Android Mobile Health Application (mHealth) System

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ABSTRACT

The purpose of this study was to come up with a Mobile health (m-Health) application system. This system allows patients' to communicate directly via an android mobile system through notifications or messages and at the same time enables them to perform electronic booking of appointments, receive e-prescription and accessing after visit summaries from the hospital or clinic. The development of this system comes out after the identification of numerous problems which are associated with the current system. The different types of information gathering techniques were used to unveil these problems. Techniques which were used are interviews, questionnaires and observations. The results obtained shed light that there is need of a new system in the organization. This system was developed using Android and Php, after it was implemented the system was reviewed to check whether it is performing up to standard, the results from the users were positive which means it was successful. To conclude, Android mobile health system (m-health) was greatly appreciated at the organization, this at the same time calls for the future advancement of the system.

DECLARATION

I, Mecury Mujere, hereby declare that I am the sole author of this dissertation. I authorize the Midlands State University to lend this dissertation to other institutions or individuals for the purpose of scholarly research.

Signature …………………………………………..Date ………………...............

APPROVAL

This dissertation, entitled **"mobile Health Application system"** by **Mecury Mujere** meets the regulations governing the award of the degree of **BSc Honours Information Systems** of the **Midlands State University,** and is approved for its contribution to knowledge and literacy presentation.

Supervisor's Signature …………………………………………………………………

Date ………………………………………………………………………………………

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DEDICATION

Every challenging work need self-efforts as well as guidance of others, especially those who are very close to our heart. My humble effort I dedicate to my sweet and loving husband, Mr. Rabison Mavhunga, whose affection, love, encouragement and prays of day and night make me able to get a success and honor. Along with my twin children Michael and Michelle Mavhunga, and to God be the Glory.

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LIST OF ACRONYMS

m-Health App ---mobile Health Application

MoHCW – ---Ministry of Health and Child Welfare

e-Prescribing -- electronic Prescribing

ROI ---Return On Investment

HTML --- Hyper Text Markup Language

PHP ---Hypertext Preprocessor

HTTP ---Hyper Text Transfer Protocol

UTP CAT 35 -- Unshielded Twisted Pair Category 35

VARCHAR ---Variable Character

EER diagrams---Enhanced Entity Relationship diagrams

UML Diagrams -- Unified Modelling Language diagrams

UML techniques --Unified Modelling Language techniques

AIS system --Application Interface Specification

DBMS --DataBase Management System

SQL --Sequential Query Language

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Ministry of health and child welfare (MoHCW) has taken a step to automate the operations of all the institutions by proposing the development of Android Mobile Health Application (m-Health App). This introduction phase first explains briefly on the background of the organization which is the Ministry of health and child welfare at the same time explaining accountability, responsibilities and authority movements through organogram. Impediments that led to the need of a proposed system are then explicitly examined being problem definition giving birth to the aim of the study and the objectives that are feasible and measured against the deliverables when the system has been completed, a justification is carried out in support of the theory as well limitations to initiate feasibility study which will be discussed in the next chapter. Software development tools that helps in meeting the previously mentioned objectives are then laid down and with these tools project time will be deterministic and is then given in the form of a Gannt chart before concluding the introduction phase of m-Health App research and system development.

1.2 Background of the Study

The implementation of mobile health (mHealth) projects in low- and middle-income countries raises high and well-documented expectations among development agencies, policymakers and researchers. By contrast, the expectations of direct mHealth users are not often examined. In preparation for a proposed intervention in the health sector, in Zimbabwe, this study investigates the expected benefits, challenges and limitations associated with mobile Health, approaching these expectations as a form of situated knowledge, inseparable from local conditions, practices and experiences.

1.2.1 Background of the Organisation

Government owned Ministry of health and child welfare (MoHCW) is responsible for health services in Zimbabwe. David Parirenyatwa has headed the ministry since 2013.The Ministry is committed to making health services more responsive to the needs of individuals, families, and communities. Improving quality of all health care services in health institutions.Some of the core functions of the ministry includes: Coordinating the development of national health policy, setting of national standards and guidelines, coordinate the planning and provision of affordable, accessible, acceptable and comprehensive range of health care services, Coordinate the

establishment and continuous improvement of a reliable national health information system to facilitate planning and evaluation as well as the implementation of policies, strategies and action plans, Consolidate and monitor implementation of national health plans,compliance to national policies and guidelines."The ministry is speareaded by the minister under him being the Ministry Permanent Secretary.

1.2.2 Organizational Structure

A planned coordination for resources to achieve a stated organization vision through a hierarchy of responsibility, authority, accountability and division of labor, is referred to as organizational structure according to Jewel (2004), hence an internationalized and formal structure of positions and roles in an organization to coordinate work of the employees for Ministry of Health and Child Welfare is given as follows:
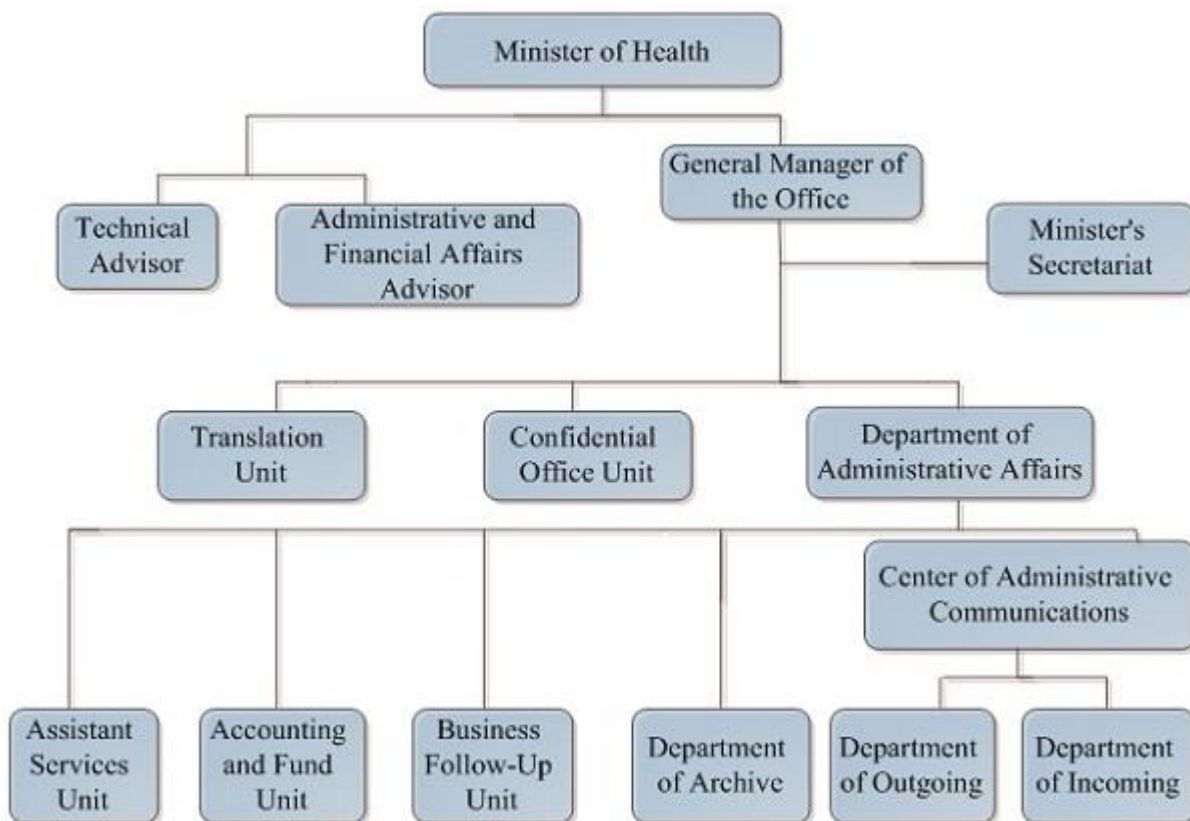
Table 1.1 Organogram

2

1.2.3 Vision

Making health services more responsive to the needs of individuals, families and communities. Improving quality of all health care services in health institutions.

1.2.4 Mission Statement

Record the highest index for health and quality health for all people in Zimbabwe.

1.2.5 Clients' Charter

The Clients' Charter aims to improve the relationship between clients and health care providers. It includes the information they need to enable them to make informed judgment about their care and treatment.

1.3 Problem Definition

A statement that points out a specific area of concern an issue to be resolved and eliminated within an operational system whether practical or theory which birth a corrective or reactive measures in solving it is referred to as a research problem according to Rogers. S. P (2011). The current operation of Ministry of health and child Welfare Mobile health data are:

- Bad handwriting for the prescription written in the clinic book.

- A patient who is treated in a different hospital will have to bring the clinic book in order to trace previous treatments so as to make a decision on better treatment of the current situation.
- Integrated health information interchange creates a disruptive and complex patients records since its from different data providers, most of which will have assigned their own identifiers to each patient, it is difficult for the ministry to correctly align these different sources making it impossible to fulfill the mission of the analysis.

- Misidentified or duplicate patient data collected from different institutions of health sector results because of different platforms.
- Disconnected activities and processes which happen because of lack of coordination and ineffective communication.

- Report generation for overall health statistics is difficult to draw with the current system

- Health information insecurely stored in clinic books.
- No data backup for patients' clinic books

1.4 Aim of the Research Study

The steady aim of the mobile healthy app which is the core research of this study is to address the above mentioned research problems for the current system operation.

1.5 Objectives of the study

An objective is a reactive or corrective result from the problem definition that a system aims to achieve in a specific period given the available resources according to Yeates and Wakefield (2014), henceforth objectives helps keeping the research and system development inline and the deliverables are compared with these initial objectives to determine success or failure. Following re the research objectives for m-Health app:

- Electronic Prescribing(**e-Prescribing**)
- Push notifications for preventative care on pandemic spread (i.e January 2017 Harare Typhoid issue)
- Electronic booking of appointments **(e-booking).**
- Enabling direct communication of patient's with providers from an Android application through messages and making their queries known.
- Accessing after visit summaries.

1.5.1 Limitations of the study

Possible constrains that the research study can run into are referred to as limitations for the study according to Yeates and Wakefield (2014) and are described as:

- Data charges when sing the application.
- Educating the general public on using the application.
- Application software development skills may not be adequate
- The reports do not yield actual health informatics in the nation but a rough estimate
- Ministry may divert resources before project completion to other priorities.
- Personnel training to new Application which is prone to resistance of change.
- Password patient data protection is becoming less secure.

1.6 Instruments and Methods

Instruments are software development tools that are used for the practical action to achieve the stated objectives according to Rogers. S. P (2011), in order to develop the proposed m-Health App the author has proposed the following tools:

Table 1.2 Instruments.

Microsoft Tool:	Brief Description:
Android and Java	Language to develop Android application through XML definitions for the mobile application.
PHP(OOP)	Multiuser access and free language.
SQLite and MySQL database	Android's remote database and Relational database of MySQL.
Apache Server	Academics' best Hosting server.

1.7 Justification

The development of an in-house system has been considered after a brief analysis of the possible limitations because:

- The app will link up several institutions of the health sector together with outpatient clinics and rehabilitation facilities and medical centers, this helps patient data consolidation and reduce amount of time taken to view patient history and past medication.
- Electronic prescription reduces time for printing and calling in for lost prescription.
- Patient medication schedules are retrievable anywhere regardless of place.
- Patients are able to remotely book for an appointment without the need to travel to the clinic or hospital.
- After visits summaries are retrievable for analysis with family.
- M-Health App's advanced reporting capabilities assist the ministry in making presentation in the parliament and beyond.

1.8 Conclusion

This phase has put greater emphasis on the Ministry's problems which resulted in the proposal of m-Health App which has a brief explanation of the limitations and justification as a short feasibility overview which will be the core of research in the next chapter.

CHAPTER 2: PLANNING PHASE

2.1 INTRODUCTION

The planning phase place its thrust in exploration of the feasibility study for the research on Ministry of Health and Child Welfare's mobile health application system. The feasibility study evaluates to see if the research is operationally, economically, technically and socially feasible. This measures the success of the projects given some impediments or hindrance factors. Other aspects in consideration for this phase are the business values which are the main principles of business or ministry operations throughout its institutions that will be obtained using the proposed application. This gives birth to the cost benefit analysis that compares the benefits and the costs of the obtained in the feasibility analysis. Work plan is then drawn after evaluating that the benefits outweigh the cost meaning the project study is feasible. Further analysis will then be discussed in the next chapter after making planning phase conclusion.

2.1.1 Why build the System

The Ministry is in need of the system that can be implemented by its institutions that easily capture patients' information and that can easily raise alerts to the general public on different kinds of events. In making the decision the Ministry needs statistical records on where to place much doctors due to an outbreak that have happened henceforth with the current system it is difficult to do the manual report generating before making decision which is easier enough with the proposed system.

2.2 BUSINESS VALUE

Business values are the guidelines that keeps the organization and its workforce in line and they rarely changes over time according to Stoner et al, (2010).
Values

- **Superior patient service for all institutions**
  Establishing institutions to all places that have people in settlement, so as to promote good health country wide.

- **Consistency and fairness**
  Provision of health care to all cultures and race to the people in Zimbabwe without favor and neglecting others.

- **Teamwork**

  Having all institutions in conformity to treatment standards so that patients transfers can be easily done understanding previous procedures that have took place.

- **Integrity and honest on professional conduct.**
- **Responsible citizen abiding to law.**

2.3 FEASIBILITY STUDY

Skidmore (2014) explains that feasibility study is an evaluation of the project's competence or worthiness to be carried out through evaluating means that include technical, economic, social aspects to mention a few. The chief purpose is to bring forward the viability of the research in pursuit considering a lot of standing factors so as to make the decision of carrying on with the research.

2.3.1 Technical Feasibility

Technical feasibility's thrust is in resource determination, the project's technical requirements are purported in this section weighing if the ministry have (internal) technical support to carry out the research, developing, implementing and supporting the proposed system. The analyst examines whether to upgrade the available resources or adding other resources to the required amount. This is where the analyst's expertise are vital since when they are working with vendors the Ministry have to answer the following questions on technical feasibility:

- Do you have the required technology?
- Are Development and implementation factors available which include licensed software systems, hardware and manpower?

Table 2.1 Hardware Requirements

Available Quantity	Name and Identification	Required amount/ Quantity
100	LaserJet Printers	200
100	HP Core i5 Desktop/ Laptops	200
0	Surge Protector	200
0	Microsoft SQL Server	1

Table 2.2 Software Requirements

Available Quantity	Software Name and Identification	Required amount/ Quantity
0	Licensed Operating System that supports Microsoft Server. 64bit to be specific	1
0	PHP version 5.3 or above	1
0	Android Studio 1.5 and higher version	1
0	Apache Hosting server software	1
200	Internet Browser	200

Monetary terms must also be attached to the technical feasibility study. A project can also be highly technical feasibility whilst having exotic loss in economic social and operational feasibility which need to be considered.

Technical   Expertise

Ministry's workforce have to be evaluated on their expertise which is needed on the development of the proposed system. The system deliverables are weighed against the expertise of the employees so as to determine whether their skills are competent enough to deliver the milestones set as objectives in the introduction phase, currently there is no technical expertise in the ministry which leave them with the following options:

- Outsourcing from an external company
- Grooming their employees through training
- Hiring new ICT personnel with the needed expertise

General idea of the Technical feasibility

The analyst had to explore the following major aspects:

- Do you have the required technology?
- The ministry have proved to have some and only need to upgrade from the existing and adding some quantity to fully support the application.
- Are Development and implementation factors available which include licensed software systems, hardware and manpower?
- The system development need few licensed software many them are free wares and can be used without any violations, hence feasible enough.
- Equipment's availability?
- The ministry is willing to acquire the needed equipment's that are falling short that support the implementations and operations of the system.

- Technical Expertise needed?
- Selected employees will undergo the training so as to fully facilitate the development and support of the system when implemented.

2.3.2 Economic Feasibility

Projected benefits, savings and cost are determined under the economic feasibility. When the projected benefits surpasses the projected cost then the project study is said to be economic feasible

else it will be the other way round. Cost benefit analysis is the major concept of question in this section which is the evaluation of cost as to benefits derived from the application although its difficulty to attach a value on a human value that have been saved, benefits are put in two expressions:

Intangible Benefits

The qualitative benefits derived are:

- Saving human lives – being able to provide medic where needed instantly for emergence using the m-Health app
- Quality decision making – drawing conclusion from the m-Health app on where to priorities the medical staff in cases of outbreak.

