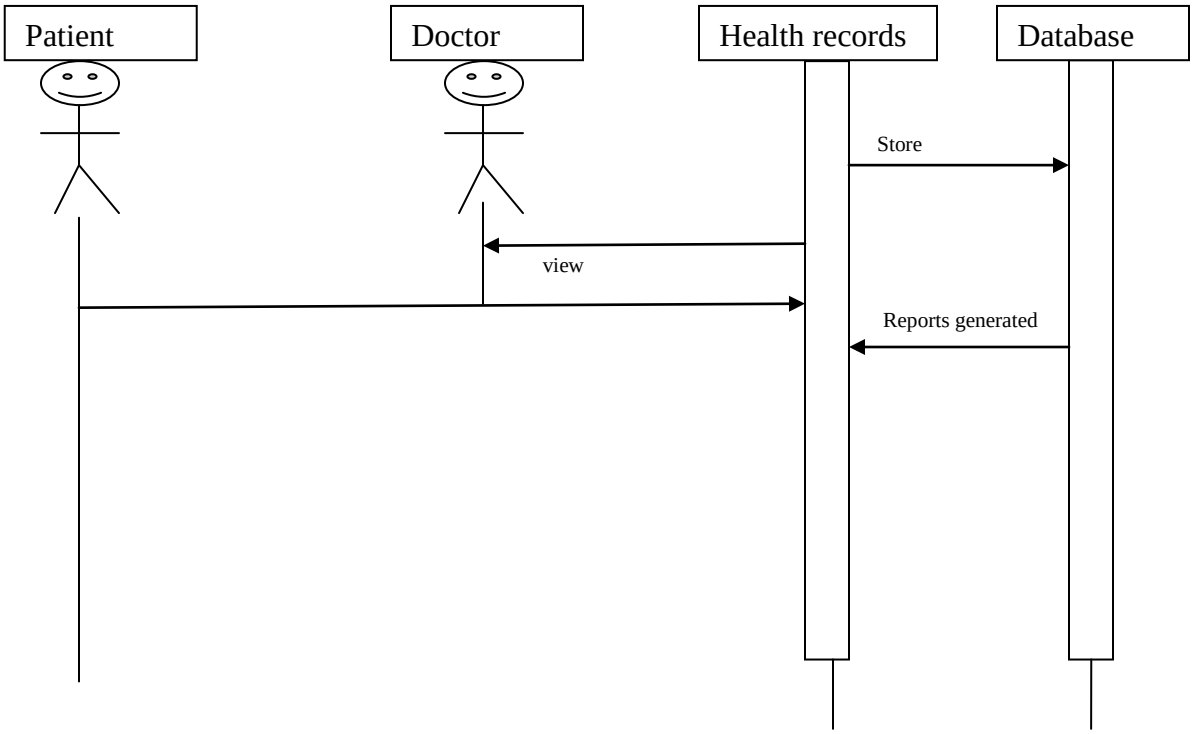
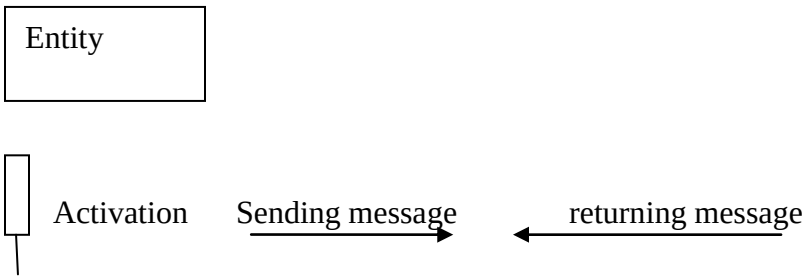


Fig 4.8 Sequence Diagram of proposed system

Key



4.7 Interface Design

The interface design defines the way in which users will interact with the system and the nature of inputs that the system will accept. Screen design of the system has been designed in such a way that it provides a user friendly Graphical User Interface (GUI). This includes defining internal and external control and data flows. Its highest level of abstraction and hides the complex parts of the system by simplifying the user's interaction with the database by the provision of an interface, it outlines the design for the menus, forms, reports etc.

4.7.1The login form

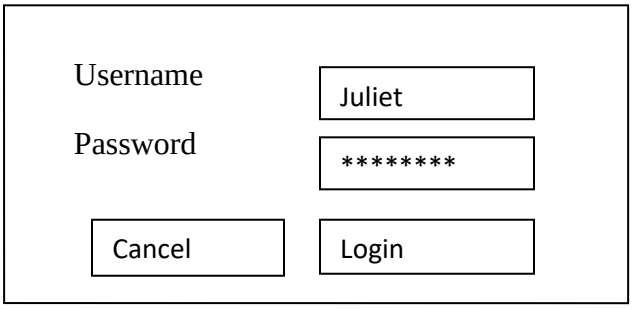


Fig 4.9 login form

4.7.2The main form (home page)

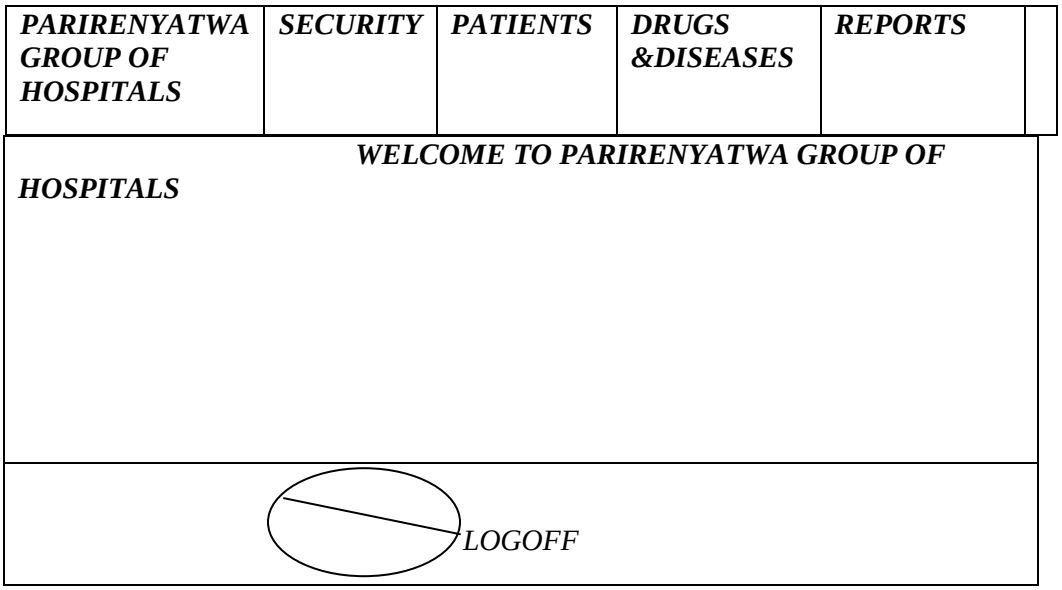


Fig 4.10 Main form of proposed system

The interface should be:

Be easy to learn- easy for users to remember, to develop and to use even with inexperienced users

4.7.3Input Design

The input of data is through text (both numeric and non-numeric) from the keyboard. Input is thus of a natural type that the user will comprehend. The application focuses on a graphical user interface that is both friendly and easy to use for the user.

The new proposed system will contain input forms that will allow users to enter all the necessary data e.g. patient details. The input forms should be user friendly simple to use.

Patient health record

Prescription for	Juliet Goromonzi
Address	768 Senga 2
Cell number	0777876540
Prescription date	15/04/2012
Disease name	Malaria
Symptoms	Weak bones
Prescribed drugs	Chloquine

Table 4.7 patient health record

Patient Personal Record

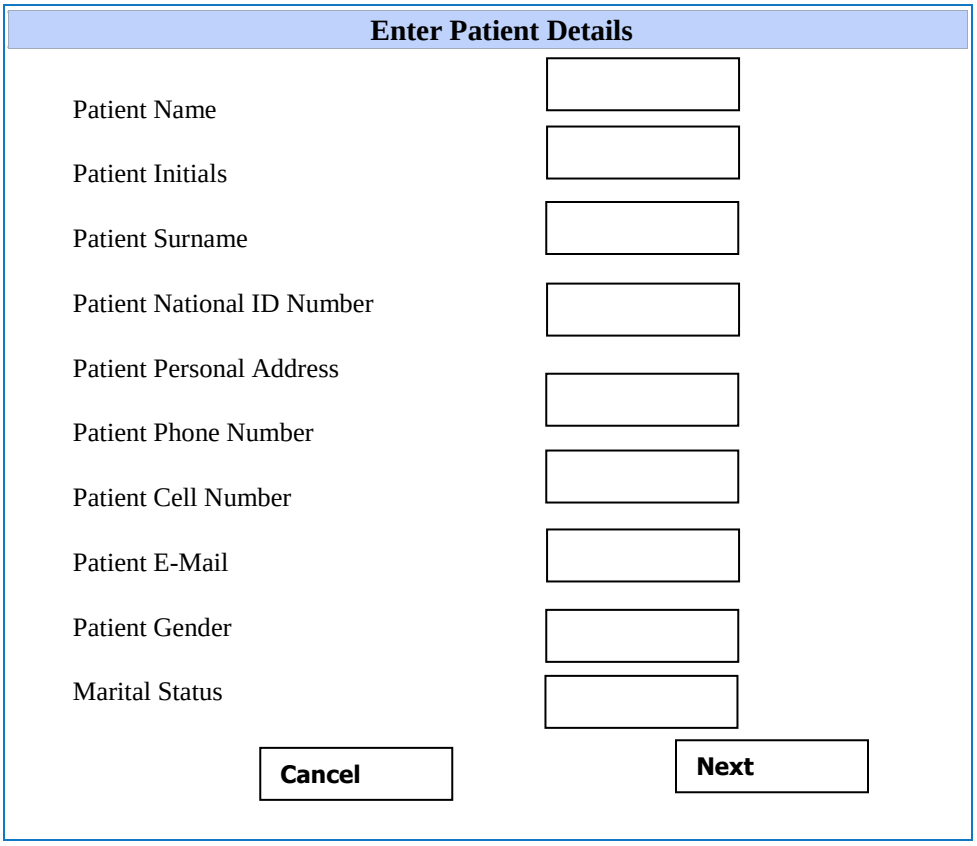


Fig 4.11 Patient personal record input form

4.7.4Output Design

Output forms will allow authorised users to view information that has been entered by others or sent to them by mail. Other than just output forms the system allows for medical reports to be generated and also printed on a printer connected to that particular terminal or over the network.

A general practitioner can also create patient discharge summaries which are stored as reports in the database and can be printed out. The reports should look like the one below

4.7.4.1Report of the registered patient

SEARCH BY NAME OR SURNAME	search
OUTPUT OF THE SEACHED PATIENT	

Fig 4.12 report of the registered patient

4.8 Conclusion

The design phase defined how the system would work in the actual environment and the specifications of the components of the software that is going to be developed defined in detail. The desired system is being designed and the hardware and software requirements have been selected which will be used together with the system. The system has been in designed in a way that the users will find it easy to use. The system has been designed such that it is easy to maintain and does not cause problems and that it function or performance is reliable.

CHAPTER 5
IMPLEMENTATION

5.1 Introduction

The implementation phase takes a look at the mechanism of presenting the application of the system to the final user. That is we are looking at the actual activities that are going to be done for us to hold the system in our hand for presentation. In addition, we are looking at how the system is to be produced, tested for user requirements who are the main stakeholders and lastly in terms of functionality. Therefore, there are some steps that have to be followed for a system to be finally and completely delivered to the final users.

Testing of system

- Verification
- Installation
- User training
- Pseudo code of the system
- Validation
- System conversion
- System operation

5.2 Coding

This system was coded using PHP, Dreamweaver and WAMP Server were used for the development of the software package. Coding involved turning program logic into specific instructions that are to be executed by the computer system. The system database was the first thing to be constructed. All the elements in the data dictionary conceptualized during the database design were mapped into the relevant tables. The Graphical User Interfaces was then constructed using the Dreamweaver. The system functionality was developed as modules. The modules were finally integrated into one working system.

5.2.1 Program Pseudo code

A pseudo code of the new proposed system will show a general but full overview of how the system operations are going to take place. It shows the whole process from data input, processing up to the point it is output from the system to produce the necessary required reports.

5.2.2 Program code segments

This section shows sections of the code that were made so that the system would become functional. Code segments performing functions which are add, update, search and validate payments were selected. Below is part of pseudo code of the proposed system

5.2.3 Code for Login

Start

Select system

Enter username and password

If (username, password and access level) valid Then

Log in

Else

Invalid login.

End if

End.

5.2.4 Menu Form show

Start

If (click form) Then

form show

End if

Else

If (request patient) Then

Patient form show

End if

Else

If (request Diagnoses) Then

Diagnoses form show

Select date and Time

End if

5.2.5 User Form Show

Start

If (check user) is administrator Then

If (add user) then

Enter user details and add

End if

Else if (deactivate user)

Enter username to be deactivate

End if

5.2.6 Change password

Enter username

If correct then

Check old password and new password

Else

Try again

If number of tries =3 and logon is unsuccessful then

Log out

End if

5.3Testing Process

The testing phase of the system included testing of the system at all levels, from the lower levels to the conceptual level of the system. That is, we started from individual modules, integrating them into groups as we go up, until the whole system has been finally tested. This is done to ensure that the system meets specifications and user requirements.

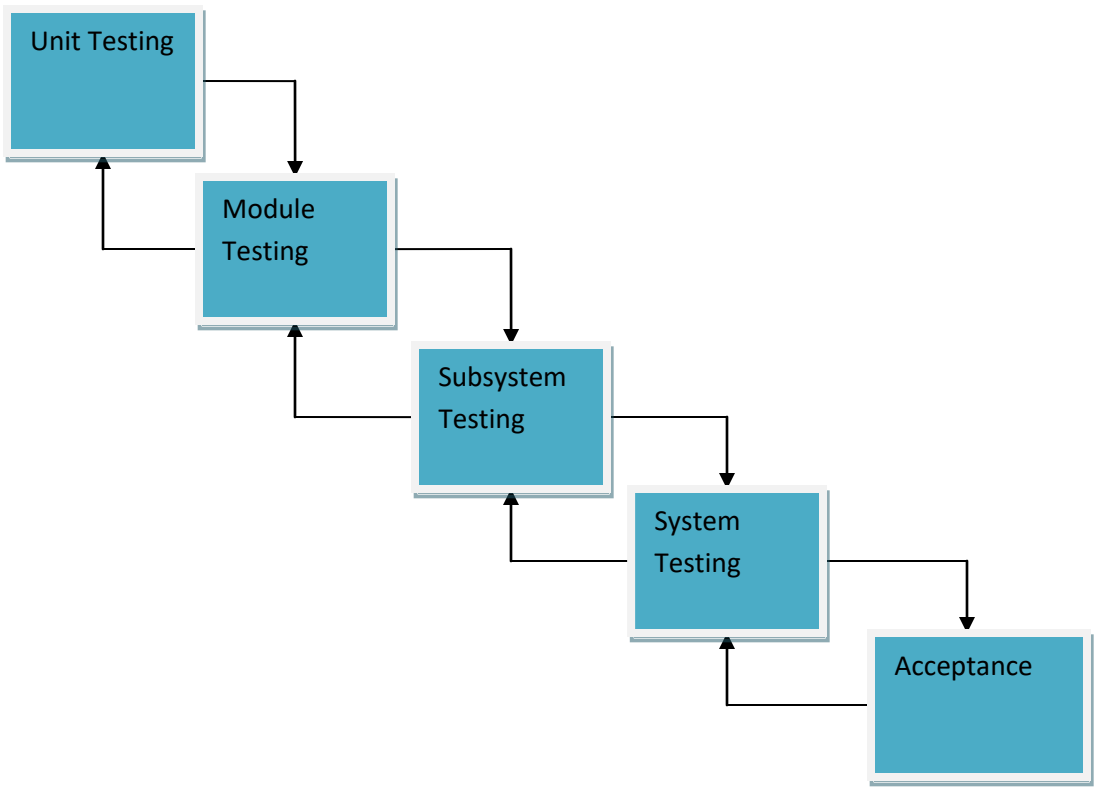


Fig 5.1 The testing flow process

5.3.1 Unit testing

In unit testing the objective is to verify whether the module components are functioning, as they are required. That is, are they doing what they are supposed to be doing?, for example adding a patient to the database. This is done on the lowest level program module (unit) in an isolated environment before it is combined with the other units to form higher-level modules to be tested as a whole. Each component within the system was tested individually before progressing to the next component .The unit tests were done in two scenarios which are logical testing/white box testing and functional testing /black box testing.

5.3.2 Logical Testing (White Box Testing)

The logical testing (White box testing) focuses on point on the inner working detail of a unit and it will help find errors not immediately identifiable by treating a unit as a black box.

- The logical testing (White box testing) dependent on the code derived from the program structure rather than its function. The logical testing (White box testing) technique pays detail to the internal processes of the system. It focuses on the internal working detail of a unit and identifies errors not shown through black box.

5.3.2.1 Advantages of white box testing.

- This test is able to inspect the internal state of the box after the test has been run. This can be useful to ensure that internal information is in the correct state regardless of whether the output was correct or not.

5.3.2.2 Disadvantages of white box testing.

- A skilled analyst is needed to carry out the test which makes the test expensive and time consuming.

5.3.3 Functional Testing (Black Box Testing)

The black box testing focuses on the overall functionality of the software and in uncovering faults like incorrect or missing functions, errors in any of the interfaces, errors in data structures of the database and errors related to the performance of the system and is concerned with input and output of the program. It is also used to test the given program behavior against its specifications without making any reference to the internal structure of the program.

5.3.3.1 Advantages of black box testing

- The test is done from the point of view of user not the designer and it is unbiased because the tester and the designer are independent of each other also the tester does not need to be a programmer to test the system.

5.3.3.2 Disadvantages of black box testing

- The user needs to test the whole program, so it's not possible because testing whole input stream is unrealistic and also test cases are difficult to program.

Testing audience

The following individuals were involved in the testing of the system:

a) System developer
b) The system administrator
c) The Doctor
d) The system analyst

5.3.4 Module Testing

This involves the testing of the different modules independent of one another. It combined the details of the patient etc. Module testing collects individual components in module testing and also tested to check if patient details could be deleted or updated.

5.3.5 System Testing

System testing is the testing of all the integrated modules that makes up the system to check if it was performing the required functions. The system is able to diagnose a patient if the patient is not in the system. If the patient is available the system will confirm then one can edit the patient's details is to be edited .The system is able to add new records of patient. The system is also able to cancel a user if he/she no longer active. All queries are executed by the system. Finally my system can produce reports like the patient details.

5.3.6Methods of conversion

The methods that were taken into account include the following:-

- Direct conversion
- Pilot conversion
- Phased conversion
- Parallel conversion

5.3.6.1 Pilot conversion

Pilot conversion is a selective implementation method. Installation of the new system is only to those departments that require the use of the system. Cost is relatively moderate since only one location runs both systems. Risk is also relatively moderate as risk of failure is reduced to the pilot site.

5.3.6.2 Direct conversion

Direct conversion method sees a complete overhaul in the use of the existing system. The new system is then implemented and begins being used by the organization. The Old system will stop operating as all the users will have been updated with the new system. This strategy has a relatively low cost of implementation, however there is an imminently high risk if the new system fails to live up to expectations or does not provide better functionalities compared to the old one.

5.3.6.3 Phased conversion

On phased conversion the new system is installed in different stages. This is done while the old system is being slowly phased out. Users can easily adjust to the new system as there is no rush in implementing it. Cost is relatively moderate because the system is implemented in stages. Risk is also relatively moderate because the risk is limited to the module being implemented.

5.3.6.4Parallel conversion

Parallel conversion involves running the two systems together at the same time. This gives the users a better background and backup to refer back to if the new system fails to live up to the expected standards. The implementation costs are relatively high as both systems are in operation for the changeover period. Risk is relatively low.

5.3.7 System Security

System Security is one of the most important aspects of the project. There is a need to protect the system as any harm that can come to it can affect the day to day operations of the system.

5.3.7.1 Physical Security

Physical Security aspect covers the physical environment of the system. The major part of the system is the system server which will be maintained on a weekly basis and will be locked up in a different room from the other computers access of which will be limited to certain individuals. The physical security will also include the backup information which is going to be located and the server will be fitted air conditioners to prevent the machines from overheating.

5.3.7.2 Software Security

- Authorized users will have different access levels assigned to them in the use of the system. Specific authorities will have rights and access to some of the most sensitive parts of the system like deletion and editing of user data.
- To gain access to the system passwords and usernames will be used, to ensure that privacy prevails and to avoid data destruction by unauthorized-users. Only authorized users will have usernames and passwords for the system.