Table 2.3 Intangible benefits

Description	Value(US$)
Total	5 000

Table 2.4 Tangible benefits

Description	Value(US$)
Employment/salary decrease	1000
Stationary cost decrease, transport and calling expenses	7000
Enhancement on employee productivity	200
Total	**8 200**

Development Costs

Cost of development when it is an in-house development project are less that is all resources are already available hence only internet cost are recognised on development cost.

Table 2.5: Costs for development

Narrative	Unit Value (US$)	Value (US$)
Internet subscription	**3 725**	**3 725**
Total		**3 725**

Running Costs

Cost that are encountered as the system have been installed and operating which may include RAM expansion as the server becomes slow when processing the data for report generation are classified as fixed and or variable cost.

- **Fixed Costs-**those cost that occur once in a while.
- **Variable Costs**- these are costs relatively proportional to operations.

Table 2.6 Operational/Running costs

Installation and operational costs	Cost (USD)
Server Upgrade	500
Backup Sever	2 500
Stationary	100
Conversion Costs	300
Software upgrades	400
System maintenance	500
Training costs	550
Total	**4 850**

2.4.4 Cost Benefit Analysis

Table 2.7 Cost Benefit Analysis

COSTS & BENEFITS	Cost (US$)	Cost (US$)	Cost (US$)
System Development costs	3 725		
System Running costs	4 850		
System Total costs	**8 575**		
Benefits to Organisation			
System Tangible benefits		8 200	
System Intangible benefits(given monetary value)		5 000	
Total Benefits		**13 200**	
Net Benefits			**4 625**

Using the above cost benefit analysis the project's viability can be calculated using the following accounting techniques:

- Period of payback(Payback Period)
- Net profit(NP)
- Investments Returns(Return on Investments)
- Rate of return(Accounting rate of Return)

Payback Period

This calculates the time it takes to raise the amount that was induced as the initial investments and it is calculated as follows:

Payback period = (4625-2000)/2100*12]

           = 1 year 3 months

Advantages for payback period calculation:

- It is easy to calculate.
- Forecasting errors are less.
- It uses cash flows and forecast cash that can be received and paid

Disadvantages of using the payback period:

Time value of the money when it is received is neglected

Comment: The payback period is favorable since it will take only a year and quarter to return the induced capital which is very beneficial.

Net profit

Net profit is the difference between overall costs and overall benefit and in this case it is $4 625 which is very beneficial to the ministry, short term estimates are reliable than the long term

Advantages

It is easy to calculate

- Simple on calculation.

Disadvantage

- Time value of money is neglected.

Comment: Net profit are beneficial since the benefits are higher than the costs.

Returns on Investment

ROI measures the profitability of a project using the average net profit in ratio of the total cost being the investments.

ROI=(TB)/(TC)*100%

$$ROI : \quad = 4625/8525*100$$

$$= 54\%$$

Comment: Advantage of ROI is beneficial and in this instance it is beneficial, its disadvantage is that it ignores timing of cost and benefits since a dollar received today can be of much value than received tomorrow.

2.3.3 Social Feasibility

This section's thrust on the stakeholders and the society the application will be implemented into. This establish how our m-Health app will be of effect to ordinary citizens whether patients or just ordinary citizens.

- Improve health conditions
- IT jobs will be created and internet network facilities will be accessible everywhere.

2.3.4 Operational Feasibility

The m-Health application's fit in the operations of the ministry is explained under operational feasibility. Change always come with some effects which can be resistance or acceptance which then can attached a value of benefits or cost depending on the response of the current operations when fitting the 2 systems. The concerts have its thrust on:

- Do we have the President and the Parliament in support?
- Does our prevailing system seen as disadvantageous to all?
- Is everyone involved in this change?
- Will the application provides tangible or recognized benefits?

General idea of the operational feasibility

The parliament and the cabinet are all in support of the proposed application for m-Health development, patients need to know that they can tell a caring expert their concerns at any time of the day and have an instant respond and the current application is seen as disadvantageous. Employees are finding it difficult to keep large cabinets of patient records as well keeping of clinic books hence pressing for a change. Reports from this application will be quick efficient and reliable thereby providing recognized benefits

2.4 RISK ANALYSIS

There are risks associated with the project can be categorized according to identification, estimating how they are likely to happen and devising ways to avert them as well keeping heads up on all circumstances that can give rise to risks. This section is very critical because when neglected, these risks can unfolder and delay the project or affect the overall feasibility of the study leading to the project being dropped in some instances.

2.4.1 Technical Risks

All health institutions staff should be computer literate on mobile and as well online integrated system. Patients should also be in position smart phones which runs android operating system and also have data or internet access.

Shareholders

➢ These are the government agencies or the parliament at large that can rule to cut the project's funding

Institutions

➢ These are involved in the day today operations with then patients and responding to the outbreak at hand and offering medication to the public if they resist change patients may die due to poor responds of institutions.

Patients

➢ Many might have smart phones which makes it ineffective.
➢ Data charges for internet maybe expensive to them since it requires money for internet access to fully utilize the application.

Risks are very low since the project is supported by all the above mentioned stakeholders.

2.4.2 Economic Risks

Economic risks major concern are on the cost of the project and its implementation, sponsors might be unavailable, hence the ministry will have to provide for smart phones and as well internet access for free to cater for all.

2.4.3 Other Risks

❖ The patients might feel it's too complicated and neglect the use of the application.

2.5 STAKEHOLDER ANALYSIS

- **Ministry-**The ministry present their issues to the parliament and henceforth with the m-Health app at hand, clearer and specific information can make it easier for the presentation that's where to focus resources mainly in order to achieve a complete health society.
- **Medical Institutions–** these are the Hospitals and clinics that treat patients, without using the app and using clinic books issues of handwriting and writing prescriptions are an issue when pharmacies will have to call in for prescription which can be easily carried out by the m-Health app
- **General Public –** The general public are in need of effective communication with the health institutions as well accessing after summary visits even if they lost clinic books which the m-Health app is mainly concerned with.

2.6 WORK PLAN

According to Murali, C (2013), a work plan is any work that has a clear start time and end time and that happens only once a project starts. Thus it takes into account the time factor in the form of a Gantt chart, which keeps the project into alignment, according to time specifications outlined. This can be shown as follows:

Table 2.8 Time plan

Activity/Phase	Starts date	End Date
Introduction	01/02/17	02/02/17
Planning	02/02/17	30/03/17
Analysis	30/03/17	02/04/17
Design	02/04/17	30/04/17
Implementation	30/04/17	30/05/17
Maintenance	30/05/17	30/06/17

The Gantt chart.

Activity/ Period (months)	1	2	3	4	5	6
Introduction	■					
Planning		■				
Analysis			■			
Design				■		
Implementation					■	
Maintenance						■
Documentation	■	■	■	■	■	■

Fig 2.1 The Gantt Chart

Gantt chart Key: Weeks ■

2.7 CONCLUSION

This phase focused much on the feasibility of the project and according to the research the project is highly feasible in terms of economic, technical, social feasibility and also the cost benefit analysis that has been much of a discussion in this phase. The next chapter dwells more into the analysis of the project.

CHAPTER 3: ANALYSIS PHASE

3.1 INTRODUCTION

According to Yeates et al (2014), Systems analysis is the studying of ways that a ministry carries out its activities in capturing, storage, retrieving and processing its information and data to produce the required output and making it work better. In this phase, initially fact finding methodologies are dwelt upon and a thorough analysis is done in relation to respective stakeholders. An analysis of what the current system does is then carried on highlighting areas of strength and weaknesses and areas of improvements. A way forward for system development is then mapped deciding whether to choose an in-house system development methodology or outsourcing as well off shelf. Functional requirements are then drawn before concluding the chapter.

3.2 INFORMATION GATHERING METHODOLOGIES

Information gathering methodology is a way that can be devised in order to bring about feedback to the source of requirements according to Yeates et al (2014), information gathering techniques which can also be called gathering methodologies differs in terms of how they are structured and are named accordingly, in this research three methodologies where used jointly to gather maximum data required for the analysis which includes:

- ➢ Structured interviews and unstructured interviews.
- ➢ Open ended Questionnaires and closed Questionnaires.
- ➢ Onsite observation

The above mentioned methodologies where carried out to all stakeholders be it internal or external to ensure all data needed is available.

3.2.1 DATA COLLECTION METHODS

The researcher used the grounded theory approach, motivated by Hancock *et al* (2009) who emphasized that the grounded theory uses various data collection techniques particularly interviews and observations, with literature review and relevant document analysis making important contributions. The instruments used to collect data for this research, as highlighted above were questionnaires, interviews and observations. The data collection and analysis, took place concurrently, sometimes prompting the researcher to review the interview questions, based on the

amount of the information gathered. During data collection, the researcher also realized that there was need to look at more literature as it relates to the findings from the interviews and observations.

Table 3.1 Sample size for Respondents

Data source	Respondents
Ministry Directors	1
Ministry Institutional Managers	3
Institutional Shop flow workers	5
Institutional Clients(Patients)	3

3.2.2 Interviews

Generally, there are two types of interviews namely structured and unstructured interviews. Unstructured interviews are a form of interview where the interviewee can give free responses without much of a direction to yes or no answer this pokes for a detailed explanation in regard to the information being gathered according to Jewell (2010).On the other hand, structured interviews requires to follow a certain way in answering the questions being asked and this is further sub categorized as open response and close response where the open response requires a brief explanation in answering whereas the close response might be restricted to yes or no responses according to Jewell (2010).

The researcher used semi-structured interviews, which according to Fox (2009) allows the researcher to plan questions in advance, using open-ended questions despite them being time consuming due to the requirement to draw up a coding framework. Venkataramanan (2015) concurred that interviews are used to collect data using open – ended questions allowing for detail. It is an opportunity for both the interviewer and interviewee to discuss a topic in detail, with room for cues and prompts to elaborate further. Alshengeet (2014), observed that interviews help in obtaining direct explanations for human action, however the interviewer must have skills, knowing that listening to people and their experiences brings in challenges which have to be addressed and allow the interview to be critical and reflective.

The researcher used face to face interviews having identified key informants and having earlier developed the interview questions accordingly. The researcher was also guided by the objectives and the roles of the organisation and she spoke with different respondents in trying to establish what conditions they faced and the improvements they thought should take place. Problems encountered for the face to face interviews were mainly those of cancellation of appointments and having to rebook. The researcher kept diplomatically pestering especially for respondents who had to take part in the interview, whose perspective was considered important until an interview took place.

Interviews involve effective communication between the interviewer and the interviewee and it needs one to possess a wide range of interpersonal skills according to Jewel (2010). In carrying out the interview following approaches where followed:

- Ministry Directors–Ministry headquarters.
- Ministry Institutional Managers–These were the healthy institutional runners who were interviewed to give direct input processing and outputs for the current system.
- Institutional Shop flow workers– Ordinary employees where interviewed so as to extract much data in relation to the information being gathered.
- Institutional Clients (Patients) –The patients that get services from the government institutions where interviewed so as to get what needs to be done to ensure convenience in their services.

A plan was made first when approaching each stakeholder mentioned above that's interview questions where printed out so as to follow the same format with every stakeholder, two interview types where carried out being the structured and unstructured so as to obtain general idea using unstructured and specific data using the structured interview

Findings from the interviews:
- Patients need remote communication with institutions
- E-prescription is a shortage and end up costly due to calling in for prescriptions
- Booking of visit was essential to avoid time wasting in postponement
- After visit summaries that are electronic are essential since a clinic book can get lost any time or get wet.

A sample of Interview questions are attached to the Appendix Section

3.2.2 Observations

According to Driscoll (2011), unobtrusive observation, is appropriate for places like hospitals without interacting with participants, but rather simply recording their behaviour. The researcher observed the status of the hospital facilities and this did not require any consent since it was in public places. The researcher visited Gweru general hospital, claybank hospital, suburban hospital and Parirenyatwa hospital at different times during the course of the research. In total 9 observational visits took place at an estimated 1hour per visit.

The analysis had an opportunity to gather all essential data at an onsite observation when she was attached at various stations in order to get to know the processes involved in healthy service delivery. The analyst managed to obtain the needed information.

Onsite Observation fact findings:

Following aspects where obtained by the analyst:

- Stumbling blocks for the current system
- How the current system works and its strength
- Areas for improvement in the current system

3.2.3 Questionnaires

Designed set of questions where distributed to various stakeholders mentioned earlier so as to have a view of how stakeholders feel for the current operating system and this involved closed questionnaires and open questionnaires.

A closed questionnaire

A list of questions prepared that needs a single word or short description is called closed questionnaires and they can also be answered by a yes or no. the following characters where found in the questionnaires:

- Providing facts to the analyst
- Narrowing responder's response
- Fast answering.
- Control over responders

An open questionnaire

This being the opposite for Open questionnaires, a list of questions prepared that needs a long answers where used and had the following characters:

- Think and reflect to the question
- Feelings and opinions being dashed
- Control over the respondent.

A sample of the questionnaires is attached to the Appendix Section.

Questionnaire Findings where on:
- Ministry Directors
- Institutional Managers
- Workers/Employees
- Patients

3.2.4 Data Analysis

For the interviews, the researcher used a thematic data analysis, which according to Cochran and Patton (2002), looks across all the data to identify common issues that recur and identify themes that summarizes all the collected views. The researcher summarized the interviews one by one, went through the notes, identified themes, developed a coding system, coded the data and looked at the linkages and cross cutting issues that the data presented. The themes that were developed were overall health place situation, challenges, roles and responsibilities, participants / clients, current projects and recommendations.

Table 3.2 Questionnaires response rate

Data source	Respondents in total	Rate of response
Ministry Directors	2	2
Institutional Managers	4	4
Workers/Employees	8	6
Patients	15	2

Reasons for using the above Data gathering methodologies.

- **Interviews** help the interviewer to dig deeper into relevant issues or areas of interest as they are brought up by interviewees, as opposed to the limiting approach of a quantitative research method.

- **Observations** helped the researcher to compare the findings from the interviews, desk study, and literature and as such created a good triangulation platform. Unlike in interviews where the researcher could have relied on what patients say they do, observation draws on what the researcher sees and witnesses as emphasized by Denscombe (2010).

- **Questionnaires**are one of the most affordable ways to gather quantitative data. These methods have little to no cost, depending on how one administers them, though strong targeting is necessary if one wants them to receive the most accurate results.

The findings of the questionnaire data was presented in a table above and analysed with reference to the answers given by the respondents.

Questionnaires findings:

➤ Need for m-Health mobile application.

3.3 ANALYSISOF THE EXISTING SYSTEM

The existing system can be easily analyzed used the following activity diagram:

3.4 PROCESS ANALYSIS

m-Health Process

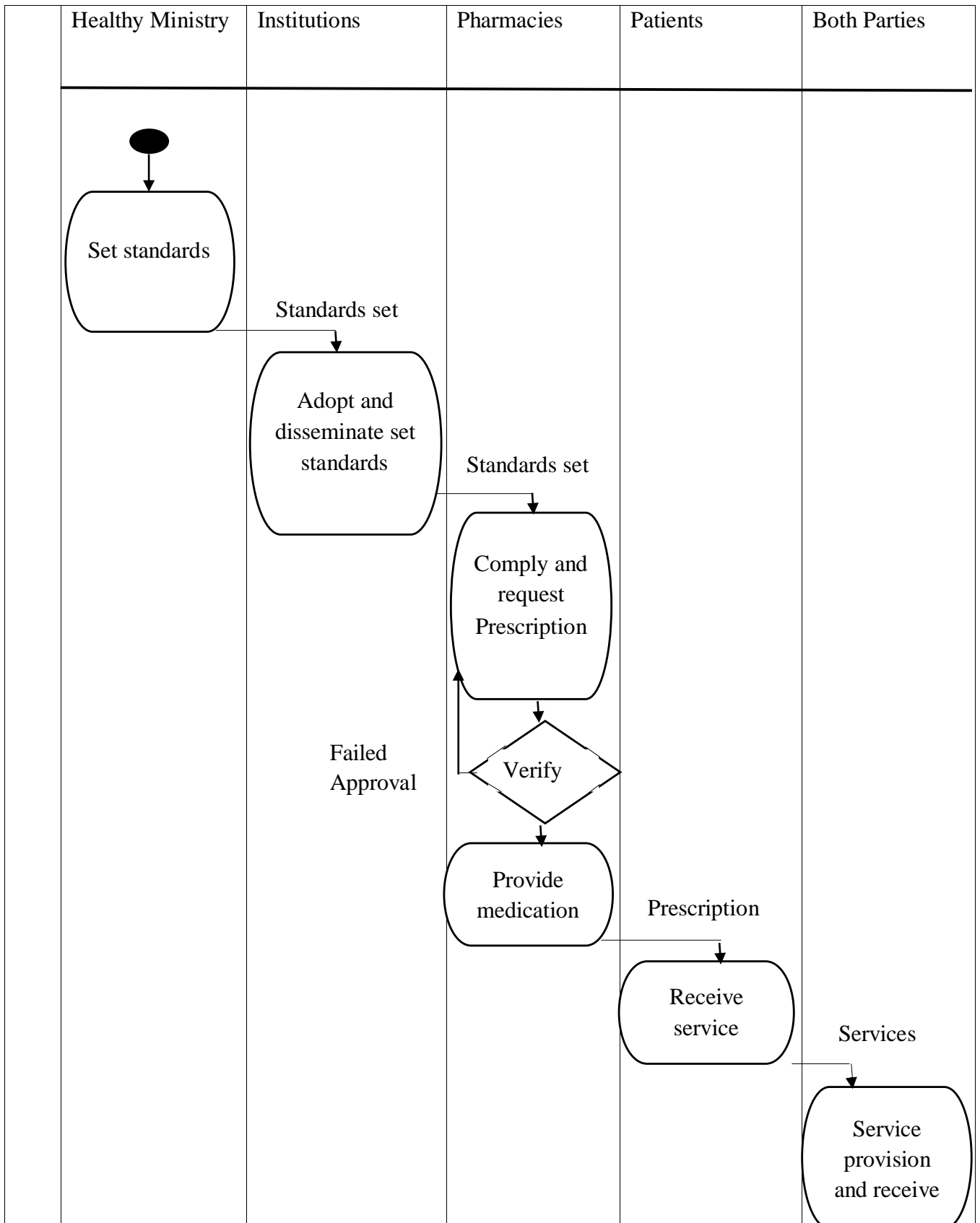**Inputs**

System got the following inputs:

Set standards: these are the standards that are set by the ministry and disseminated to the various institutions.