5.3.8 Verification and validation

For the database to store data that is consistent there is need for proper validation of data as it is entered in the system. Validation was considered when designing the system because of the following reasons - :

- **Reductions of errors -** input errors are reduced by proper validation. This is so because users will be notified or the system automatically rejects a command, thereby stopping the error to occur.

- **Data consistence -** The new system will require the user to input data. Such information is very vital for the system's proper functionality since it is such data that will be manipulated by the system during the execution of query statements.

5.3.8.0 Test Results

5.3.8.1 Login testing

- The system was tested to see if it allows a user who supplies the wrong credentials be allowed more than three tries to remember their password.
- Login testing involved testing of whether the supplied username and password can actually give access to the user.

The following page will appear when an unauthorized user tries to log into the system.

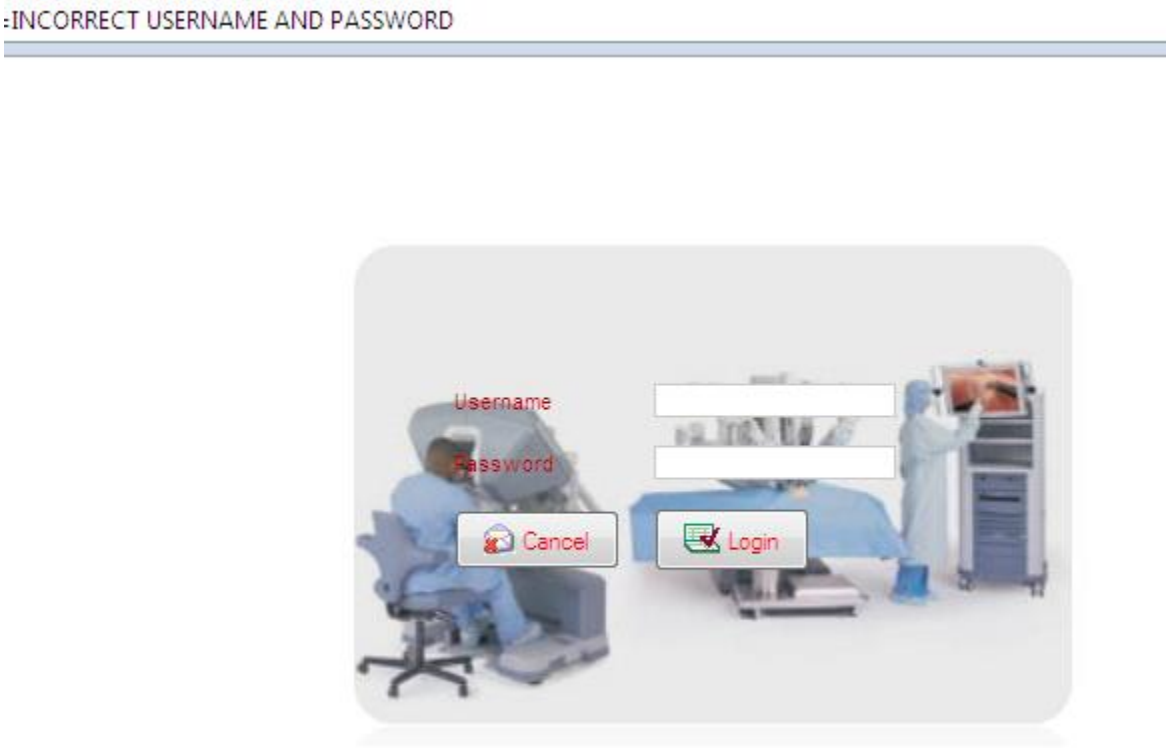


Fig 5.2: User Login Form

5.3.8.2 Beta testing (Validation)

Beta testing aims to show the invalid data being entered into the system and how the system validates the data to inform the user through the use of message boxes. Only when the data integrity of input is to be saved is met that the data can be accepted and saved into the system.

This message will show when there is data type mismatch trying to be saved by the user of the system.

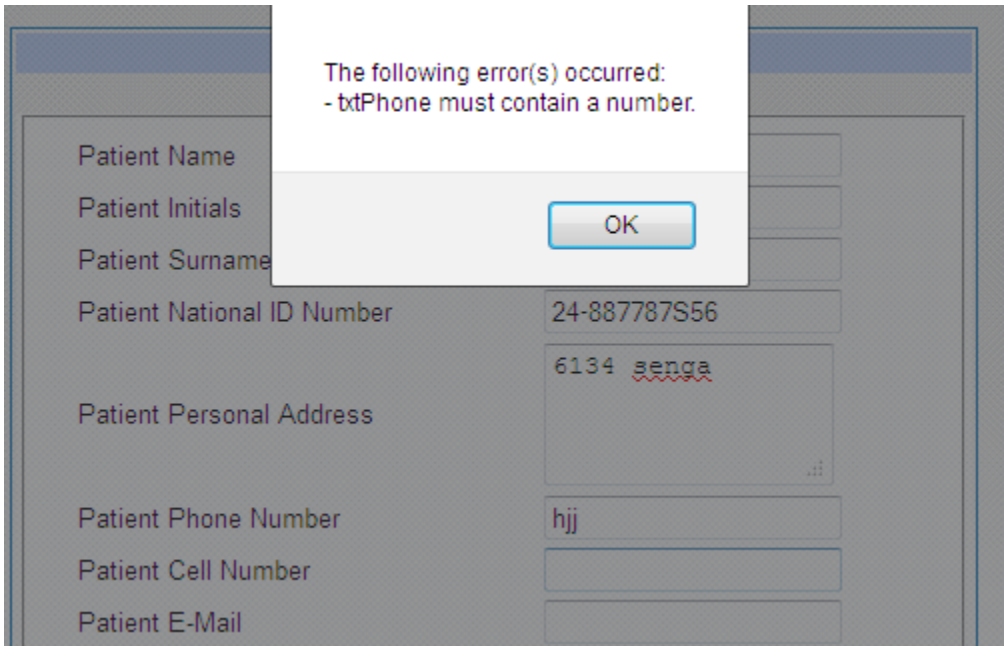


Fig 5.3: Error message form

5.3.8.3 Validation of null fields

This aims to inform the user of a field that is required and has been omitted before the data is saved. This is shown by the result of the diagram below.

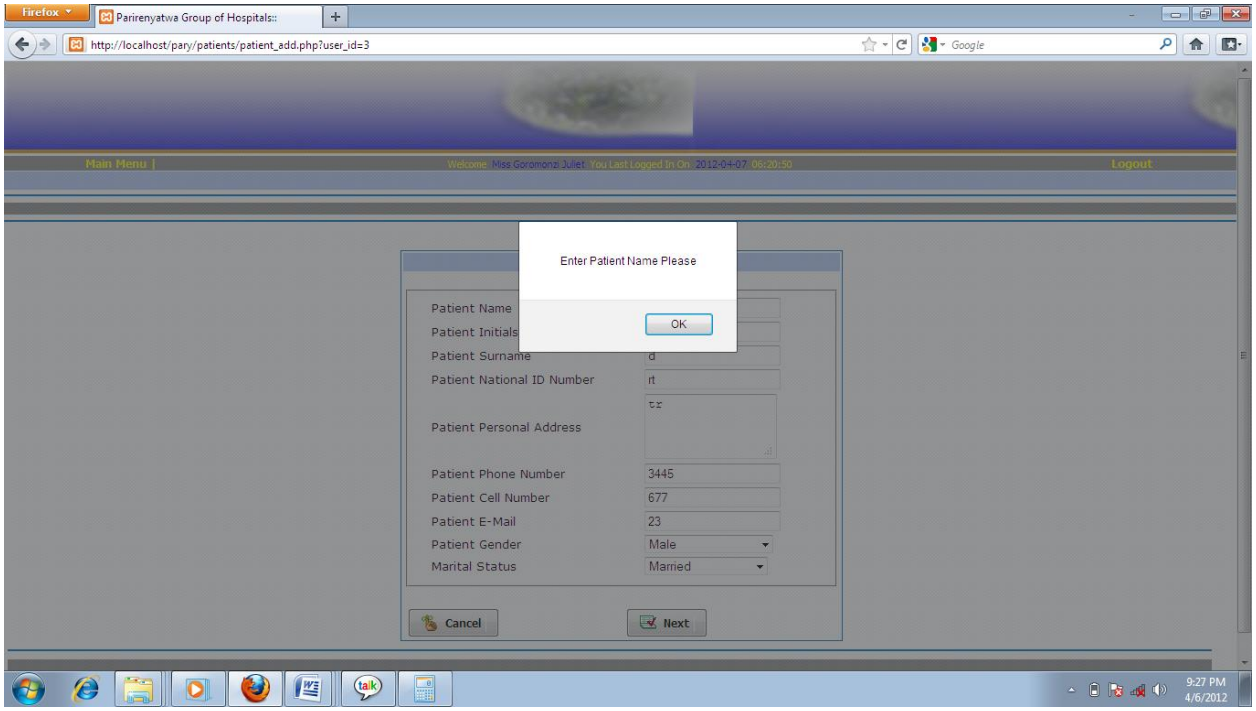


Fig 5.4 Validation of null fields form

5.3.8.4 Password change results

When a user wants to change his/her password, they are supposed to provide their account number, together with an old password and a new password. If the passwords do not match the following diagram with a message box will pop up.

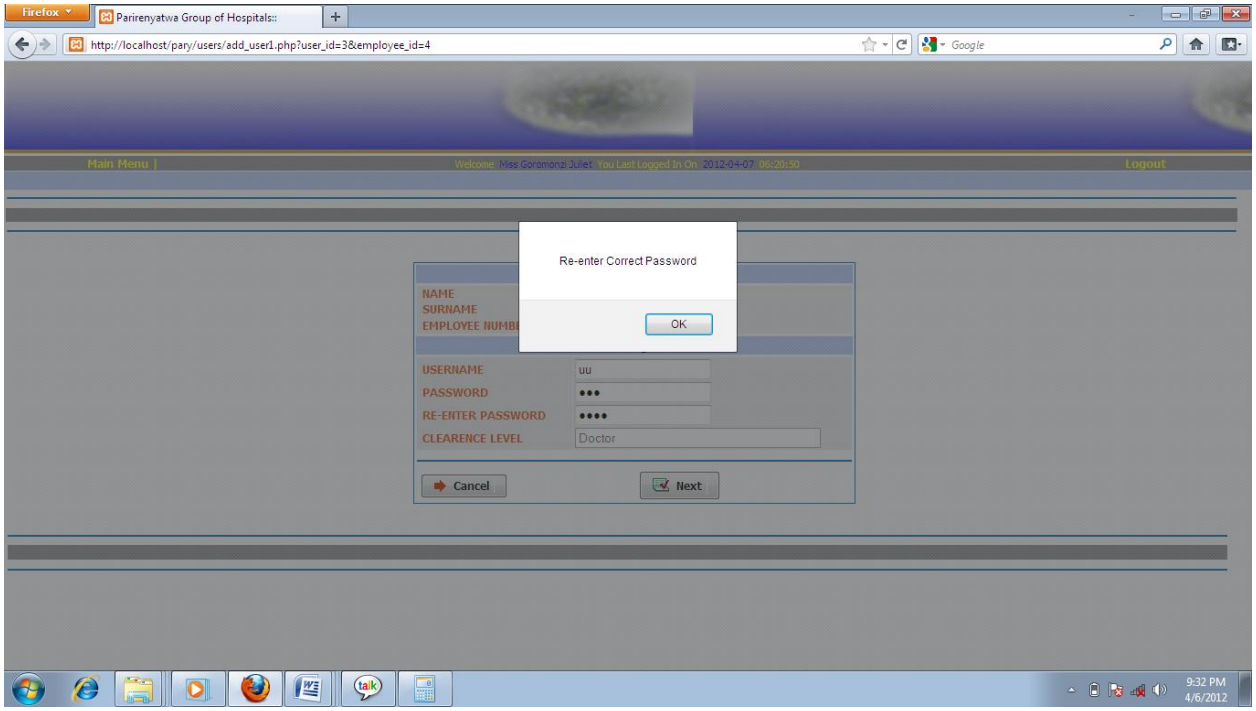


Fig 5.5 Password change results

5.3.8.5 Record deleting verification

When the administrator wants to deactivate a user in the system, it will ask the administrator to verify whether he/she wants to deactivate for real, in case they would want to deactivate that user by mistake. This is shown by the diagram below.

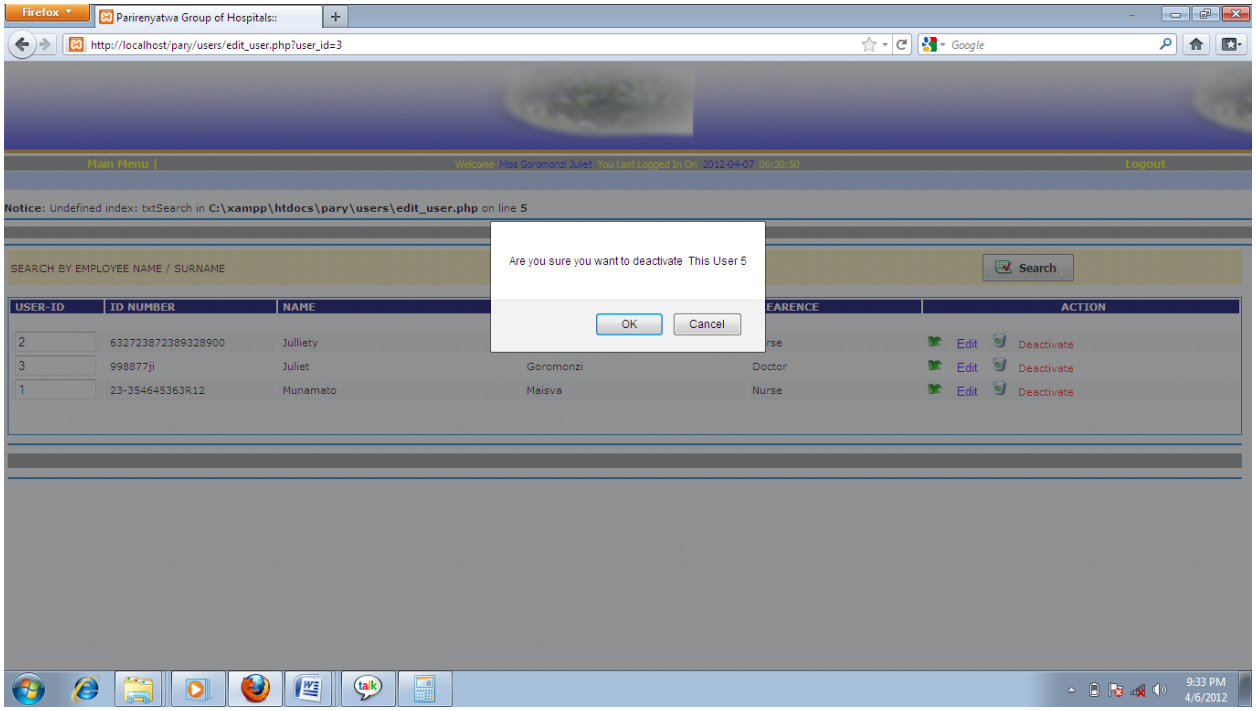


Fig 5.6 Record deleting verification form

Verification and validation was concluded by a statement revealing that the system was correctly validated and conformed to its stated objectives.

5.4 Installation

The system is installed within the network as defined within the design documentation. During conversion the data from the old system was entered into the new system. It was made very important at this stage to ensure that data is entered accurately and in a complete manner. It was decided that when running the new system the users of the system will have to firstly verify if the information entered in the database was accurate.

5.4.1 Steps followed to install the system

a) Install Exampp 1.7.4 on your machines

b) The system is installed from the software C.D

c) Install system to path. (It is recommended that the system be installed on the program files folder.)

d) Verify that the system is installed properly that is all folders are installed and placed on the correct folders.

5.5 Maintenance

Though the system has gone under intensive testing, verification, and validation testing still some anomalies will always exist. When these occur they need to be rectified within the minimum, possible time. Corrective maintenance is therefore an ongoing process that will include most or all of the following activities.

a) The users who will be closer to the system are the ones who are able and expected to notice anomalies that may actually exist within the system.
b) The management may find that some functions of the system may not be adequate due to some overlook that may have occurred during system analysis, design and development.
c) The system developer can also notice anomalies that may have been overlooked during development. This can also be done as a result of an appraisal technique.

The type of maintenance that will be implemented to this system will be adaptive, corrective and perfective maintenance.

5.5.1 Adaptive Maintenance

This deals with the system adapting to changes within the operational environment. It will be done whenever some new environment has to be used. The software has to be changed sometimes when a different hardware platform or operating system has to be used.

5.5.2 Corrective maintenance

Corrective maintenance refers to changes made to repair defects in a design, coding or implementation of the system. Most corrective maintenance problems surface soon after installation. When corrective maintenance surface we recommend urgent actions to be taken to reduce possible interruptions in normal activities. It mainly focuses on removing defects from the existing system without adding new features to it

5.5.3 Perfective maintenance

Perfective maintenance is carried out when there is need to change the whole system to make it more efficient. Implementation of new functional or non-functional system requirement generated by users as their organization or business changes. This process ensures that the newly implemented system meets the system development objectives established for it. Errors in development or use of a system must be corrected by this maintenance process.

5.5.4 Recommendations

It is recommended that any maintenance that must be done should go through the following.

1. Identify type of maintenance that is needed.
2. Apply steps that are relevant to the system
3. Users of the new system should be trained so that errors are reduced.
4. Security should be frequently revised especially in virus controls as viruses are constantly changing.
5. Users should make full use of the user manual which gives a detailed step by step approach on the basics of operating the system.

5.5.5Achievements

The new system has proved satisfactorily to be working. It has managed to meet the following objectives as originally specified:-

- To develop a system that can diagnose a patient after stating her medical problems - the system can diagnose a patient.
- To develop a system that prescribes the medicines and printout the prescription –the prescription is being provided after the patient has been diagnonised.
- To provide security mechanism through the use of a computerized system – security is provided through the use of passwords.
- To provide ad-hoc reports – reports can be printed out such as patient list details
- To provide a system which manages data resources and easily accessible to the people within the organization when and where it is needed –this was also achieved through the use of reports,

5.6 Conclusion

The implementation of the system went on well and a detailed documentation of the system has been done. Proper verification and validation of the system was done so as to come up with a system with data integrity. In this chapter, the developer also highlights what is expected to be done after the system has been installed. There is also a look at the system backup in place and to be continuously done.

Appendix A: User manual

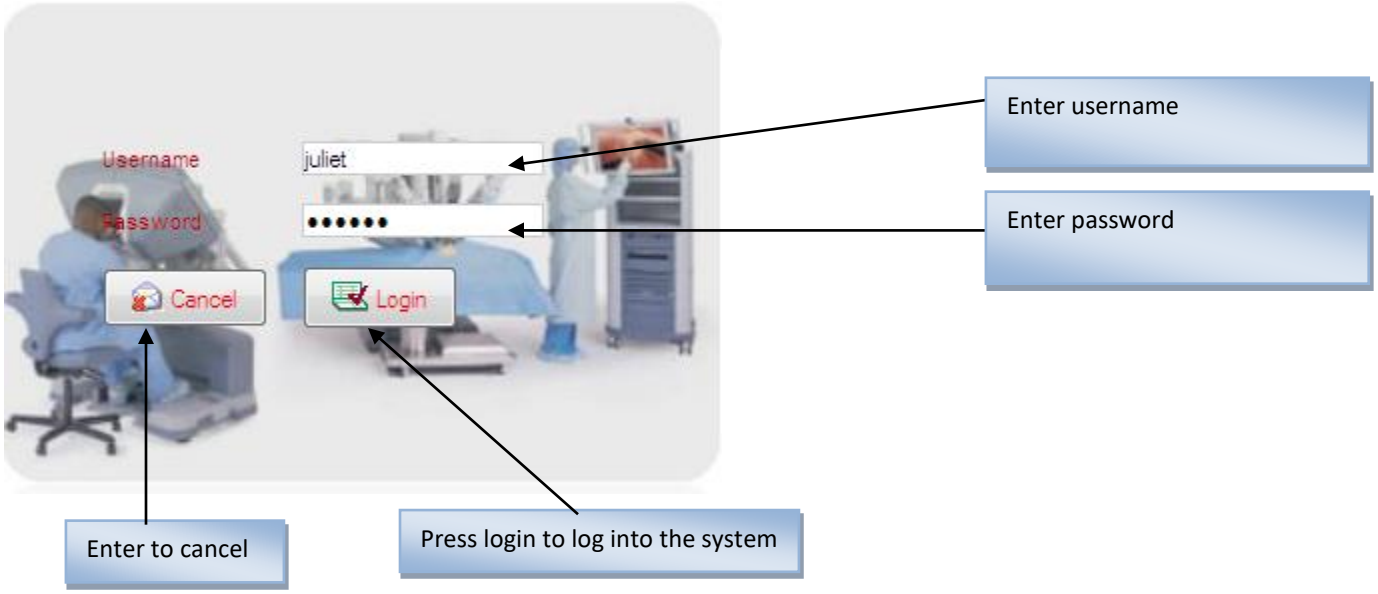


Fig A1: User Login Form

To log on to Parirenyatwa Group of Hospitals Access Control System, the user must do the following:

1. Enter the username that the system administrator has used the user's account in the username text box.
2. Enter the password that the system administrator has assigned for you in the enter password text box.
3. Then Click the Login button to proceed to the main page.