Patience details: patience medical information that are recorded at institutions.

Outputs

The proposed system will produce:

Activity Diagram for the existing system

Healthy Ministry	Institutions	Pharmacies	Patients	Both Parties

Set standards

Standards set

Adopt and disseminate set standards

Standards set

Comply and request Prescription

Failed Approval

Verify

Provide medication

Prescription

Receive service

Services

Service provision and receive

Fig 3.1 Existing System Activity Diagram

- E-prescription
- Patients booking details
- Patients after visit summaries

3.5 DATA ANALYSIS

3.1 Context diagram of the existing system
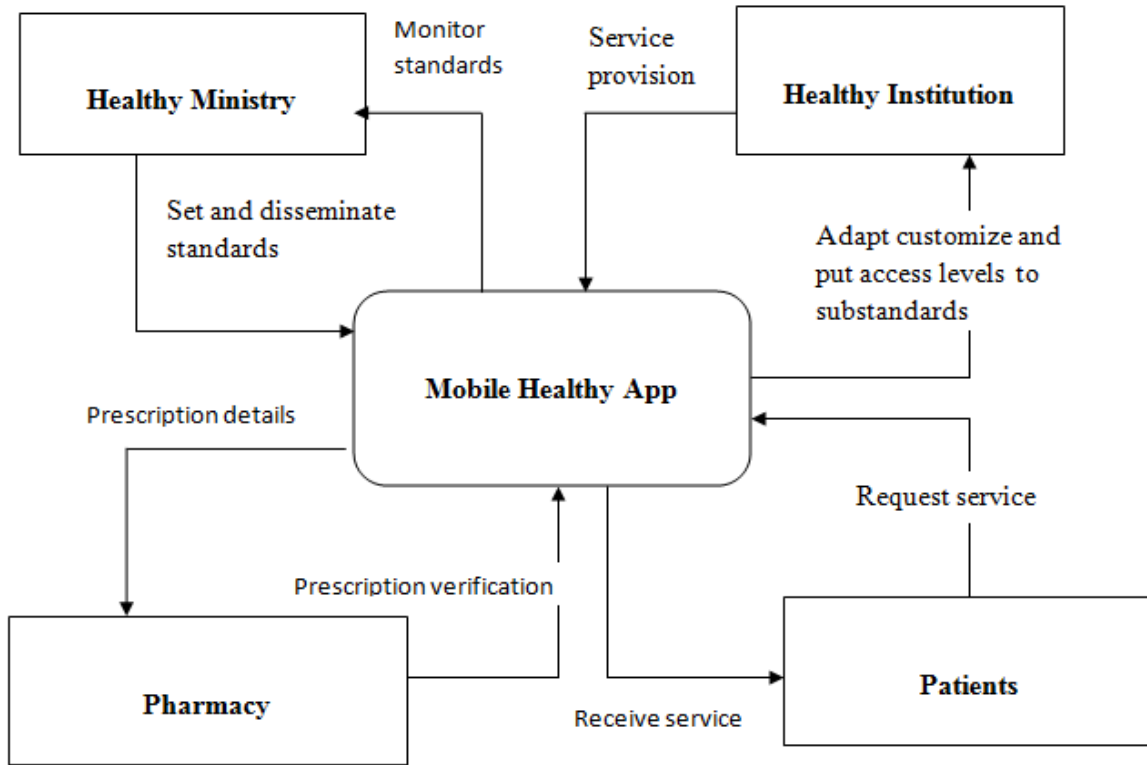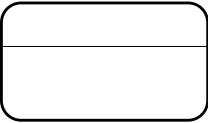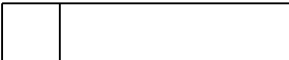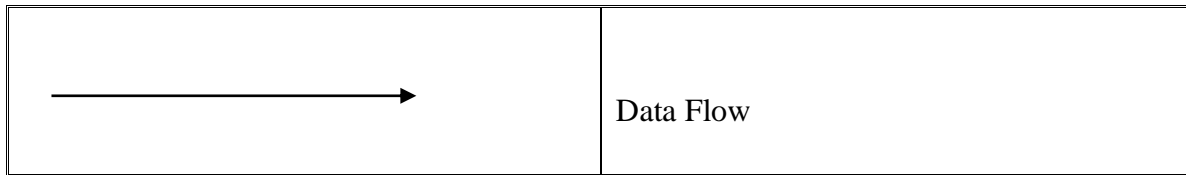

Fig 3.2 context diagram of existing system

Context diagram key

Entity/interface   System

Entity interaction with the system

Data Flow diagram of the existing system

Patient Hospital visit
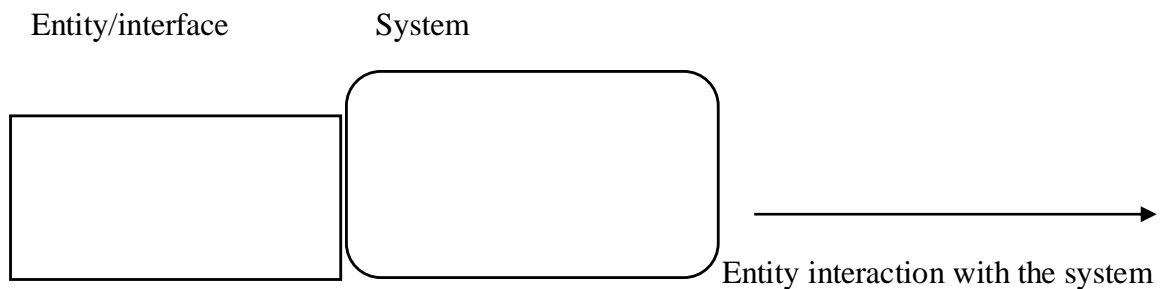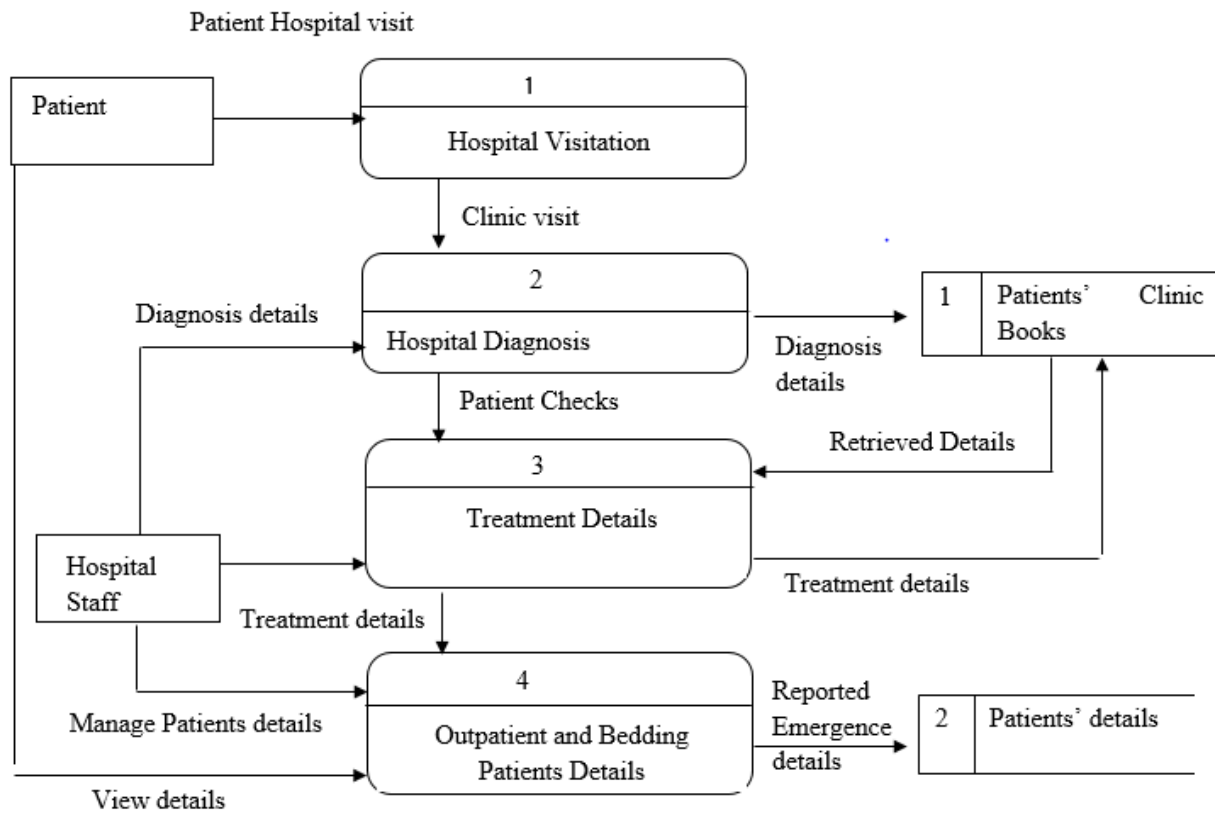
Fig 3.3 Dataflow Diagram of the Existing system

Data Flow Diagram Symbols

	Entity
	Process
	Data store

─────────────────────▶	Data Flow

Fig 3.4 Dataflow Diagram Symbols
Existing System strength

- Very easy to learn

- Implementation simple

3.6 WEAKNESS OF THE EXISTING SYSTEM

The current operation of Ministry of health and child Welfare Mobile health data are:

- Bad handwriting for the prescription written in the clinic book.

- A patient who is treated in different hospitals will have to bring the clinic book in order to trace previous treatments so as to make a decision on better treatment of the current situation.

- Integrated health information interchange creates a disruptive and complex patients records since its from different data providers, most of which will have assigned their own identifiers to each patient, it is difficulty for the ministry to correctly align these different sources making it impossible to fulfill the mission of the analysis.

- Misidentified or duplicate patient data collected from different institutions of health sector results because of different platforms.
- Patients information are only recorded when they visit clinics/hospitals those who fail to make it to the hospital are not recognized.
- Disconnected activities and processes which happen because of lack of coordination and ineffective communication.
- Report generation for overall health statistics is difficulty to draw with the current system
- Healthy information insecurely stored in clinic books.
- No data backup for patients' clinic books.

3.7 EVALUATION OF ALTERNATIVES

- Existing System improvement

- Outsourcing
- In-house development

3.7.1 Outsourcing

This is acquiring the system from external parties who come to analyze the current system and obtain all user requirements and develop the needed system for the organization and the development is controlled by the third party company

Benefits:

- Faster implementation since third part organization will be full of expertise
- Less employee are involved meaning all daily activities will not be affected

Limitation:

- Contract agreements might be a challenge
- Outsourced technologies may bring hardships to employees
- Security risks due to hacking.

3.7.2 Existing System improvement

This will bring about acquiring the skills from technical expertise in order to improve the current operational system. A proper documentation will be produced at the end by the system administrator explaining how the system works and all changes that have been effected.

Advantages

- An upgrade is easy and faster since its jus noting the changes and make effect to them.

Disadvantages

- Appropriate and efficient in the short run.
- Brings about complexities in the long run
- Total salary of system developers will rise

3.7.3 Developing the system in-house

Developing the system in-house is an ideal to develop the m-Health mobile app since the skilled people are already there and there is no need for further analysis since the technical people already know the challenge.

Advantages

- Analysis period will be shortened
- It covers both short and long term factors affecting the system.

Limitation: Resources may be diverted to other priority hence making the development life cycle take long that expected.

3.7.4 Solution selection

Table 3.3 Alternative solution selection

Solution alternative(s)	Cost (BOND $$)
Existing System Improvement	12 000
Outsourcing	15 000
In-house Development	7 000

According to the above table developing the system in-house is the best and cheaper solution.

3.8. REQUIREMENTS ANALYSIS

Those requirements extracted from user requirements or system objectives are regarded as Functional requirements according to Sarngadharan and Minimol (2010). These outlines what the deliverables in terms of system functionality should align to. There are 4 users in the system namely Ministry, Institutions, Pharmacies and Patients which the system should satisfy.

The system will have the following in its deliverables:
- Timely system request

- Efficient report generation
- User friendly graphical user interface

Actors in the system:

- Ministry–The controlling body for Healthy issues.
- Healthy Institutions –The bodies responsible for offering patient services
- Pharmacies – These are also a body that keeps medicines and deliver them to patients upon prescription verification
- Patients– These are the system end user and primary customers.

3.8.1 Non Functional Requirements

Sarngadharan and Minimol (2010), explain that these are requirements that outlines the accepted system basic operational expectations ranging from tangible properties to software and these can be explained as follows:

- Security – authentication on system access that's through the use of encryption and as well passwords.
- Hardware Consideration – The system runs on a minimum hardware requirements this should be met or met favorably for efficient system use.
- Access levels – privileges in the system should be given in accordance to use that's all users should be granted access only in modules they have use to.
- System Interfacing – since general users are resistance to highly complicated technology the system should also have interactive and simple to operate interfaces to make users not resistance to change.
- Back up – Data in the database should always be backed up so as to retrieve it in cases of a system crush.

The proposed system can be clarified by the flow of Use Case Diagrams below:
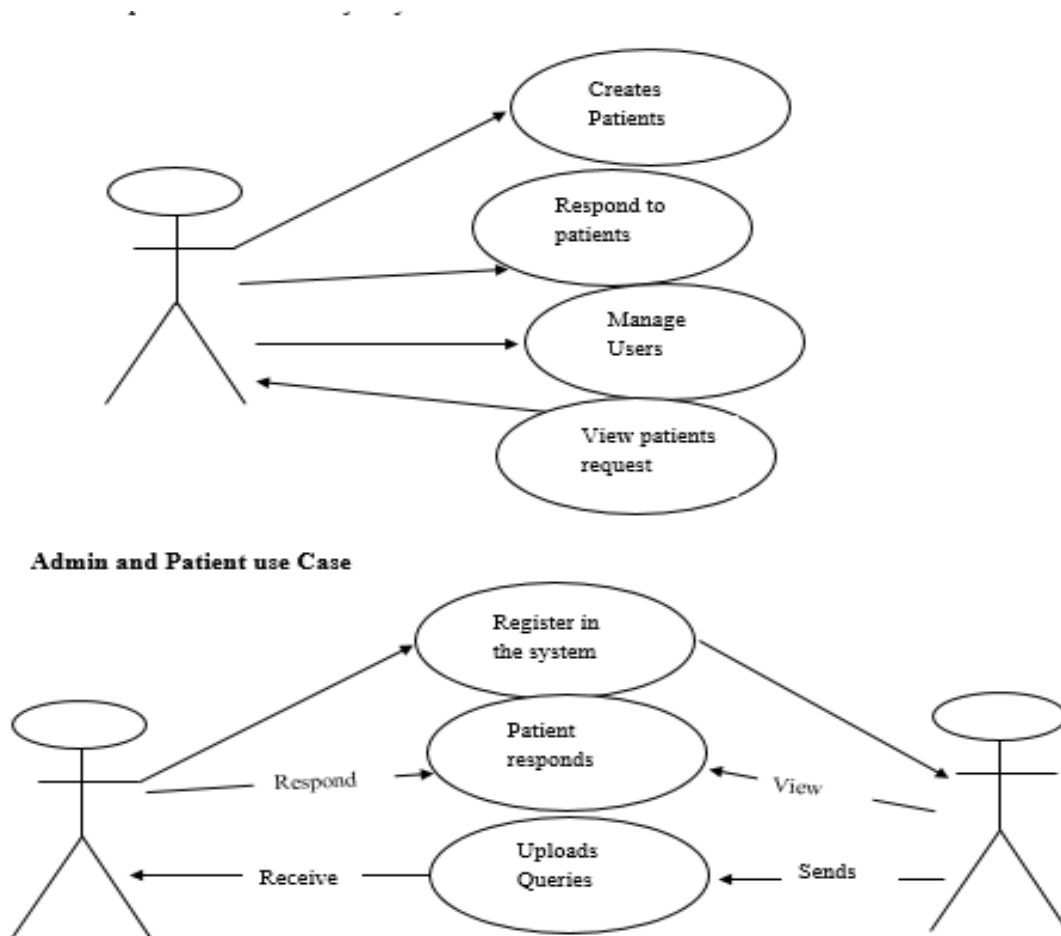
Use Case

It is a description of sequences of actions performed by the system to produce a result for an actor. Use cases specify the expected behavior 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.