Main form

Fig A2 Main Form

1. Click “Security” to register users
2. Click “Patients” to register patients
3. Click “Drugs and Diseases” to add and edit diseases and drugs
4. Click “Reports” to view the available reports

Patients

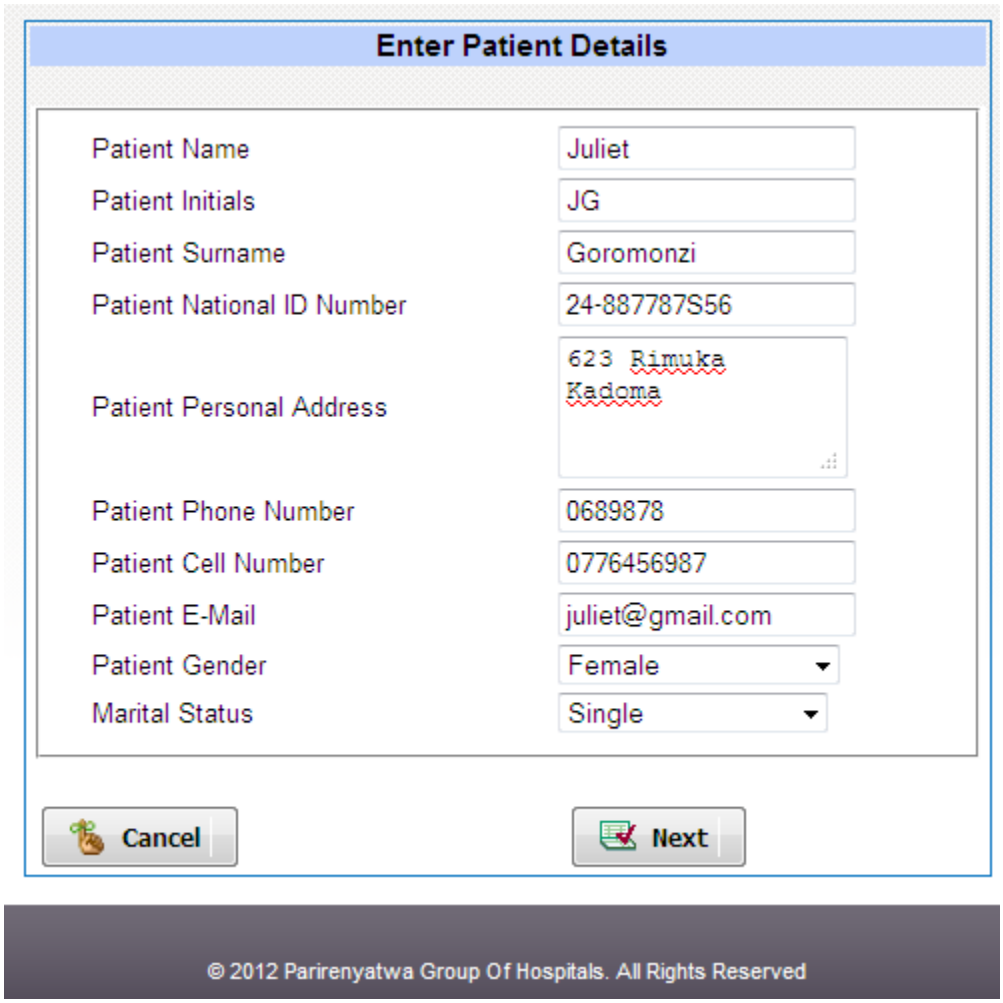


Fig A3: Capture Patient details

1. Enter patient name
2. Enter all details wherever they are required initials, surname, address etc
3. Patient phone number must be numbers only
4. Patient cell number must be numbers only
5. Patient email address should be in the format of an email(goro@yahoo.com)
6. The patient must be confirmed to be in the system after all the details have been entered
7. Press “Enter” to verify if the patient has been successfully registered

Edit Patient Details

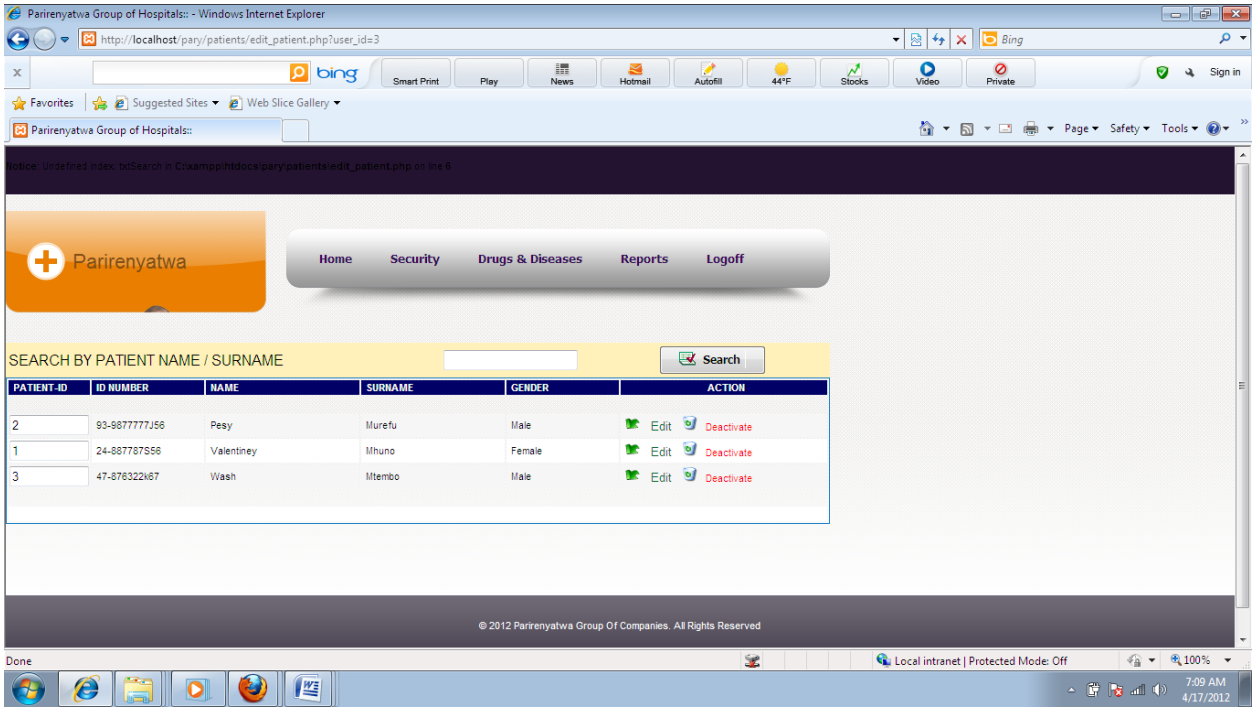


Fig A4: Edit Patient Details Form

1. This form allows the user to edit patient details
2. A patient can also be deactivated or activated on this form.

Patient Diagnostics

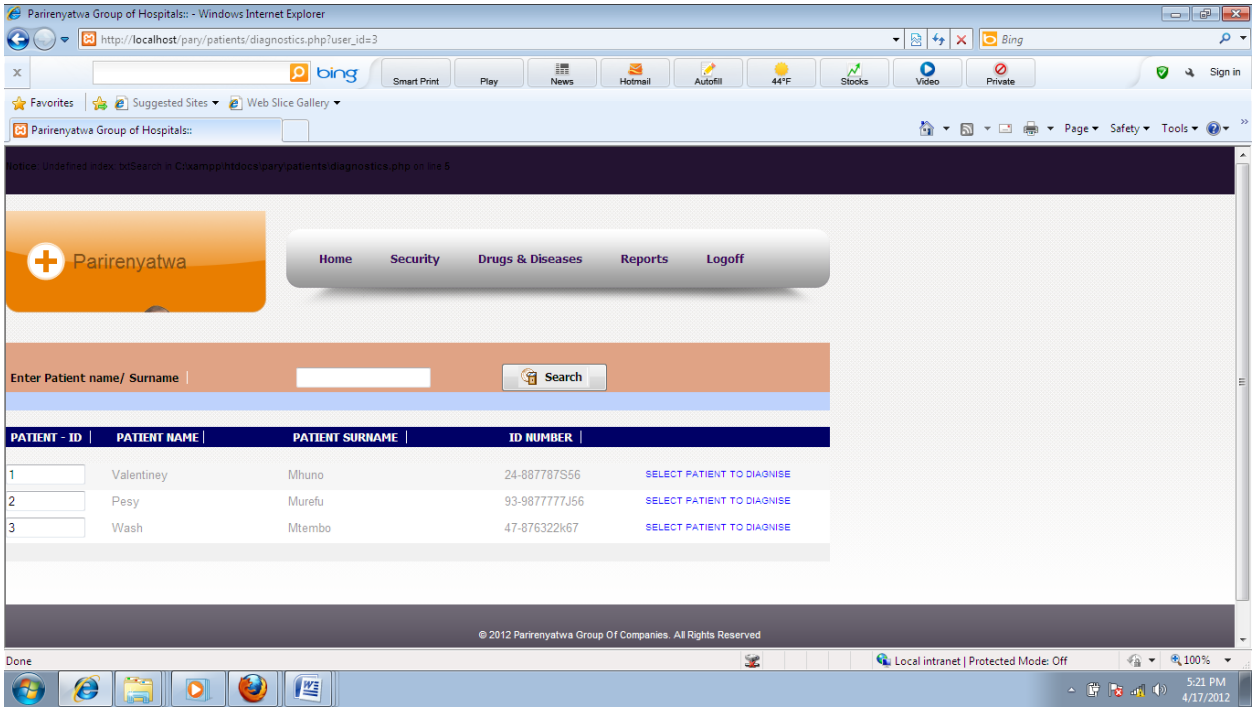


Fig A5: Edit Patient Diagnostics Form

1. This form enables a user to diagnose the patient after stating his or her symptoms
2. Type patient's symptoms on the box then click search
3. The system will then diagnose the patient and print out the disease name and prescription