Admin use case

This is the system administrator for the system. This user have ultimate privileges to add users and manipulate the data in any way he/she wishes.

Admin and Patient use Case

Fig 3.5 Use Case Diagram

3.9 CONCLUSION

The m-health system have been analyzed making all the input output deliverables clear using various information gathering methodologies namely interviews, onsite observation and questionnaires. In this analysis areas of weakness was discovered and a way forward was mapped which is to do an in-house development of m-health mobile app. Functional and non-functional requirements were then laid down for the proposed system to meet leading us to system development phase in the next phase.

CHAPTER 4: DESIGN PHASE

4.1 INTRODUCTION

This phase explains how the Android mobile Health Application (m-Health App) will accomplish its objectives. It consists of design activities that produce the m-Health App specifications satisfying the functional requirements specified in the analysis phase. The design details about the software data structure, architecture, interface and components that are necessary to implement the system are explained in detail. These can be accessed for quality and improved before the implementation stage. During this phase, we make the decisions that ultimately affect the success of the application.

The following are the types of design the designer will use before implementing the m-Health App:

- Architectural design
- Database design
- Interface design
- Program design
- Physical design

This system design mainly focus on generic elements the application have to consider taking into consideration those elements like interfaces that are user friendly. Following are components that the system will have to cater for

User friendly interfaces – the interface should help the system users (patients, doctors and the ministry) by providing easy to follow graphical instructions which makes the user feel flexible using them.

Security – a form of database, system and network security. Database will focus on making sure that the database does not offer access to unauthorized users.

Confidentiality – access to the system will be allowed to only those users with passwords and hence will protect the confidentiality of information. Each user will be entitled to viewing specific information which fall under his/her work specifications, for example the patient and system administrator will have some rights that a network user does not have.

Report generation – presentation or reports is very essential as they are part of the outputs and facilitate decision making and thus should be designed in such a way that they will facilitate the decision making process.

System design is simply a formal method for pursuing the physical development of the system. It describes the approach to be followed in transforming the logical system requirements into a functional, physical system.

Input

Patients' details: patients' medical information that is recorded at institutions

Patients' symptoms: these are signs of different ailments as explained on m-healthy application system by patients'

Processes

- e-prescribing
- home diagnosis
- e- booking

Output

- report generation
- patience after visit summaries
- prescription

In this design phase, activities which would be involved are:

```
Project Flow  ───────────────────────────────►

System Logical Design  System Physical Design

   ┌─────────────────────┐           ┌─────────────────────┐
   │ Logical    Database │           │ Test Design         │
   │ Design              │           └─────────────────────┘
   └─────────────────────┘                     ▲
             │                                  │
             ▼                      ┌─────────────────────┐
   ┌─────────────────────┐          │ Interface Design    │
   │ Program Design      │          └─────────────────────┘
   └─────────────────────┘                     ▲
                                    ┌─────────────────────┐
                                    │ Software            │
                                    │ Architecture Design │
                                    └─────────────────────┘
                                                ▲
                                    ┌─────────────────────┐
                                    │ Physical    Database│
                                    │ Design              │
                                    └─────────────────────┘
                                                ▲
```
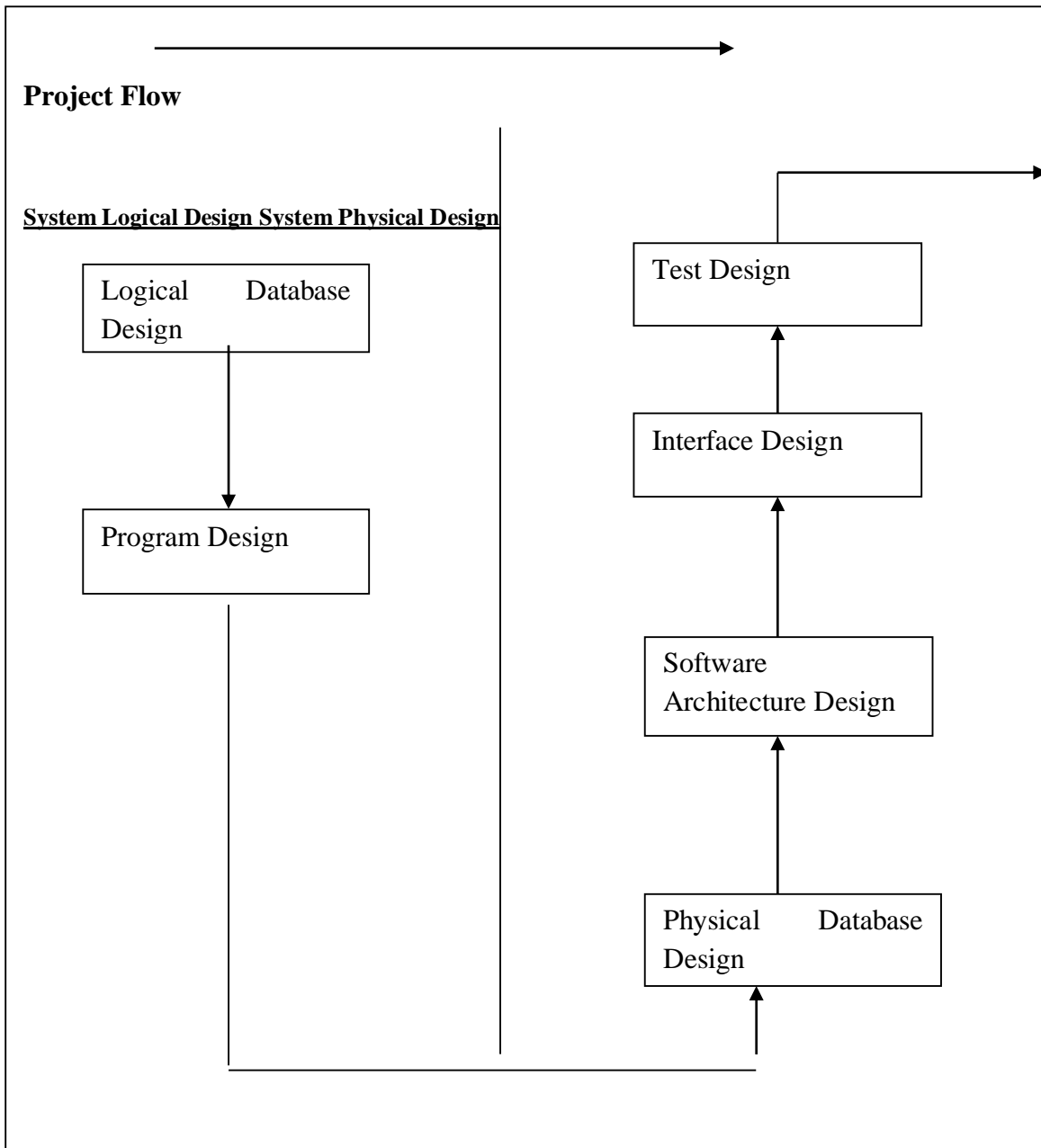
Fig 4.1: System Design Process Activities

METHOD	EXPLANATION
Logical Database Design	This includes the use of logical data models to model the proposed system, such as the E-R models and the data dictionary.
Program Design	Entails the design of modules, classes, functions of the proposed system and outlines the design of queries.
Physical database Design	Involves logical data and process models created using the E-R model in the logical design phase is transferred into a functioning database.
Physical Architecture Design	Gives a description of the technical platform on which the new system will run by describing the logical and physical layout of the system including the specifications of hardware, software, data, procedures, and the people to be involved.
Software Architecture Design	Describes how the software components of the proposed system are going to interact.
Interface Design	Deals with the Human Computer Interface. That is, the design of the user's views of the system thus how the user will see the system.

Table 4.1: Description of System Design Process Activities

4.2. SYSTEM DESIGN

Siddiqui, F. (2015) defines Systems design as the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

The following explains how the system will work:

This system helps Ministry of health and child welfare to manage healthy processes and automate core activities that are done in the health sector.

- **Electronic Prescribing** (e-Prescribing) and work flow integration: Through electronic Prescribing and workflow integration from clinical systems which link up legacy systems of health care pharmacy players, instead of using handwritten or faxed notes or calling in prescriptions.
- **Push notifications** for preventative care on pandemic spread
- **Booking appointments:** Patients being able to book appointments with the doctor from a mobile application.
- **Messaging providers:** Enabling the patients to contact the providers from an android application making their queries known.
- **Accesing after visit summaries.**

4.2.1 Context Diagram of the Proposed System
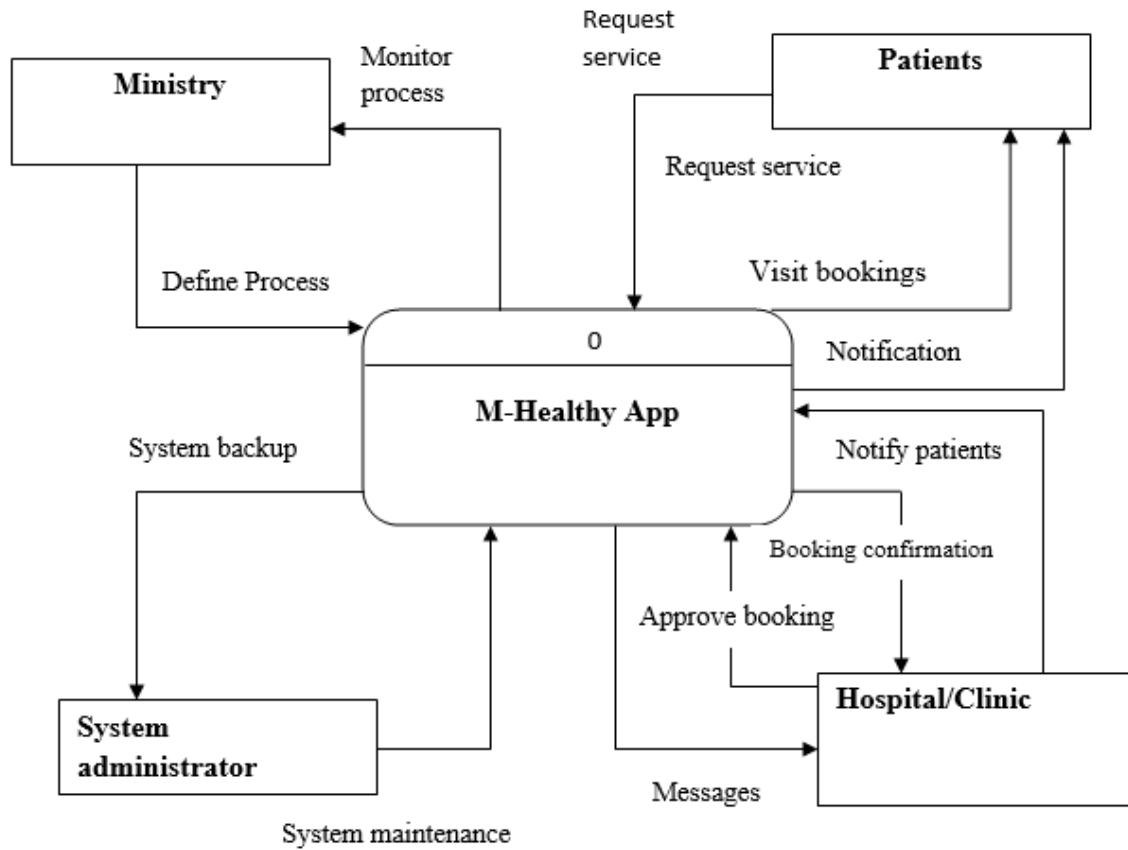
Fig 4.2 Context Diagram for the proposed system

Context diagram key

Entity/interface   System

Entity interaction with the system
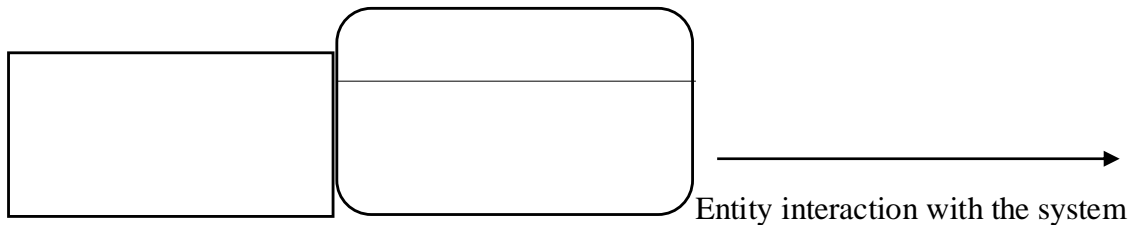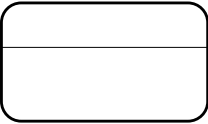
4.2.2 Data Flow diagram of the proposed system
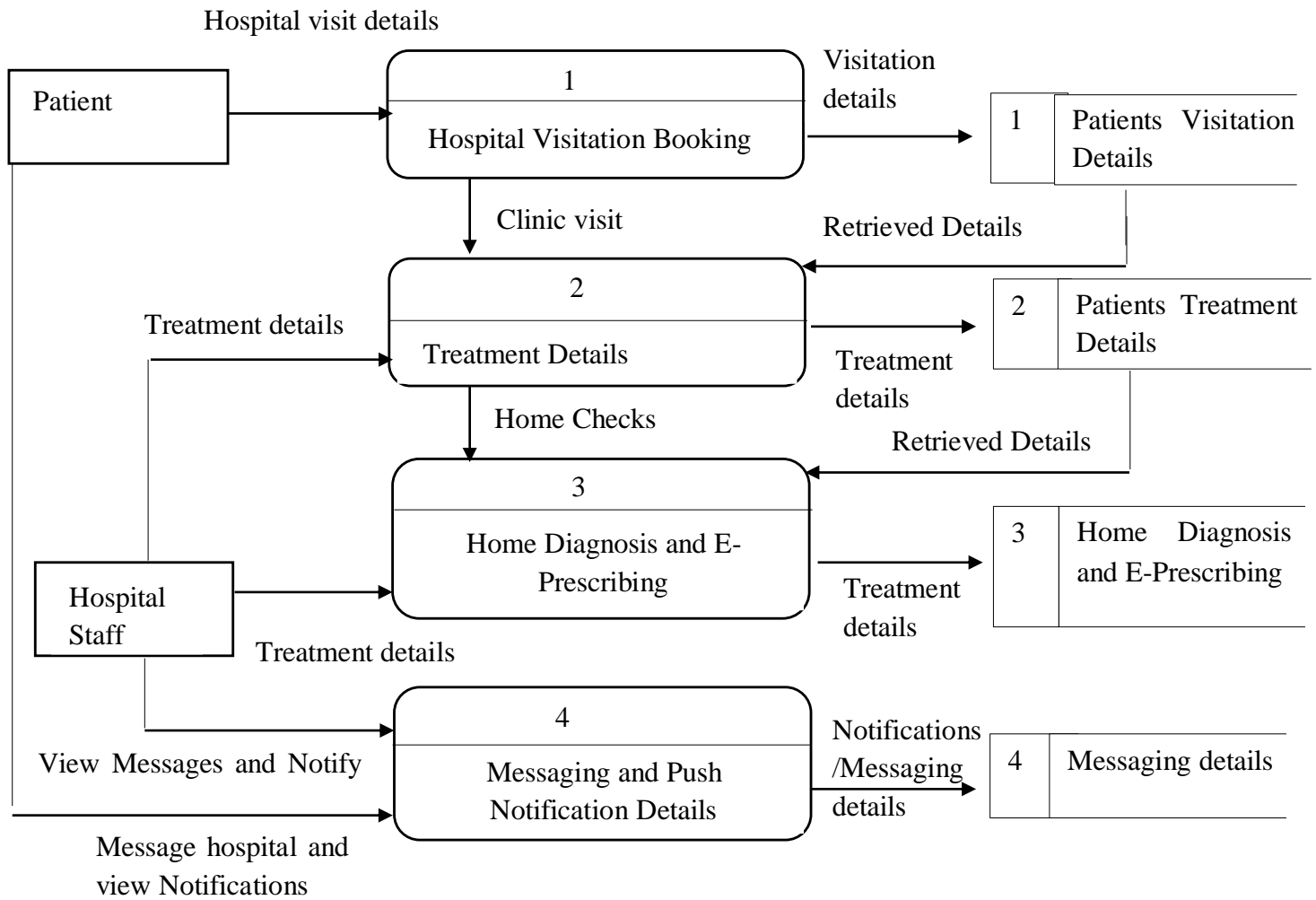
Fig 4.3 Dataflow Diagram of the proposed system

Data Flow Diagram Symbols

[rectangle symbol]	Entity
[rounded rectangle symbol]	Process
[open-ended rectangle symbol]	Data store
[arrow symbol]	Data Flow

Fig 4.4Data Flow Diagram Symbols

4.3 ARCHITECTURE DESIGN

M-Health app has been designed so as to implement a three-tier architecture. This basically means that the system will consist of three layers: i.e. the database application server, the web server and the application programs (in the form of graphical user interface).Designing in this manner has the advantage that system users are shielded from all the technical operations that will be taking place in the background.