Drugs and Diseases

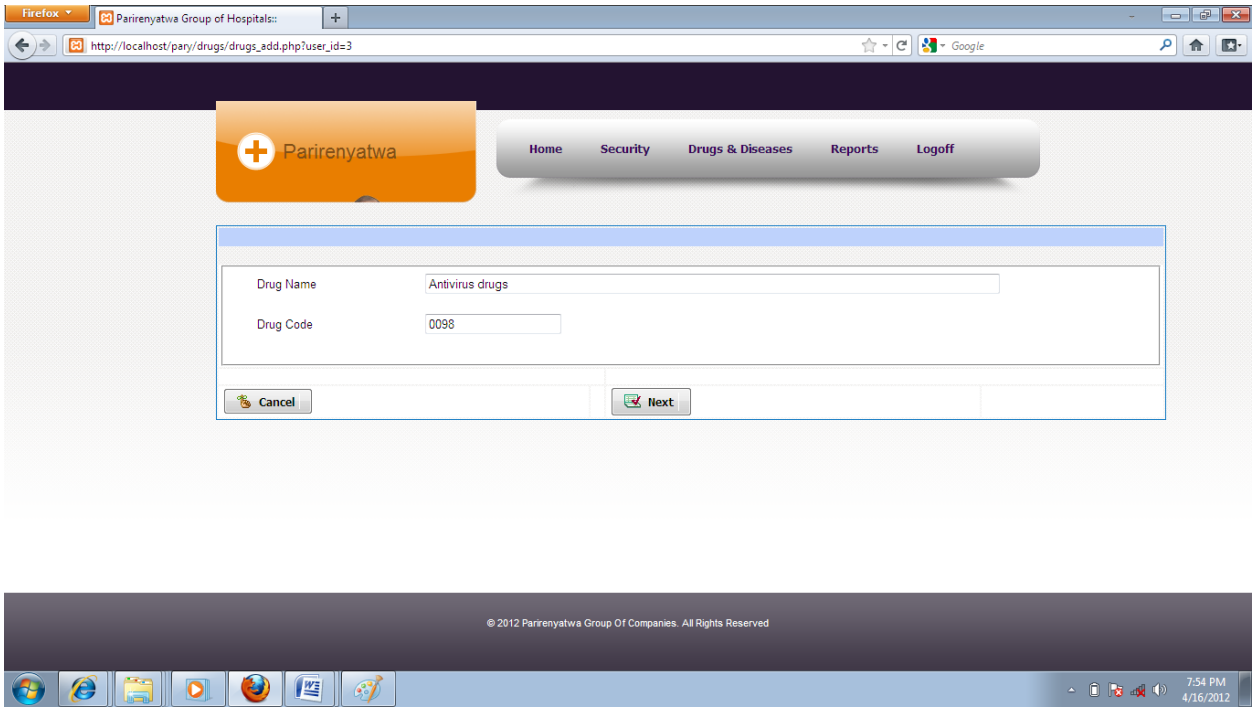


Fig A6 Capture drug details

1. Click “Drugs and Diseases” to capture drug details
2. Enter drug name and drug details.
3. Click next to save the drug

Drugs and Diseases

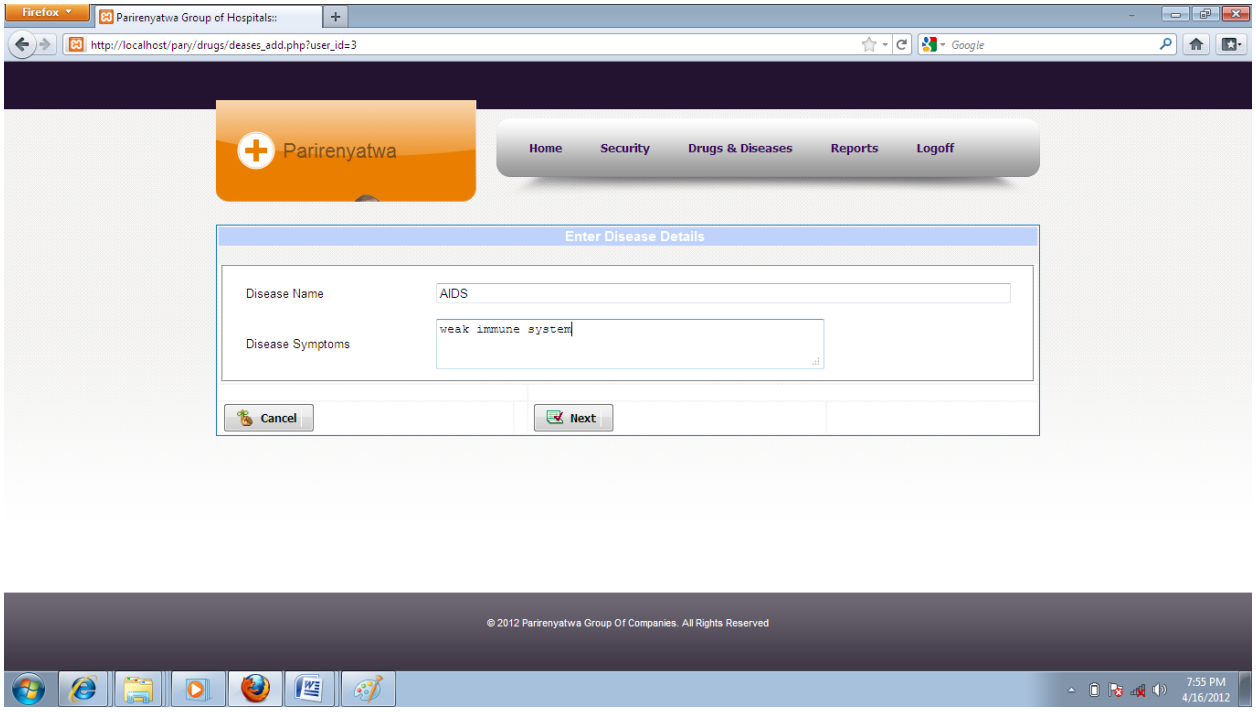


Fig A7 Register a disease

4. Click Drugs and Diseases from the home page
5. Click "Register disease"
6. Enter Disease name and symptoms then next to save
7. You can edit a disease or the drugs on the same form

Edit drug details

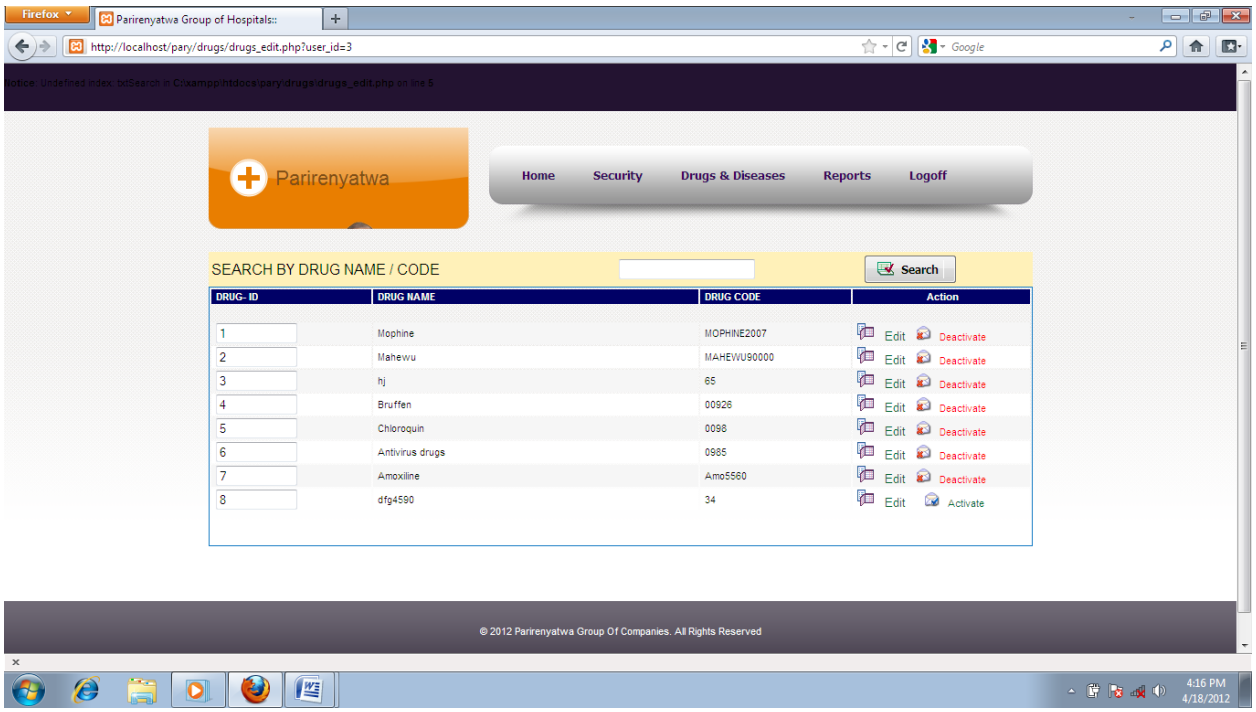


Fig A8: Edit drug Details Form

1. This form allows the user to edit drug details if there is a need for a change

Reports

Fig A9 Reports form

1. This form allows you to view different reports which include the users report
2. Click to view reports

View patient details

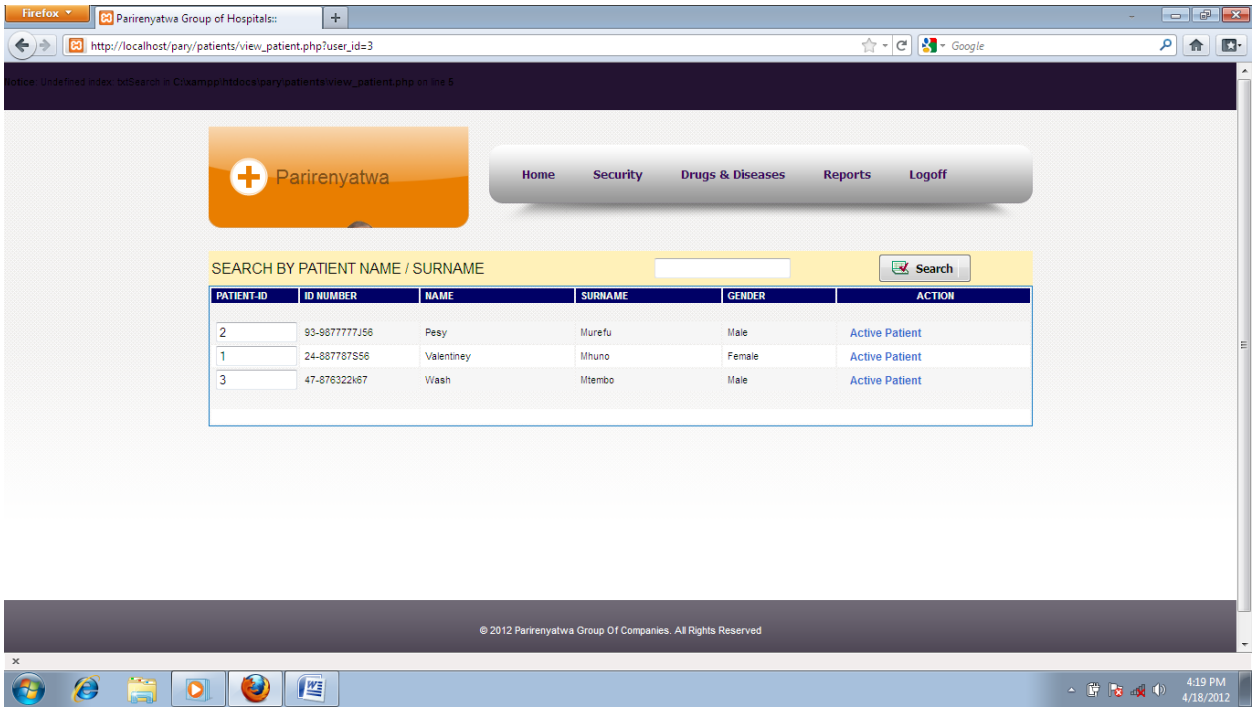


Fig A10: View Patient Details Form

1. All patient are viewed at this form
2. A patient can be searched by name or username

View prescriptions

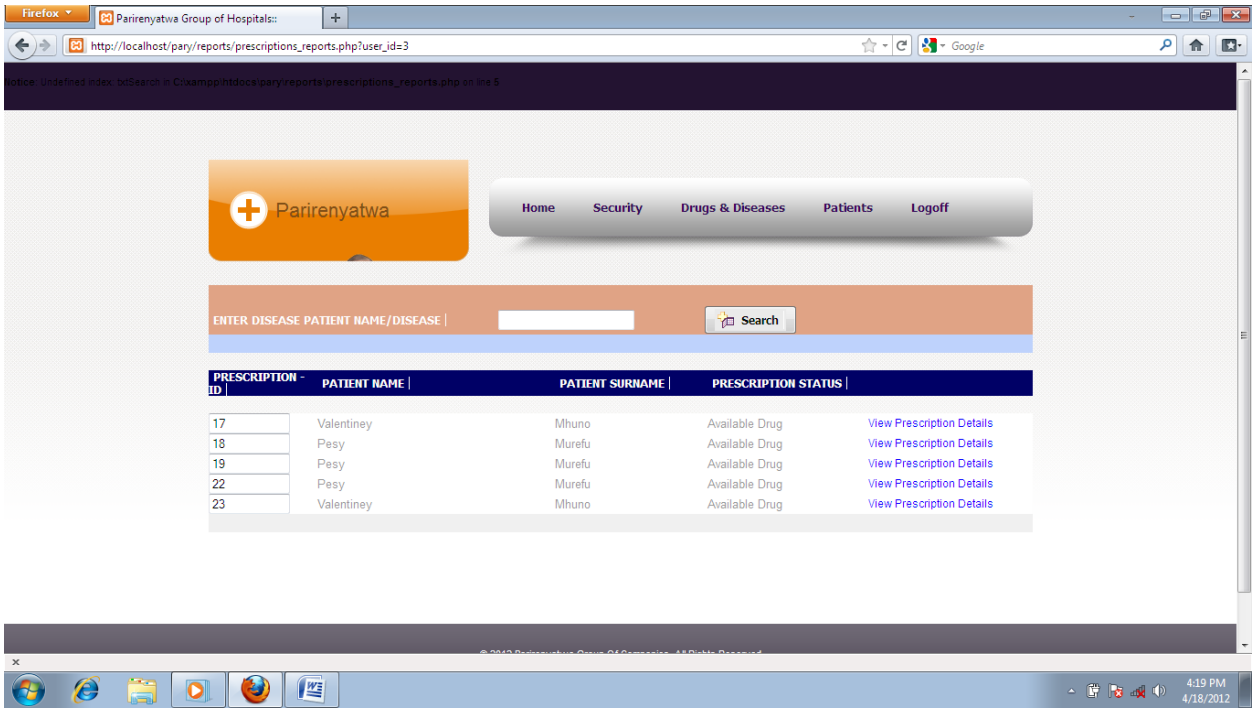


Fig A11: View prescriptions Details Form

1. This form allows the user to view all prescription
2. Click view prescription details to view detailed prescription

Security

Fig A12 Security form

1. This form allows you to register users, employees, access and edit them.

Register and edit clearance levels

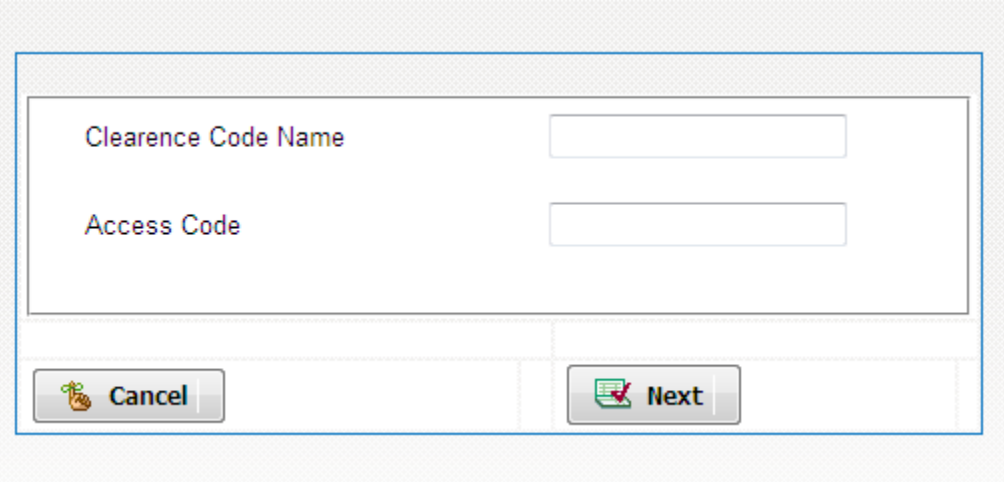


Fig A13: Register clearance levels Form

1. This form permits the administrator of the system to enter access code and clearance code name.
2. Click next to save

Register and edit employee

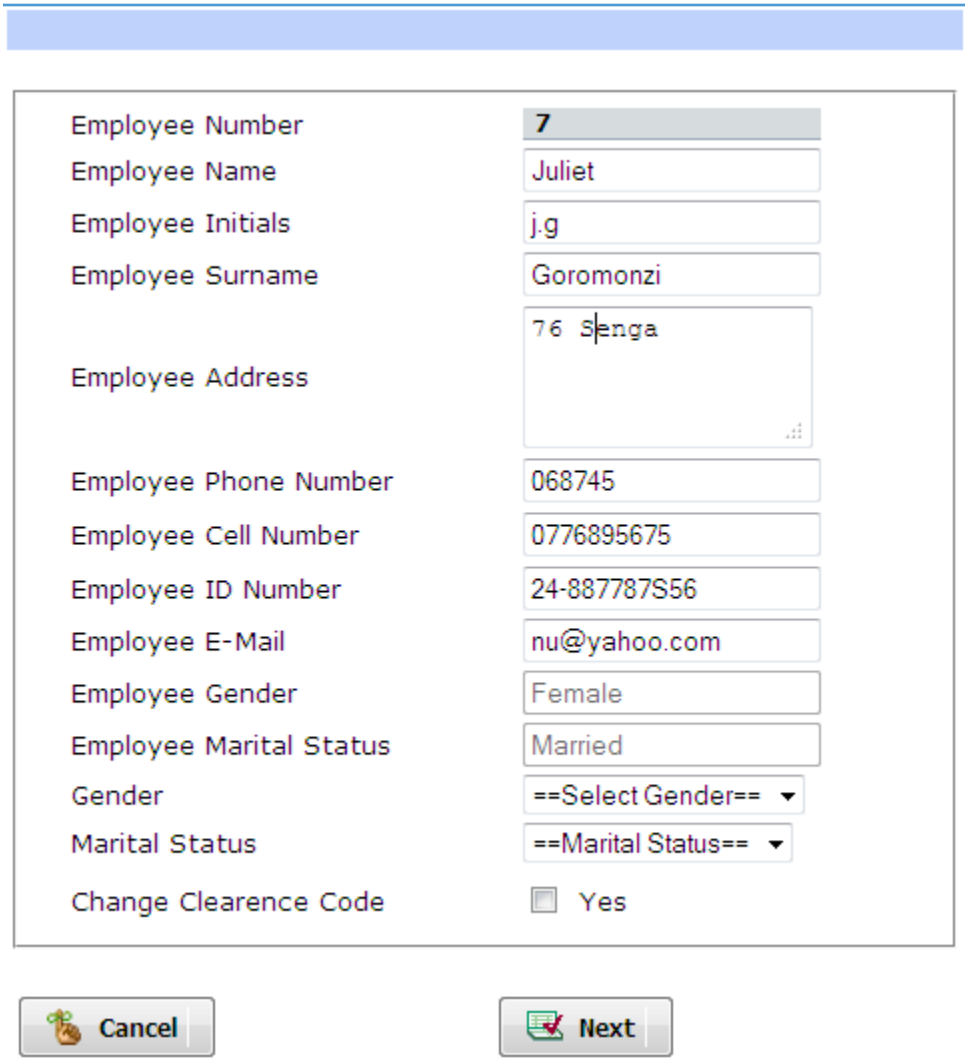


Fig A14: Register and edit employee details Form

1. This form allows an employee to enter his/her details
2. An employee can also edit his/her details on the edit employee details form on the same security page.