There will be a centralized database server and web server at the head office. The setup is that of client-server architecture.

The Client Server Architecture

The Internet revolves around the client-server architecture. A personal computer runs software called the client and it interacts with another software known as the server located at a remote computer. The client is usually a browser such as Google Chrome, Internet Explorer, Netscape Navigator or Mozilla. Browsers interact with the server using a set of

instructions called protocols. These protocols help in the accurate transfer of data through requests from a browser and responses from the server.

The model below examines the client-server inter-communication for server side scripting technologies which is implemented in the AIS system.
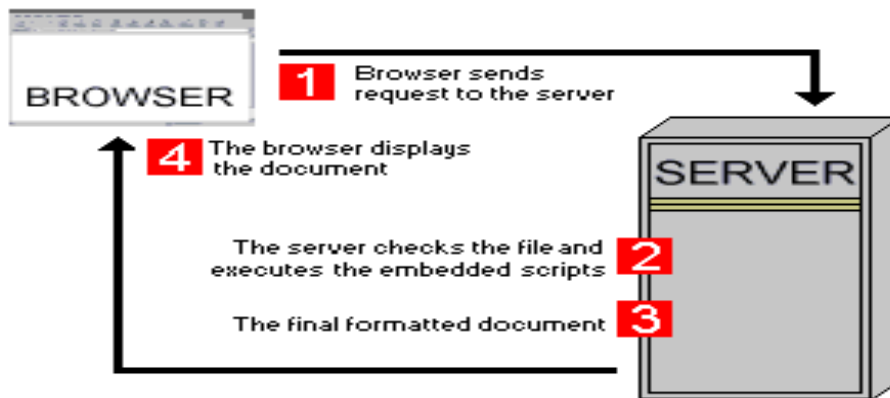
Fig 4.5 Model of the client-server architecture

Are requests sent for a PHP page from client and is passed to the PHP interpreter by the server along with various program variables. The interpreter then processes the PHP code and generates a dynamic HTML output. This is sent to the server which in turn redirects it to the client. The browser is not aware of the functioning of the server. It just receives the HTML code, which it appropriately formats and displays on your computer.

Below is an outline of the major components of the system both at server level and client level.

Server components

The server is composed of the application database, which is the MySQL database, and the Apache web server. Running on Apache HTTP server, all the data and information requirements for the m-Health app is going to reside on this server.

Client components

All client workstations shall have the following components:
- Web browsers
- Internet connection

The machines are going to provide the interface for communicating with the Database Server requesting for information and transaction processing.

Network Architecture

The m-Health app is going to be running as client-server architecture which was explained above, using the Local Area Network (for employees within the organizational branches) and a Wide Area Network (for Patience).

Internet connection

Taking this network architecture into account, it was decided to create a website for the new system to be implemented. With that, it meant that an internet connection was very necessary. All phones from different patience are to be connected to the central computer (server). The smart phones will connect to the internet using different mediums so as to link to the main server of the organization.
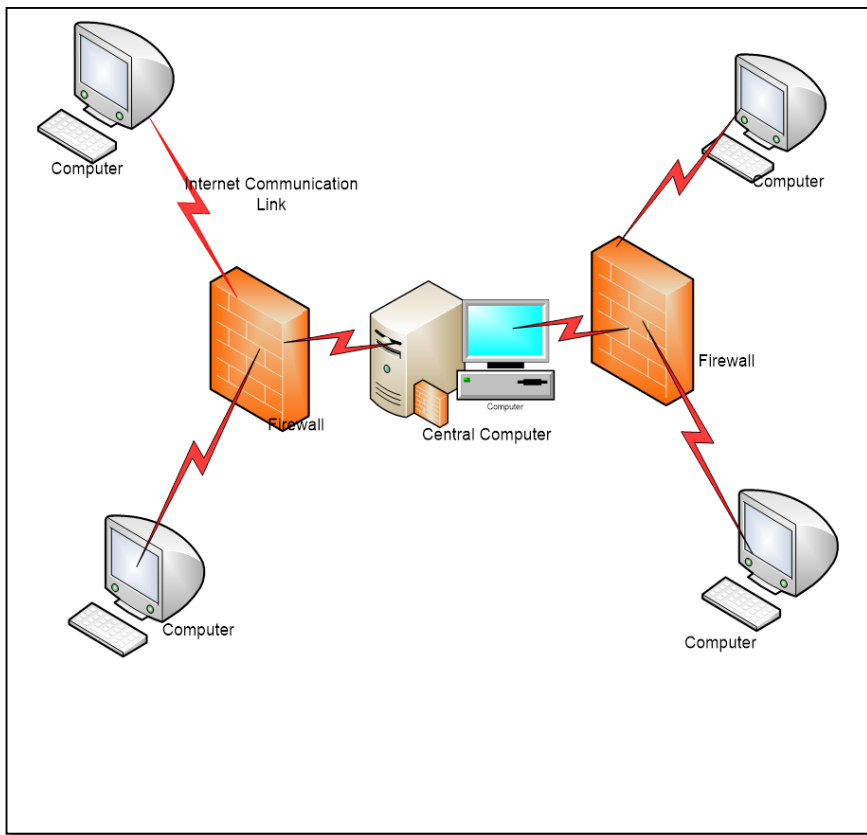
Fig 4.6 Internet connection topology

At this stage of design phase it is very difficult to know exactly the amount of traffic the website would get, as well as to how much power the system would require but a client-server architecture would allow m-Health app to scale easily as needed. Patience would use their usual personal computers laptops or smart phones.

4.4 SYSTEM PHYSICAL DESIGN

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. The most important aspect is that of the interaction between the hardware and the software underdevelopment. The system will be integrated in an already existing infrastructure, the intranet. All the user machines will be connected to the database server, networked by a 16-port hub and connected by a set of cables namely UTP CAT 35, Fly lead sand Patch codes. A 1320 HP Laserjet printer will also be connected for the purposes of report printing.

Physical Design of the Proposed System
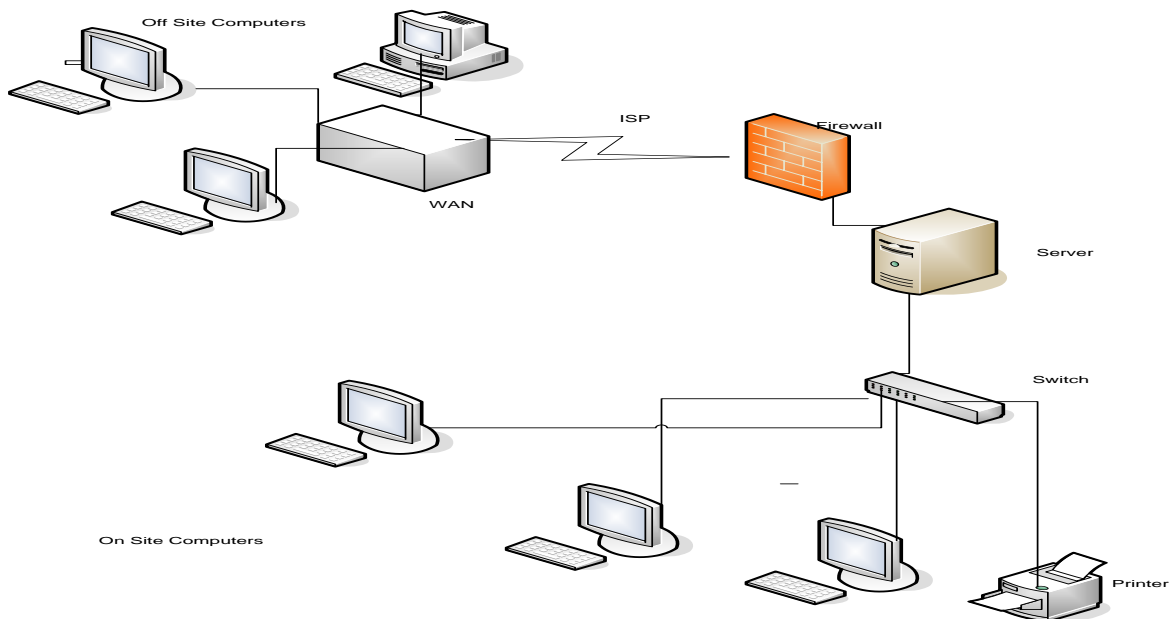
**Fig 4.7 Physical design of proposed system**

4.5 DATABASE DESIGN

All logical data and process models that were created using the EER model in the Logical Design Phase will be transferred into a functioning database and software application. These physical model is going to represent the technical importance of the logical model in terms of its tables and the relationships amongst those tables.

Database Architectural Design

Architectural design section looks at the schema of the database that will be used in the system. The diagram below illustrates the levels that are involved in designing a database

Database architecture.
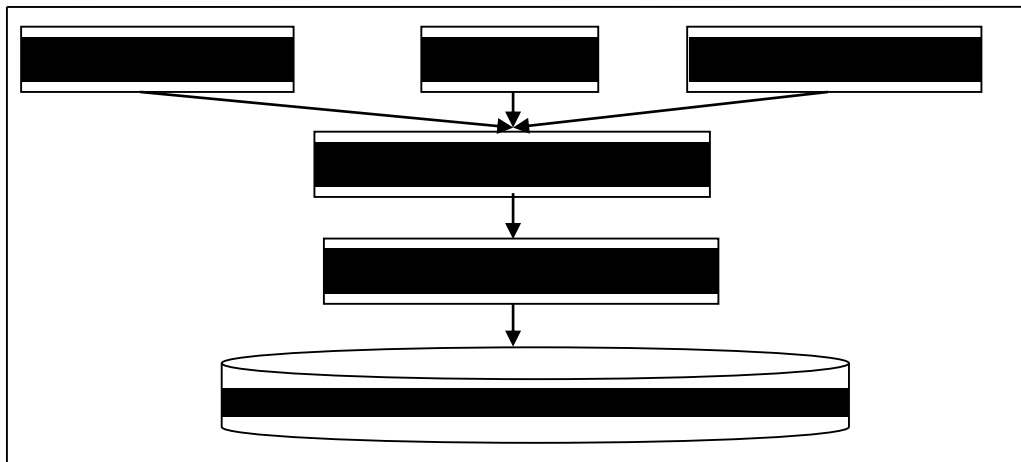
Fig 4.8: Database architecture

External level - the user's view of the database is customized to his/her interests. They only view the data that is relevant to them. This is done in a way to promotes security. In this case the customer can only view the data stored in his/her customer Records while a manager can perform certain changes to the data stored in the database.

Conceptual level - this is the community view of the database, it describes the data stored in the database and the relationships among the data.

Internal Level - This level mainly depicts the way the Relational Database Management System and Operating System perceive the data. It describes how data is stored in the database.

Database tables

Database tables are used to visually represent data objects as they reside from the backend managed by the database management system, below are tables explained with all elements including their types and sizes, primary keys, foreign keys. The database tables are shown below:

User registration details

Table 4.2 User registration details

Field Name	Data type	Length	Attribute Remarks
User ID No	INT	10	Primary key
Name	VARCHAR	30	Not null
Surname	VARCHAR	30	Not null
User name	VARCHAR	10	Not null
Password	VARCHAR	6	Not null
Phone No	INT	10	
Email address	VARCHAR	20	
Access	VARCHAR	20	Not null
Suspend	VARCHAR	20	Not null
City	VARCHAR	20	Not null
DepartmentID	INT	20	Foreign Key

Client registration details

Table 4.3 client registration

Field Name	Data type	Length	Attribute Remarks
Username	Character	30	Not null
Password	VARCHAR	30	Not null
Status	VARCHAR	30	Not null
name	VARCHAR	40	Not null
Access	VARCHAR	30	Not null
Suspend	VARCHAR	30	Not null
Email	VARCHAR	40	Not null
Surname	Varchar	40	Not null

Treatment Details

Table 4.4 Treatment Details

Field Name	Data type	Length	Attribute Remarks
TreatmentID	VARCHAR	20	Primary Key
Name	VARCHAR	30	Not null
Date	VARCHAR	255	Not null
Time	VARCHAR	20	Not null
Details	VARCHAR	10	Not null
E-Prescription	VARCHAR	10	Not null

Notification details

Table 4.5 Notification details

Field Name	Data type	Length	Attribute Remarks
NotificationID	int	10	Primary key
MessageID	VARCHAR	10	Not null
Details	VARCHAR	20	Not null
Date	VARCHAR	255	Not null

Visitation Details

Table 4.6 Visitation Details

Field Name	Data type	Length	Attribute Remarks
VisitationID	INT	10	Primary key
name	VARCHAR	10	Not null
Date	VARCHAR	20	Not null
Status	VARCHAR	255	Not null

Enhanced Entity relationship diagram of the new system

An enhanced entity-relationship (EER) diagram is a specialized graphic that illustrates the interrelationships between entities in a database. EER diagrams often use 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.
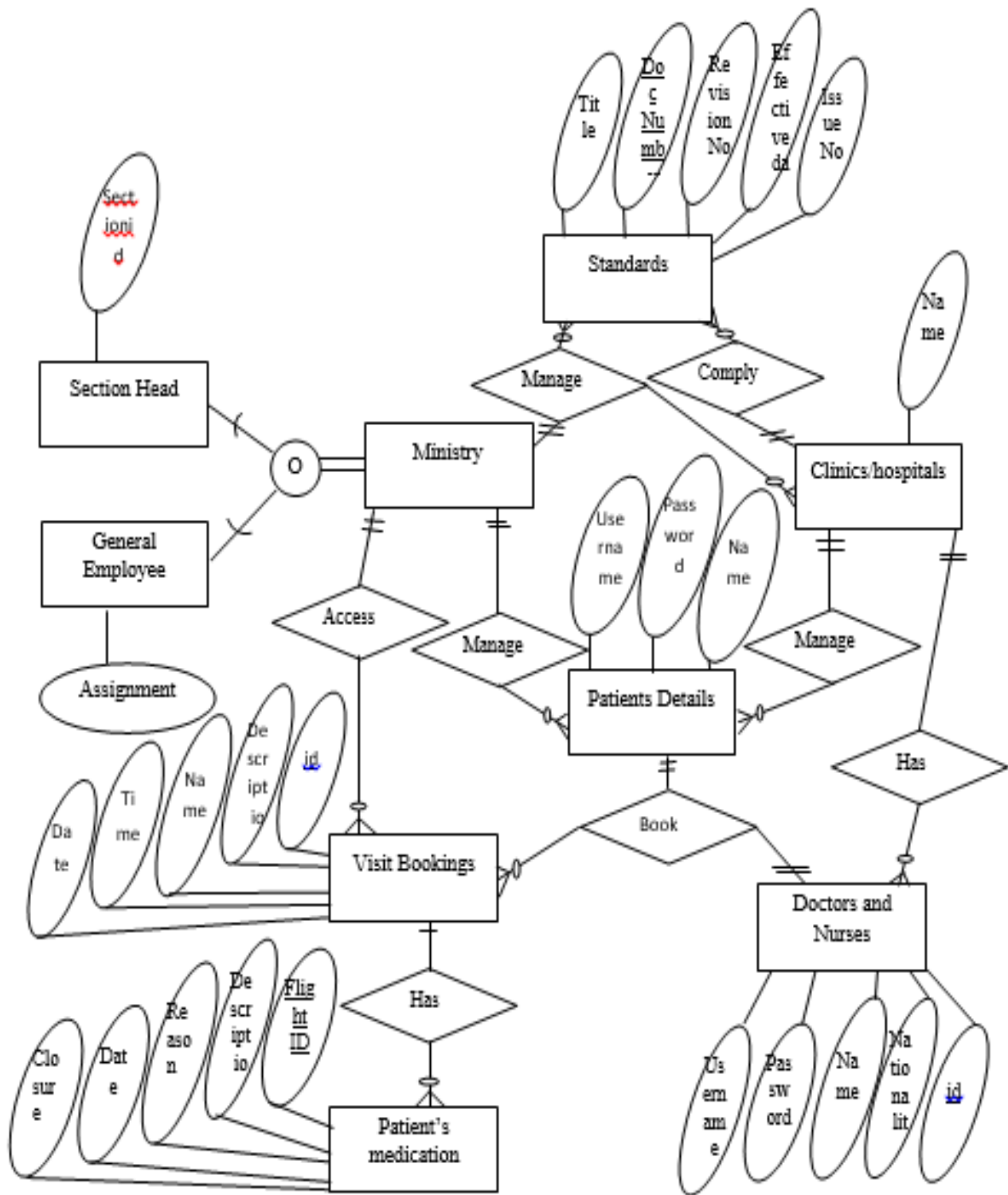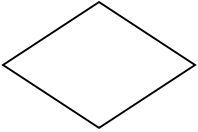
Fig 4.9: Enhanced Entity Relationship Diagram of the Proposed System
The diagram below shows the Notation used in EE-R Models:

Table4.7 EER Diagram Symbols

SYMBOL	MEANING
▭	Entity
⬭	Attribute of an Entity
◇	Relationship

4.6 PROGRAM DESIGN

The program design entails the design of modules, classes and functions of the proposed system. Modular design was chosen because of:

- **Modularity -** promotes efficiency thus the application will be reasonably fast.
- **Flexibility -** it promotes loose coupling and strong internal cohesion: changes in one module will not affect the other modules, as the modules are interdependent.
- **Easy to use –** it allows easy system maintenance since intertwined functions complicate situations because one is not sure of which other part of the system will be modified by a single change.
- **Reusability -** of part or of the system as a whole is promoted which can be time and effort saving in future.

A top down approach was used breaking down of the problem into the major tasks to be performed. That is, tasks were decomposed until they were small enough to be written as self-contained modules.

The following Sequence Diagrams depict the design of the driver program for the system. They also illustrate how the code modules will interact.
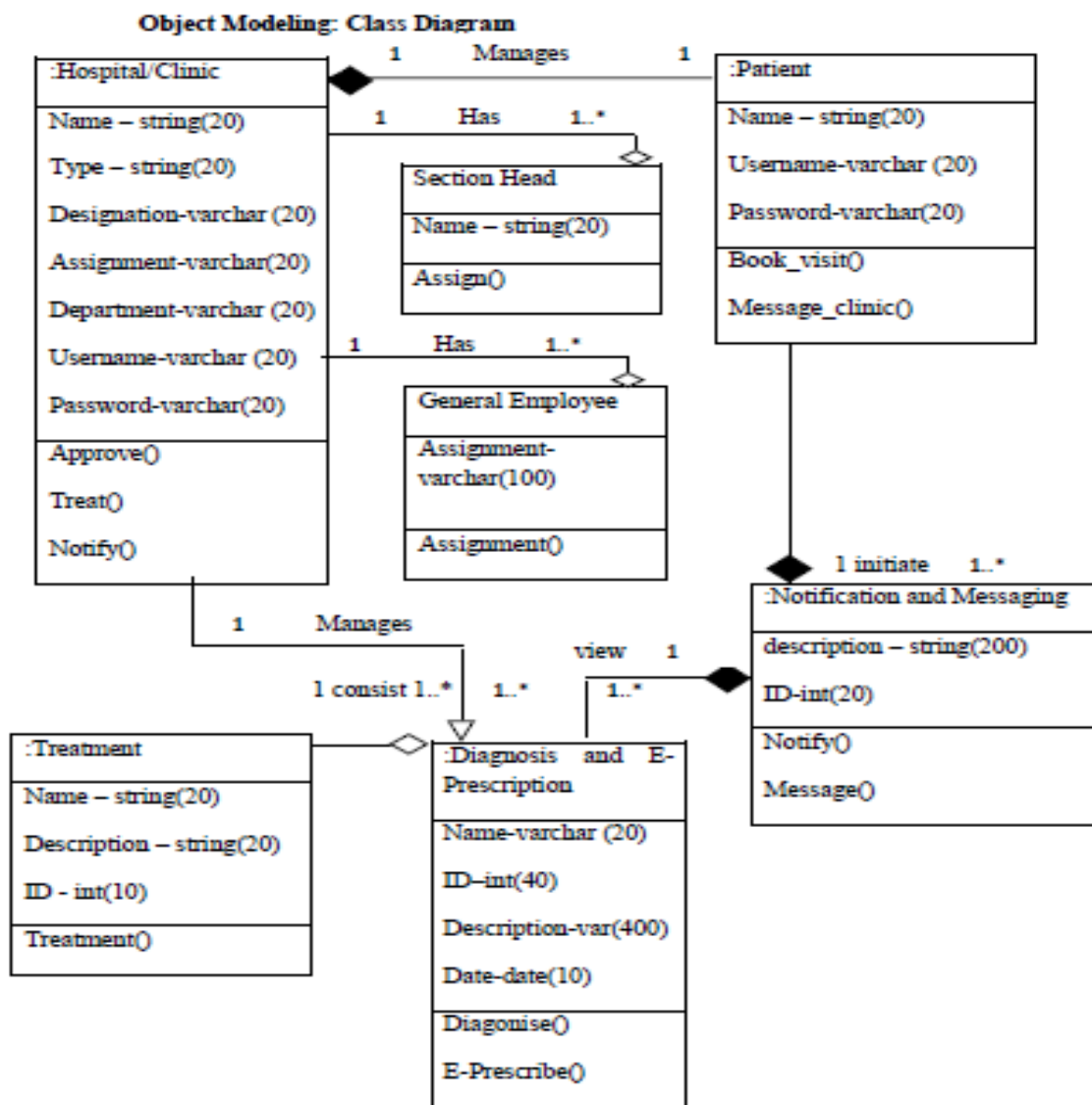
Package Diagram

To come up with a detailed and simplified design of the proposed system there is a need to model the system operations with UML modeling techniques. This is modeled by a package diagram which is a collection of UML diagrams. The diagram below is a business model in which the classes are grouped into packages.
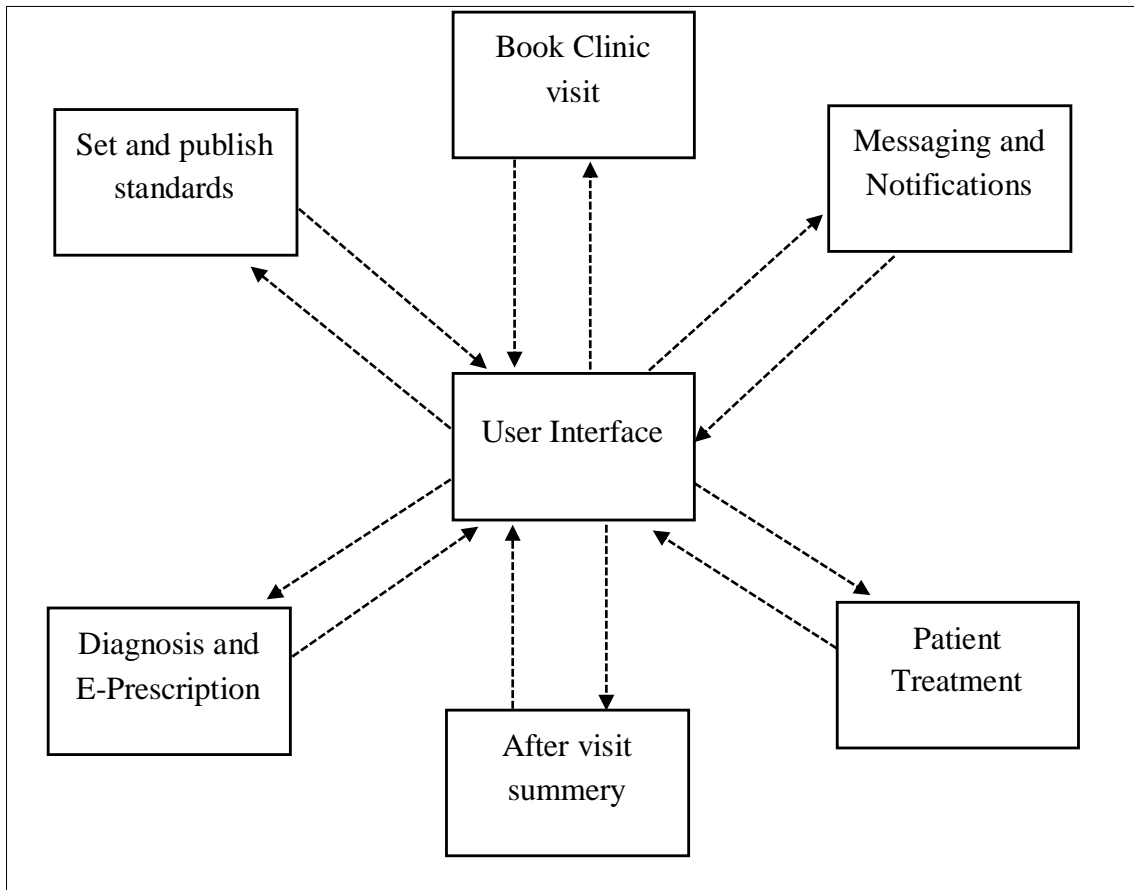
Fig 4.10: Package diagram of the proposed System
Class Diagram for the System

The diagram below is a class diagram of the AIS System which shows an overview of the system by describing the objects and classes inside the system and the relationships between them in a logical view.

Object Modeling: Class Diagram

Hospital/Clinic
- Name – string(20)
- Type – string(20)
- Designation-varchar (20)
- Assignment-varchar(20)
- Department-varchar (20)
- Username-varchar (20)
- Password-varchar(20)
- Approve()
- Treat()
- Notify()

1 — Manages — 1

:Patient
- Name – string(20)
- Username-varchar (20)
- Password-varchar(20)
- Book_visit()
- Message_clinic()

1 — Has — 1..*

Section Head
- Name – string(20)
- Assign()

1 — Has — 1..*

General Employee
- Assignment-varchar(100)
- Assignment()

1 — Manages

1 consist 1..* 1..* view 1 1 initiate 1..*

:Notification and Messaging
- description – string(200)
- ID-int(20)
- Notify()
- Message()

:Treatment
- Name – string(20)
- Description – string(20)
- ID - int(10)
- Treatment()

:Diagnosis and E-Prescription
- Name-varchar (20)
- ID–int(40)
- Description-var(400)
- Date-date(10)
- Diagonise()
- E-Prescribe()

Fig 4.11 Object modelling class diagram

Class Diagram key

Class Name
List of attributes
List of Operations
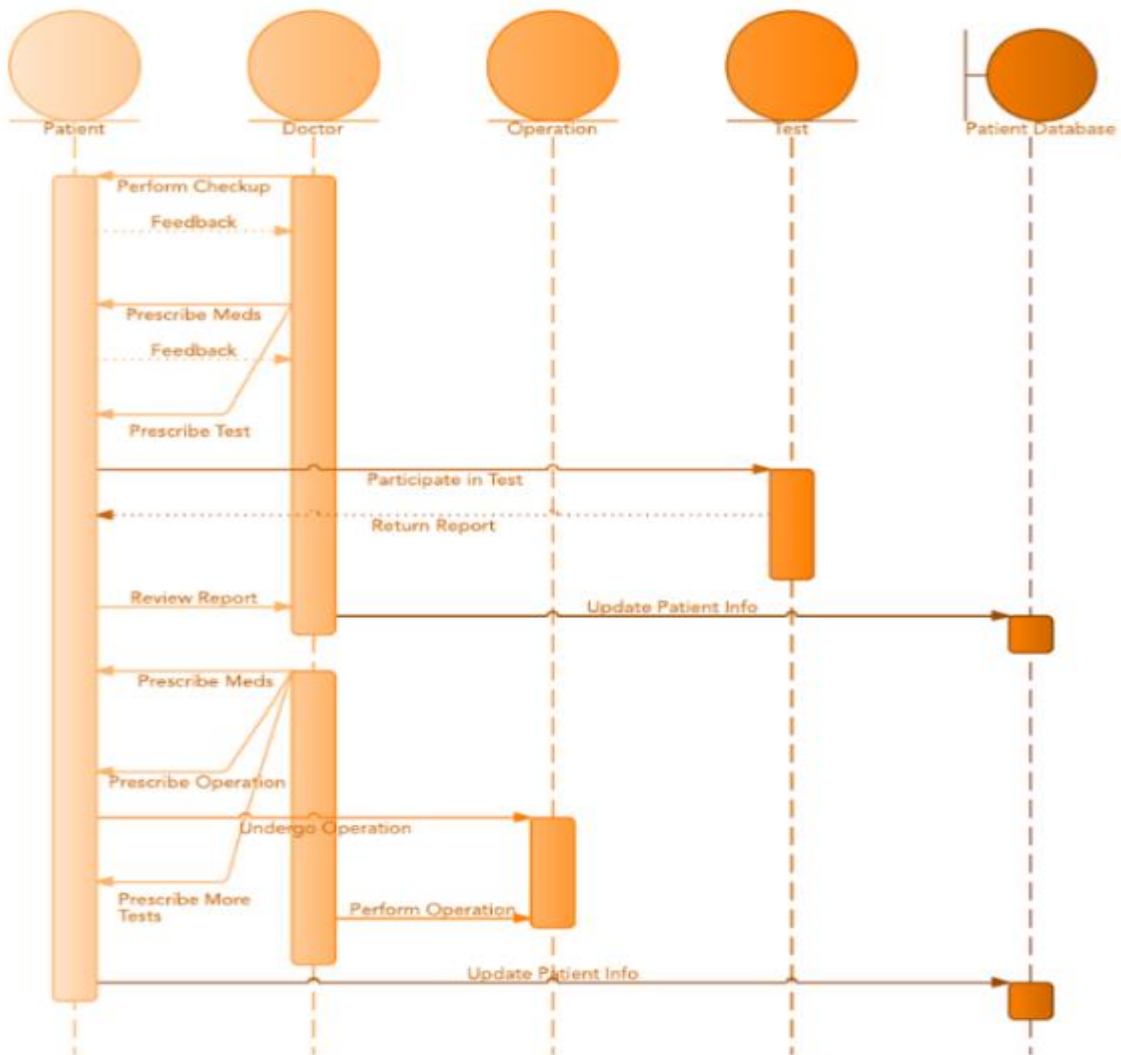
Fig 4.12 Sequence or Flow diagram

4.7 INTERFACE DESIGN

The researcher intends to design web-based platform integrated with an android application to be used by system users to input information into the system knowledge base before submitting the page to the server.

The following rules apply to input forms:

- Data will be validated on entry into the system.
- The tab/enter keys on the keyboards will be used to move to the next field for data input.

4.7.1 Menu Design

The researcher intends to design the main menu in such a way that the user will find it easier to navigate through the system and carry out the different tasks that are required.