Register and edit system user

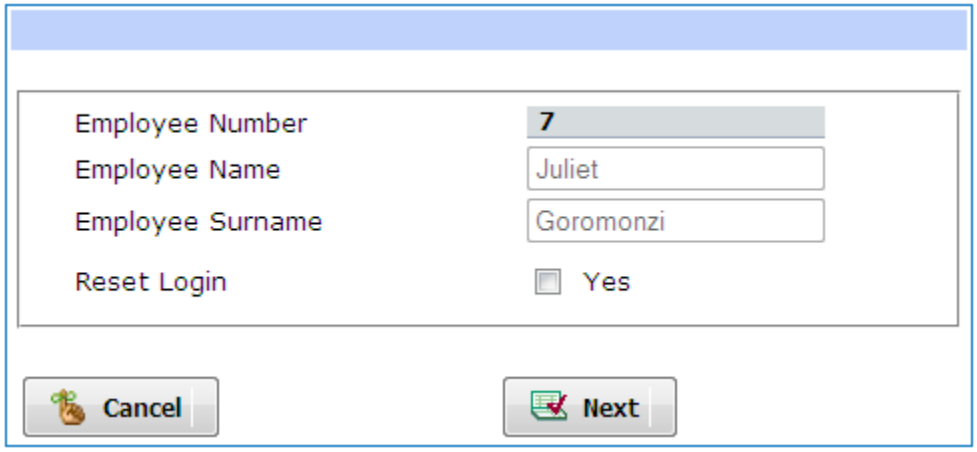


Fig A15: Register and edit user details Form

1. On this form the system administrator can register an employee as the user of the system
2. This form allows the administrator to edit the employee details

Appendix B: interview checklist

SECTION 1:

NAME OF INTERVIWEE……..

COMPANY NAME……..

DEPARTMENT……...

AGE……

SEX male ☐ **female** ☐

SECTION 2:

1. Does the current flow of information give you enough control to effectively and efficiently perform your duties?
2. Can you give an outline of all the procedures that you perform on diagnosing of patient?
3. What information is considered crucial/critical when diagnosing of patient?
4. What information do you need when verifying whether a patient is in the system or not?
5. For each task that you perform can you describe your information requirements, processes, and the outputs?
6. Do you think you are doing all your tasks effectively and efficiently? If not, or otherwise, any suggestions for improving?
7. How do you conduct the diagnoses process when a patient visits the hospital?
8. Can you identify all the reports that you need but do not have?
9. Is your information requirements satisfied by your current reports format, that is, are the reports in correct format and correct? If not identify the reports and make suggestions.
10. Are your reports timely delivered, that is are they delivered just in time? If not do you know why not?
11. How do you feel about the upgrading of your diagnoses and prescription system?

Date: ……..

Signature: …….

Appendix C: Questionnaire checklist

- **Answer all the questions**
- **Give accurate details on all answers**

(1) How do you feel about the current diagnoses and prescription system?

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(2) What problems are you experiencing when using the current system?

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(3) What do you think can be done to improve the current system?

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(4) Is the current system efficient and reliable? If not what do you think should be done?

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(5) Are there any restrictions to access data in the organization?

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(6) How are the organization files updated?

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(7) What problems do you encounter when preparing the month end reports?

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To be answered by Parirenyatwa group of hospitals Doctors and nurses
Tick appropriate box

(1) How often do you register a new patient per day on average,?

None ☐ 0 to 50 times ☐ 5 to 100 times ☐ more than 100 ☐

(2)How much time do you require to verify whether a patient is in the system or not?

1 min ☐ 2 mins ☐ 5 mins ☐ more than 10mins ☐

(3) Do you find any difficulties in verification process?

Yes ☐ NO ☐ sometimes ☐

(4) What do you consider as problems of the current system?

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(5) What do you recommend as solutions to the problems?

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(6) Does the system check data duplication and validation?

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(7) How long does it take to compile a report?

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(8) What changes would you like to see taking -place within your routine

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Appendix D: Observation score sheet

OBSERVATION SCORE SHEET FOR PATIENTS AND MEDICAL DEPERTMENT

Date ....

Time ....

Observations of how the patients records and registration carries out their duties and their general behaviour?

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Conclusions

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Recommendations

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OBSERVATION SCORE SHEET FOR THE DOCTORS SECTION

Date .....

Time .....

Observations of how the hospital staffs carries out their duties in diagnosing patients before giving them the prescription.

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Conclusions

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Recommendations

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Appendix E: Document Review Report

Reviewer Name	
Department under review	

Criteria	**Documents Reviewed**	**Remarks**
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OVERALL DOCUMENT REVIEW REMARKS:

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Reviewer ……

Date …… **Time** ……..

Appendix F: Snippet of code

Code to add a new drug into the system

```
<?php
include "../login/DBconn.php";
$user_id = $_REQUEST['user_id'];
$disease_id = $_REQUEST['disease_id'];

$SQL = "SELECT * FROM DIZIZ_DRUGS_TEMP WHERE disease_id = '$disease_id' AND user_id = '$user_id' ";
$result = mysql_query($SQL);
while ($row = mysql_fetch_assoc($result))
{
    $COU = $row['disease_id'];
            $CUR =$row['drug_id'];
            $USER = $row['user_id'];
```

```
$SQL1 = "INSERT INTO DISEASE_DRUGS (disease_id,drug_id,user_id,Dlist_status)
                    VALUES ('$COU','$CUR','$USER','0')";
                    mysql_query($SQL1);


}
mysql_free_result($result);

$SQL2 = "DELETE  FROM DIZIZ_DRUGS_TEMP WHERE disease_id = '$COU' AND user_id = '$user_id' ";
mysql_query($SQL2);


        ?>


<body onLoad="next('<?php echo $user_id ; ?>')">
</body>
<script language="javascript" type="text/javascript">
function next(user_id)
{
location.href="disease_drugs_list.php?user_id="+user_id
}
</script>
```

Code to register a disease

```
<?php
include "../login/DBconn.php";
$user_id = $_REQUEST['user_id'];
```

```
if ($user_id == "")
{
header("location: ../index.php");
}

?>


<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<link href="../css/mssastyles.css" rel="stylesheet" type="text/css" />
<link href="../css/qsstyle.css" rel="stylesheet" type="text/css" />
<link href="../css/style.css" rel="stylesheet" type="text/css">
<title>Parirenyatwa Group of Hospitals::</title>

<style type="text/css">
<!--
.style1 {color: #FF0000}
.style14 {color: #0000FF}
.style10 {color: #EDFBFE}
.style11 {color: #FFFFFF}
.style14 {color: #006633}
-->
</style>
<script language="javascript" type="text/javascript">
function backs()
{
if (confirm("Are you sure to abort this operation?"))
{
window.history.back()
}
else{
return
}
}
```

```
function next()
{
if (document.forms[0].txtName.value == "")
{
alert("Enter Disease Name Please")
document.forms[0].txtName.focus()
return
}
if (document.forms[0].txtInitials.value == "")
{
alert("Enter Disease Symptoms Please")
document.forms[0].txtInitials.focus()
return
}

else{
document.forms[0].submit()
}
}
</script>
</head>
<body>
<div id="wrap">
<div id="page">
 <br>
   <br>
   <br>

  <div id="header">
            <div id="company_name"></div>
   <div id="company_name_sh">Parirenyatwa</div>
   <div id="menu">
   <ul>
            <li><a href="index.php?user_id=<?php echo $user_id; ?>">Home</a></li>
      <li><a href="../users/index.php?user_id=<?php echo $user_id ?>">Security</a></li>
      <li><a href="../drugs/index.php?user_id=<?php echo $user_id; ?>">Drugs & Diseases</a></li>
      <li><a href="../reports/index.php?user_id=<?php echo $user_id; ?>">Reports</a></li>
                        <li class="style1"><a href="../index.php">Logoff</a></li>
```

```
      </ul>
    <ul>
      <li></li>
    </ul>
    </div>
</div>
<form id="form1" name="form1" method="post" action="disease_addx1.php?user_id=<?php echo $user_id; ?>">
    <p> </p>
    <table width="100%" height="100" border="0" class="tableBorder">
      <tr>
        <td height="9" colspan="4" align="center" class="PageHeaderBarNoBorder style11">Enter Disease Details </td>
      </tr>
      <tr>
        <td height="9" colspan="4" align="center" > </td>
      </tr>
      <tr style="cursor:hand">
        <td height="14" colspan="4" align="center" bgcolor="#FFFFFF"><fieldset>
          <table width="843" border="0">
            <tr>
              <td width="213" height="47" align="left"><div align="left"><font size="2">Disease   Name </font></div></td>
              <td width="620" align="left"><div align="left">
                  <input name="txtName" type="text" size="100" />
              </div></td>
            </tr>
            <tr>
              <td align="left"><div align="left"><font size="2">Disease Symptoms </font></div></td>
              <td align="left"><div align="left">
                  <textarea name="txtInitials" cols="50"></textarea>
              </div></td>
            </tr>
          </table>
        </fieldset></td>
      </tr>
      <tr>
        <td height="17" colspan="2" bgcolor="#FFFFFF"> </td>
        <td height="17" colspan="2" bgcolor="#FFFFFF"> </td>
      </tr>
      <tr>
        <td width="325" height="17" bgcolor="#FFFFFF"><button  type="button"  onclick="backs()" style="cursor:hand">
```

```
        <table border="0" >
          <tr>
            <td><img src="../images/remind.gif" alt="Login" width="18" height="18" /></td>
            <td class="ObjHeaderTitle">Cancel</td>
          </tr>
        </table>
      </button></td>
      <td width="11" bgcolor="#FFFFFF"> </td>
      <td width="327" height="17" bgcolor="#FFFFFF"><button  type="button"  onclick="next()" style="cursor:hand">
        <table border="0" >
          <tr>
            <td><img src="../images/reconcile.gif" alt="Login" width="18" height="18" /></td>
            <td class="ObjHeaderTitle">Next</td>
          </tr>
        </table>
      </button></td>
      <td width="233" bgcolor="#FFFFFF"> </td>
    </tr>
  </table>
  <p> </p>
  <p> </p>
 </form>
 </div>
</div></div>
<div id="footer">
            <div id="bottom_menu"></div>
  <div id="bottom_addr">© 2012 Parirenyatwa Group Of Companies. All Rights Reserved<br>
  </div>
</div>
</body>
</html>
```

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