4.7.1.1 Main Menu for the M-Health app system

The m-Health app will consist of different links that points to area of interests to system stakeholders and consist also of a link to the user login screen which will prompt the user to enter his or her username and password to have access to the system. Upon acceptance of the password and the username by the system a home page with a main menu will appear for the user depending on user type, each user type has a different home page with a different main menu this same mechanism is also applicable to the android application where flight bookings are made.
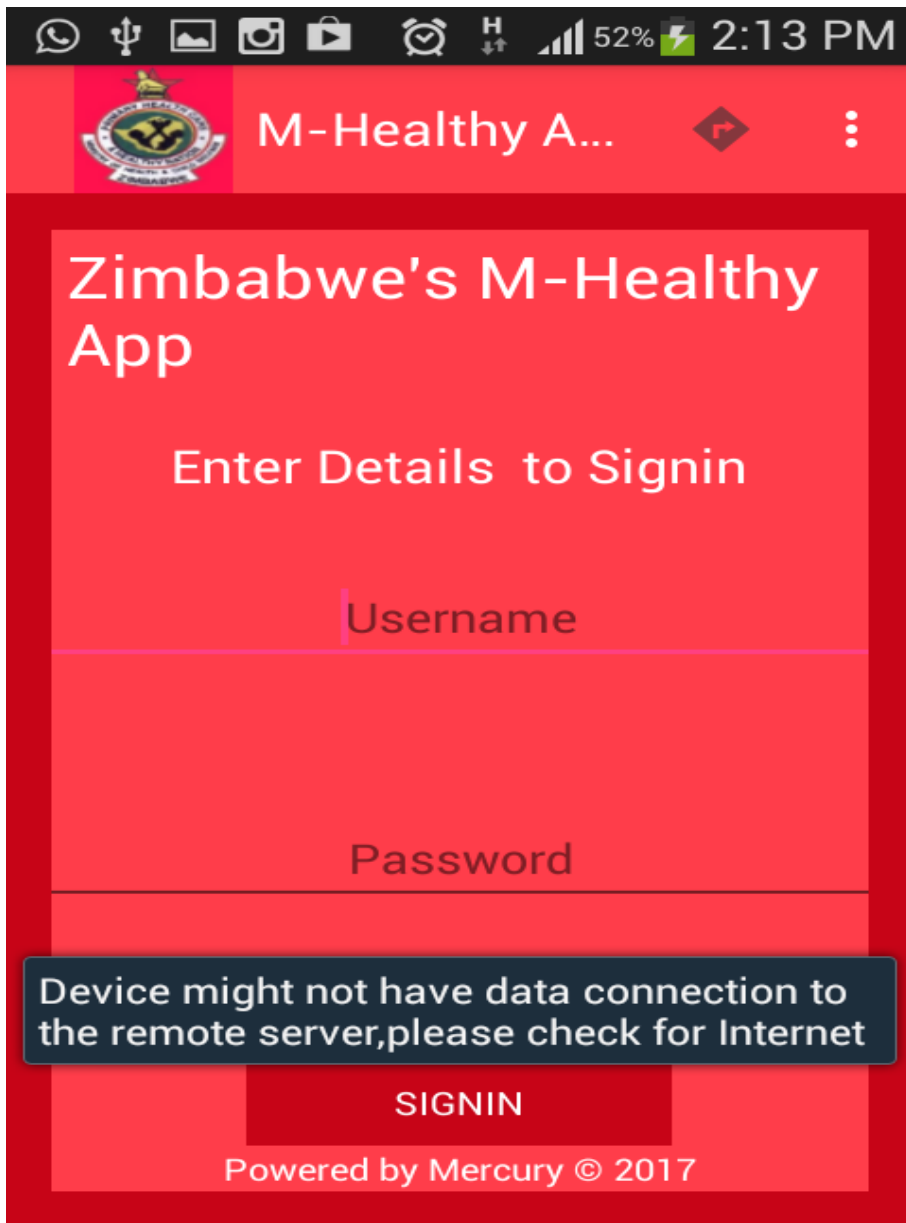
Fig 4.13 Main Menu

4.7.1.2 Sub Menu
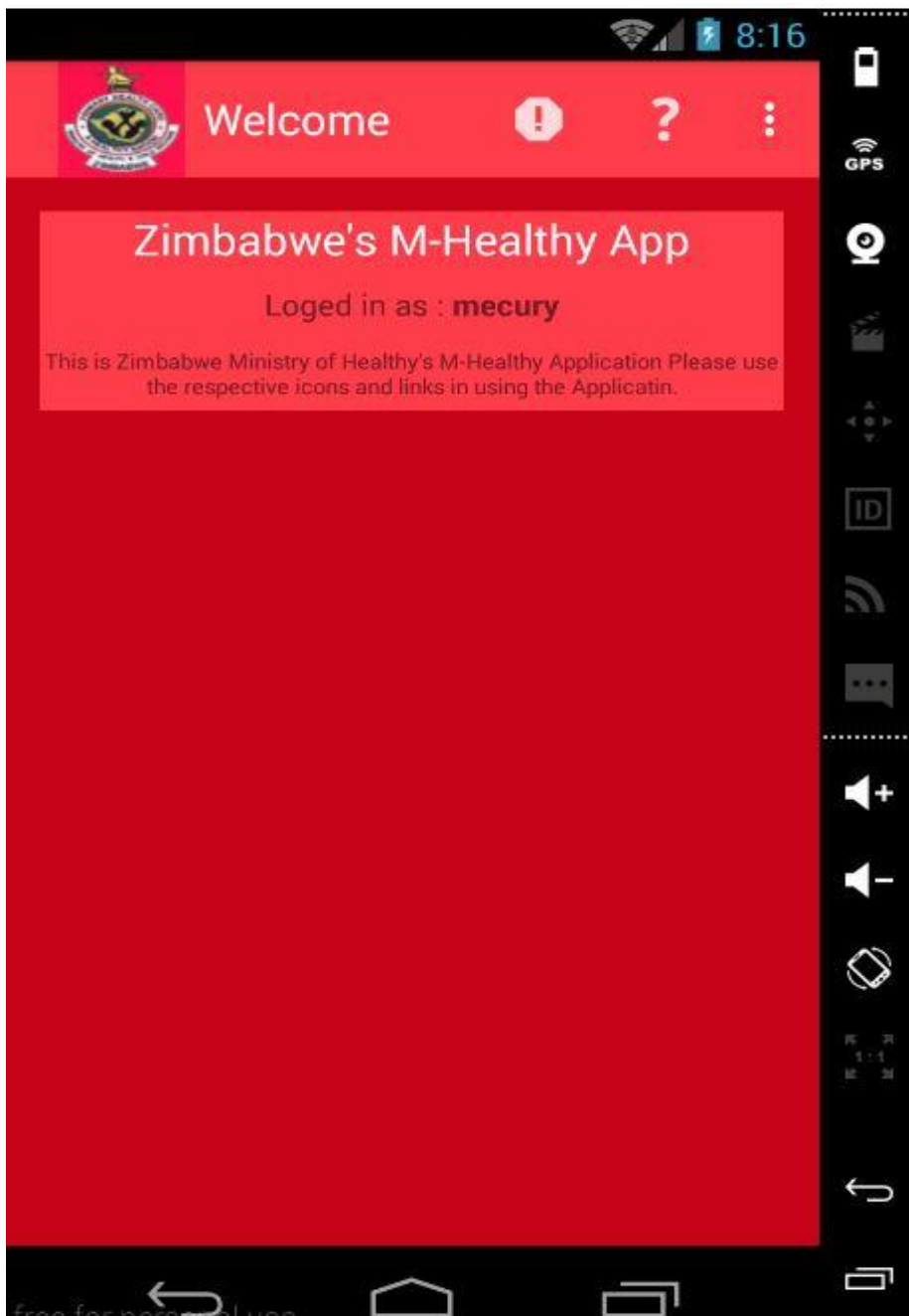
Fig 4.14 Sub Menu

4.7.2 Input Design

Procedure for Input Forms

The m-Health app will make use of graphical user-interface input format. All these forms are going to be characterized by the following:

- Appropriate captions or titles.
- To minimize input error and thus improved data quality input data validation.
- To be carried out for every form element e.g. if they is an input textbox for username, the system won't allow non-numeric values.
- Where input is known or is stored in the database, for example documents, users are not supposed to input the data from scratch but instead they select from a list, this ensures convenience in inputting of data.

Login Form

Fig 4.14 login form

Patient Book for Clinic visitation

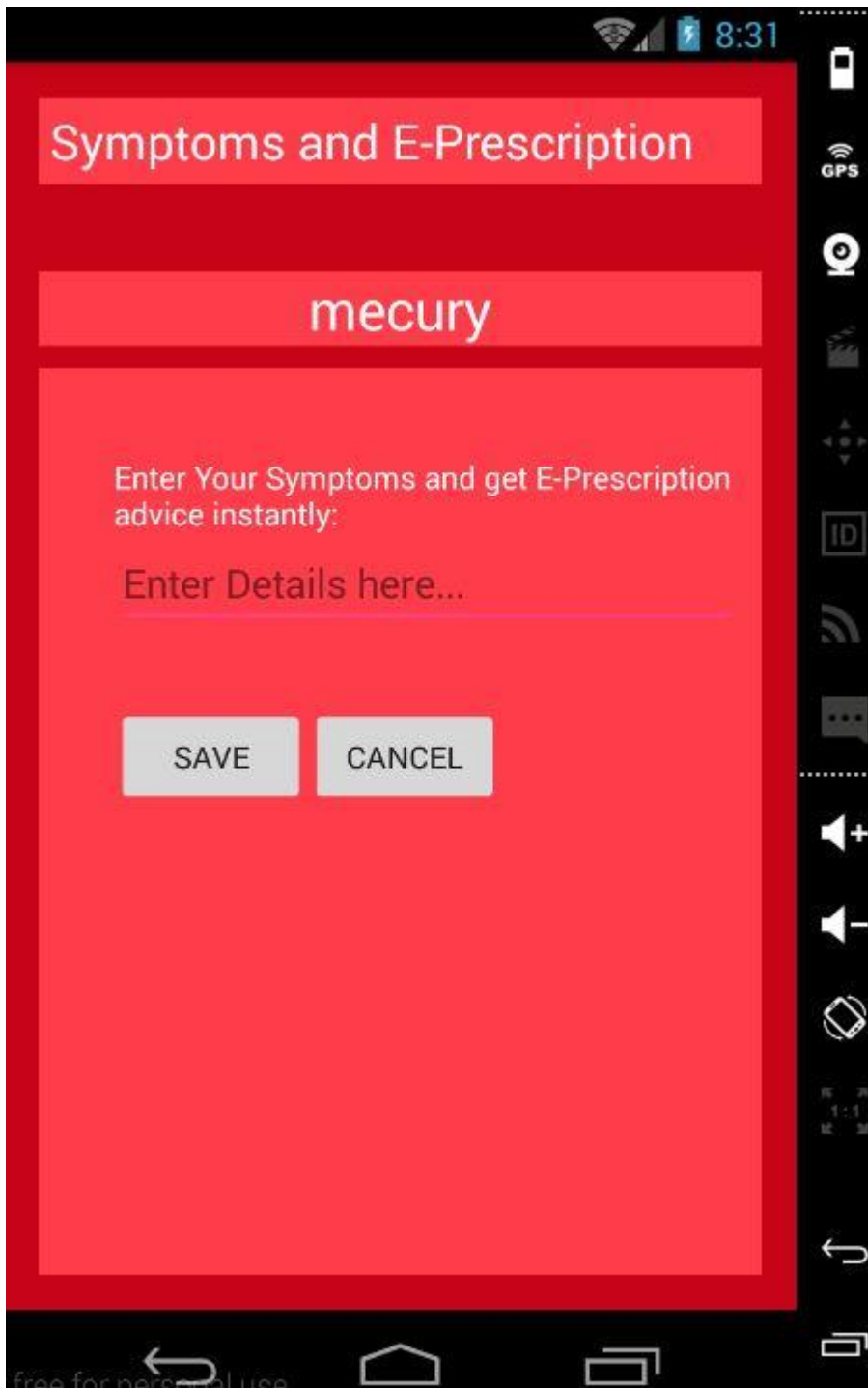**Fig 4.15 User sign up**

User Forgot password

Fig 4.16 Enter symptoms

4.7.3 Output design

The output design will mainly focus on the outputs that are produced after the processing has been carried out. The major output for the system will include reports such as, visitation Details, Notifications
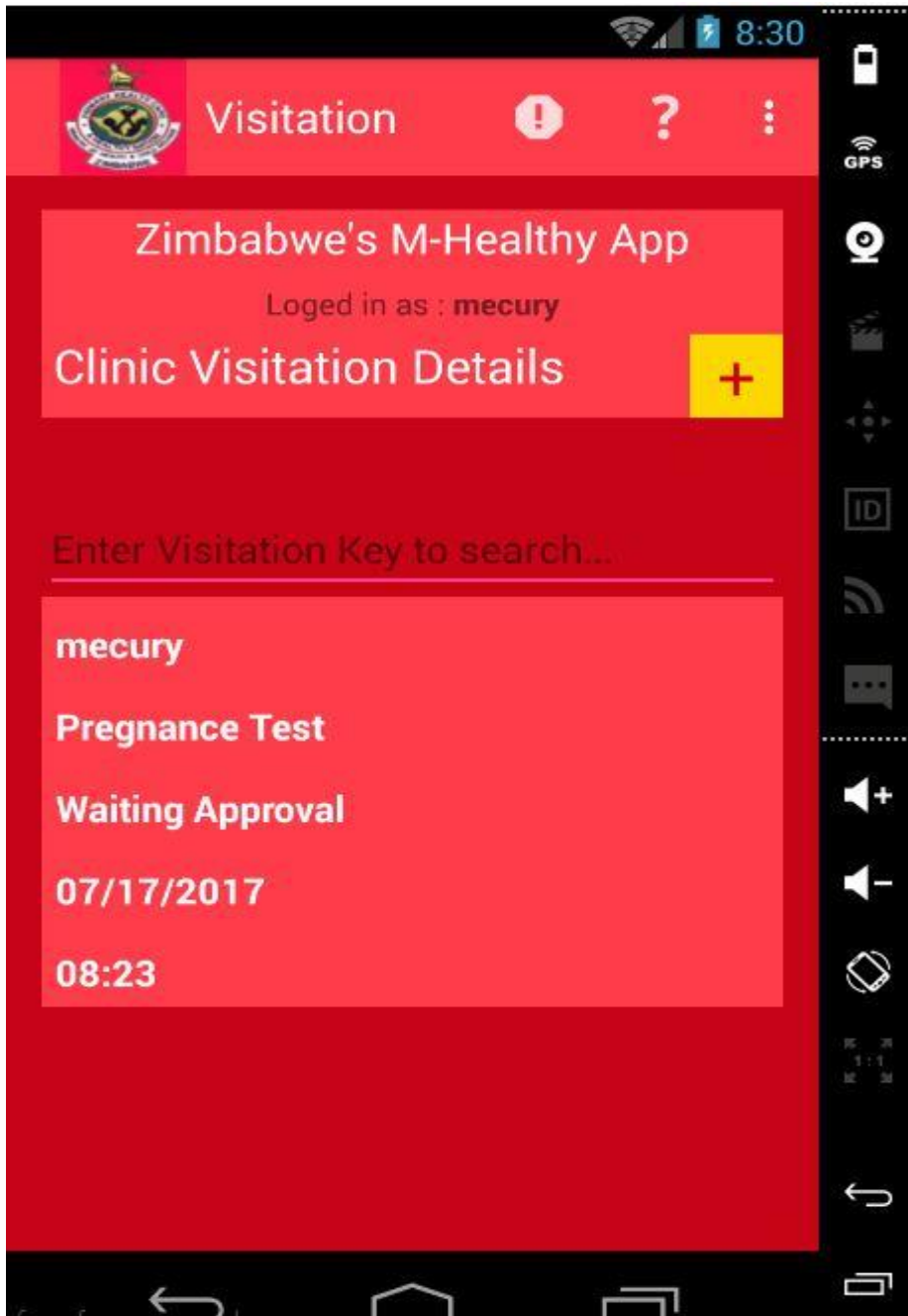

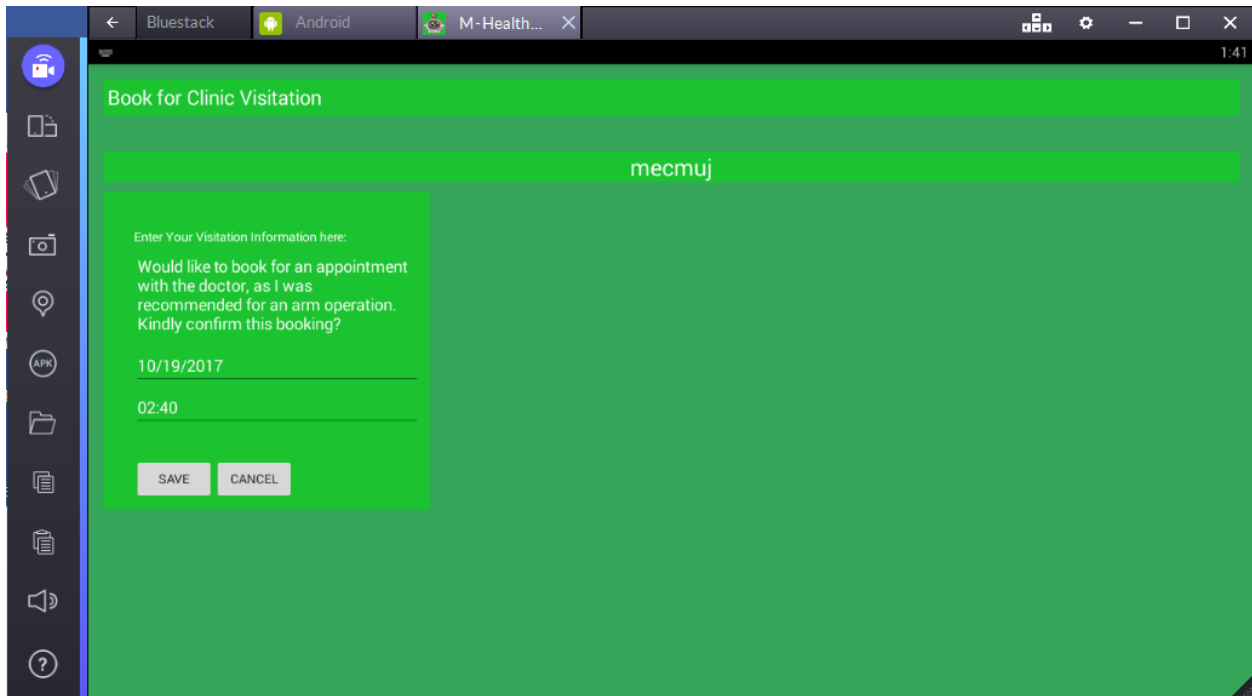**Fig 4.17 Output Design**

System reports

E-booking report

Fig 4.18 E-booking report

E-prescription report

Fig 4.19 E-prescription report

Notification Report

Fig 4.20 Notification report to the administrator

Fig 4.21 Notification details to the user

4.8 PSEUDO CODE

The pseudo code of the 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. Below is a full pseudo code of the entire proposed system.

User Login Module

// Responsible for authenticating user details and thus controlling access to the system

{

Accept Username, Password

Repeat

> **{**

> Select username and password from users table.

> Where username and password match those credentials entered.   **}**

If a match is found **Then**   **{**

> > **Direct** user to user home page based on session id page

> **}**

Else   **{**

> **Display** error message notifying user of failure during login process

> **}**

} // Close User Login Module

Manage Standards Module

//Validates the authenticity of the user that manages and publish standards

{

Accepts Clinic visit details

Repeat

{

Select patient ID

Where the patient ID matches the one entered.

}

If a match is found **Then {**

> **Capture** patient clinic visit

> **}**

Else **{**

> **Display** error message notifying the user of failure to book an appointment

> **}**

}

Patient Treatment Module

{

> **Function Capture Patient Treatment Details**

> **{**

>> Capture new patient details;

>> Select patient folder;

>> Store data in patient table;

> *}// close capture details function*

> **Function Validate Data**

> **{**

>> Validate entered details;

> **}** *// close validate function*

> **Function Upload**

> **{**

>> Read entered user details;

>> **IF** details entered are not valid **Then**

>> **{**

Error Message Shown;

Else   **{**

Upload database to site;

}

} *// end if statement*

} *// close output function*

} // Close User Maintenance Module

Upload Patient Messaging and Notification details

{

Function Patient Messaging and Notification details

{

Capture new notification details;

Select notification folder;

Store data in notification table;

} *// close upload notification details function*

Function Validate Data

{

Validate entered details;

} *// close validate function*

4.9 SECURITY DESIGN

The AIS system is to be designed along the following security concerns:

i) Software concern: The system has its own login control, which limits system users' privileges. Only those who have rights to the system can log in.

ii) Physical concerns: the system is modelled along the following concerns

● Lock and key

The administrator will give users login credentials which include their username and password to be able to log in to the system. Passwords are generated by the administrator only and are encrypted using the md5 algorithm to offer more security to the system.

4.9.1 Physical Security

The server on which the software will reside will be guarded by Security Company named Servco. This will restrict access to the server. Only Company personnel Computers will be allowed to gain access to the server room

4.9.2 Network Security

The server on which the software will reside is behind a firewall. This will restrict access to the server. Only Personal Computers (PC's) that have been configured to communicate through the firewall ports will be allowed to gain access to the server through specific port numbers.

4.9.3 Operational Security

The database will be secured through the use of the database password. The system administrator is the only person who can change the physical attributes of the database.

4.10 CONCLUSION

In this chapter, the system designer has established the overall health system architecture. This chapter has enabled the designer to identify and describe the fundamental m-Health system abstraction and their relationships. It has also addressed most of the system goals by applying effective design principles in preparation for the implementation phase.

CHAPTER 5: IMPLEMENTATION PHASE

5.1 INTRODUCTION

The system implementation phase initially gives an overview of the system code explaining its fundamentals as well the system programming language so as to understand how the system works. The system testing will be carried out in a way to find out bugs and yet unidentified errors for correction before the final system is implemented, the system installation is then carried out and the maintenance is observed repeatedly and it takes the entire life of system being maintained after installation.

5.2 Coding

According to Whitten et al (2013) Pseudo Code refers to an outline of a program, written in aform that can easily be converted into real programming statements. Pseudo code cannot be compiled nor executed, and there is no real formatting or syntax rules. It is simply one step – an important one in producing the finalcode. The benefit of pseudo code is that it enables the programmer to concentrate on the algorithms without worrying about all the syntactic details of a particular programminglanguage. In fact, pseudo code can be used without even knowing what programming language will going to be used for the final implementation. Below is a full pseudo code of the proposed system.

5.3 Testing

According to James (2014), is a way of finding out errors and tries to debug the system, before the system can be installed on a machine it is essential to conduct tests to check for errors such as syntax errors and some errors which might compromise on the quality and overall functionality of the system of the system

The testing for the mHealthapp was done in the following phases:-

- Unit testing
- Module testing
- System testing
- Acceptance testing

The diagram below gives a summarized overview of the testing process.
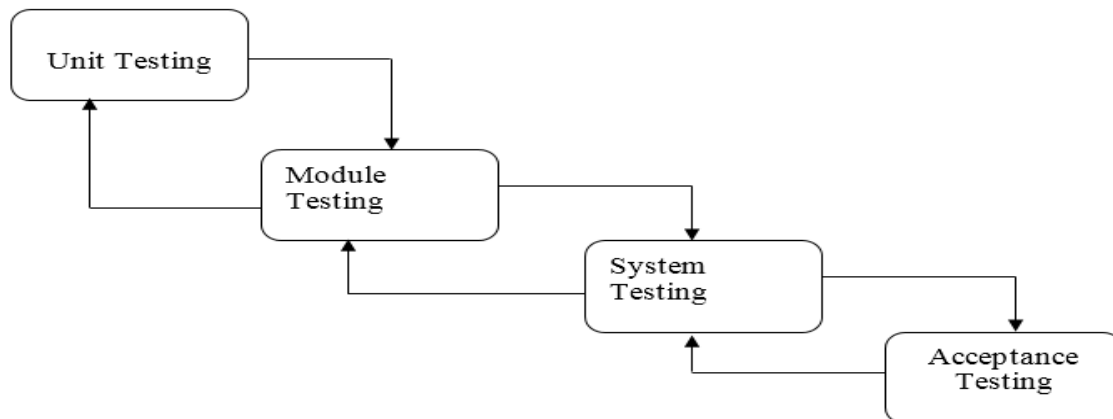
Fig 5.1 testing phases
5.3.1 Unit testing

This testing technique focuses on a unit of the program which can either be a function or a module.

All the modules within the system were tested to verify whether there were any bug such as runtime errors that might occur whilst the system is in operation. There are two different techniques that we used for the unit testing and these are:

➢ Black box testing–this involved testing of the inputs and outputs produced by the systemwithout taking into consideration the internal operations of the system. This involved checking outputs such as reports to verify whether they were producing the required outputs.

➢ White box testing this 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 Module Testing

Different units within a module are combined to test on the functionality of a module as a whole. More than one module in the system is tested to see if they are meeting all of the required functionalities.

5.3.3 System Testing

This process of the system testing cycle tests all programs and this ensures that everything necessary is in place, for instance proper documentation. It involves testing of the wholesystem to measure efficiency and effectiveness of the system. It is essential tomea sure the systems' functionality with the stated objectivesand this is done during the process of system testing. Functions such as security and output generation will be taken into account as users go through the system. There are also other issues that are taken into consideration such as the compatibility of the software to the hardware and how the system will adapt to computer threats.

5.3.4 Acceptance Testing

The users need to accept the system and they can only do so after they have tested the systemthemselves and accept to use the system.This is one of the final stages before the system is accepted for use. In this stage errors and omissions that the developers might have missed are discovered. The system will be installed to a sample group of users who will provide feedback on the system's functionality.
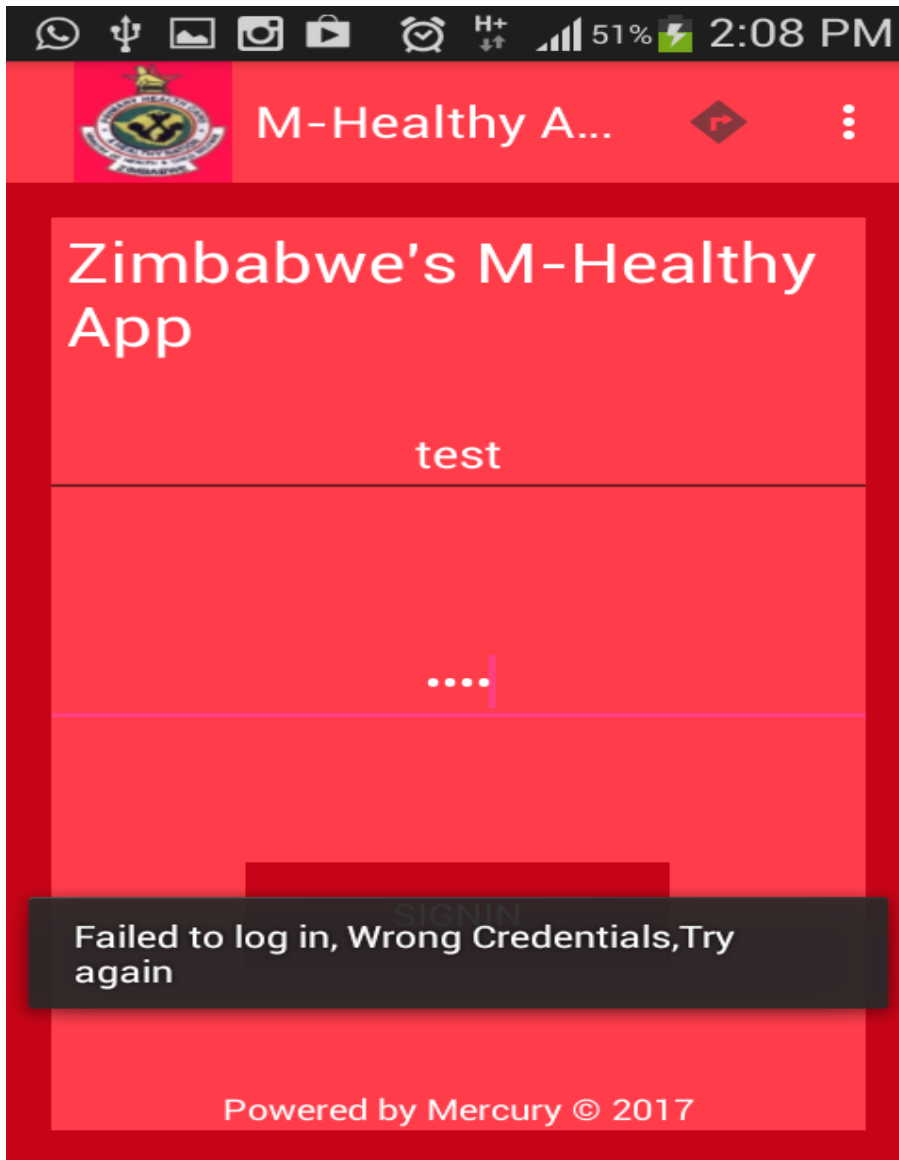
5.3.5 Alpha Testing (Verification)

With alpha testing we sought to answer the question "Are we building the product right?" This refers to a set of activities that ensure that software correctly implements a particular function. Primarily, we are looking for errors and omissions regarding end user and design specifications that were specified earlier but not fulfilled during system development.Requirements specifications and the actual system are compared and proved that what the system does basically is to solve all the stated problems and even does more than what the management had requested for. From this basis, one can conclude that the system is an excellent product for organisation.
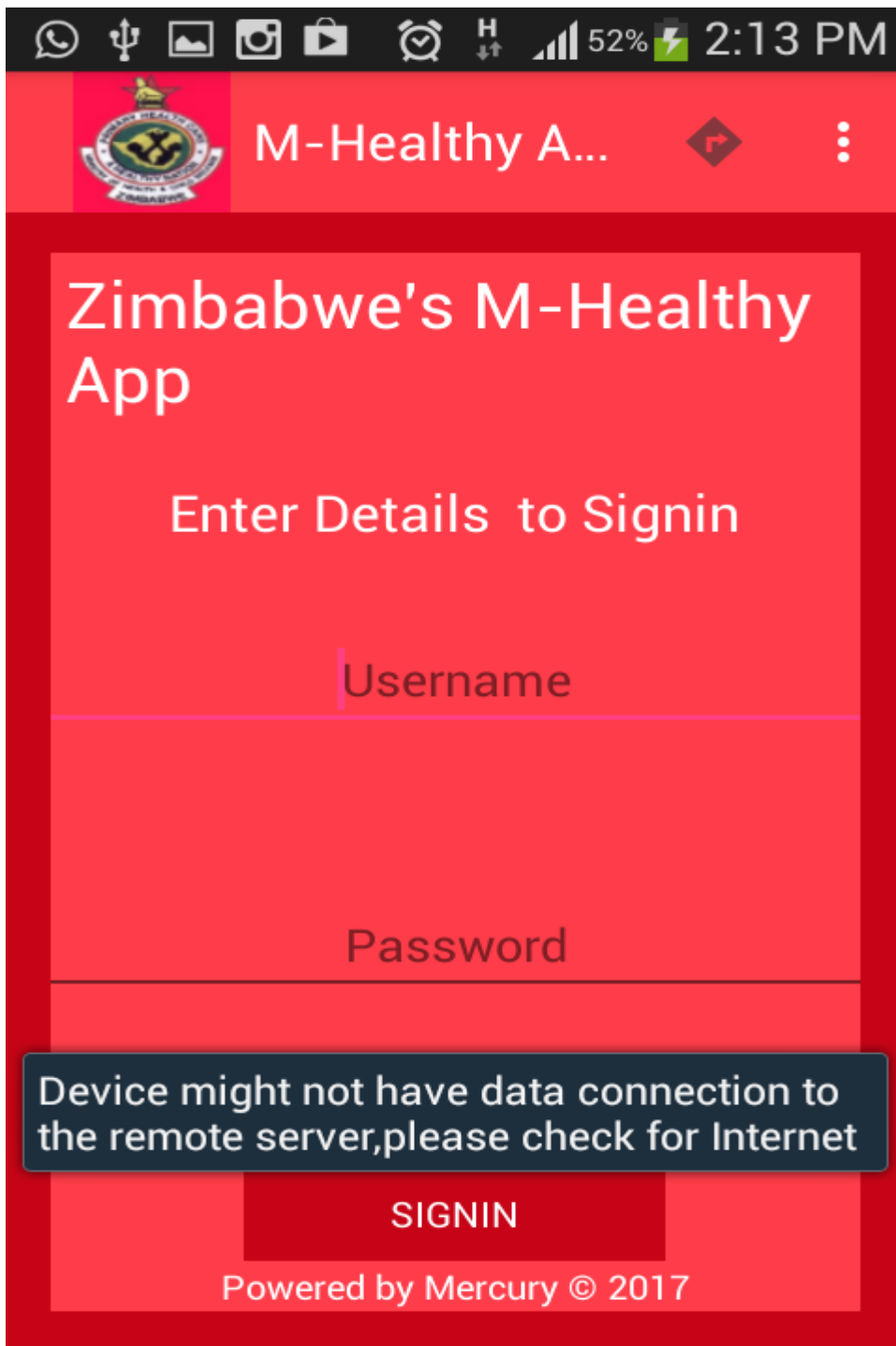
Login testing

 ➢ Login testing involved testing of whether the given username and password can actually give access to the user.
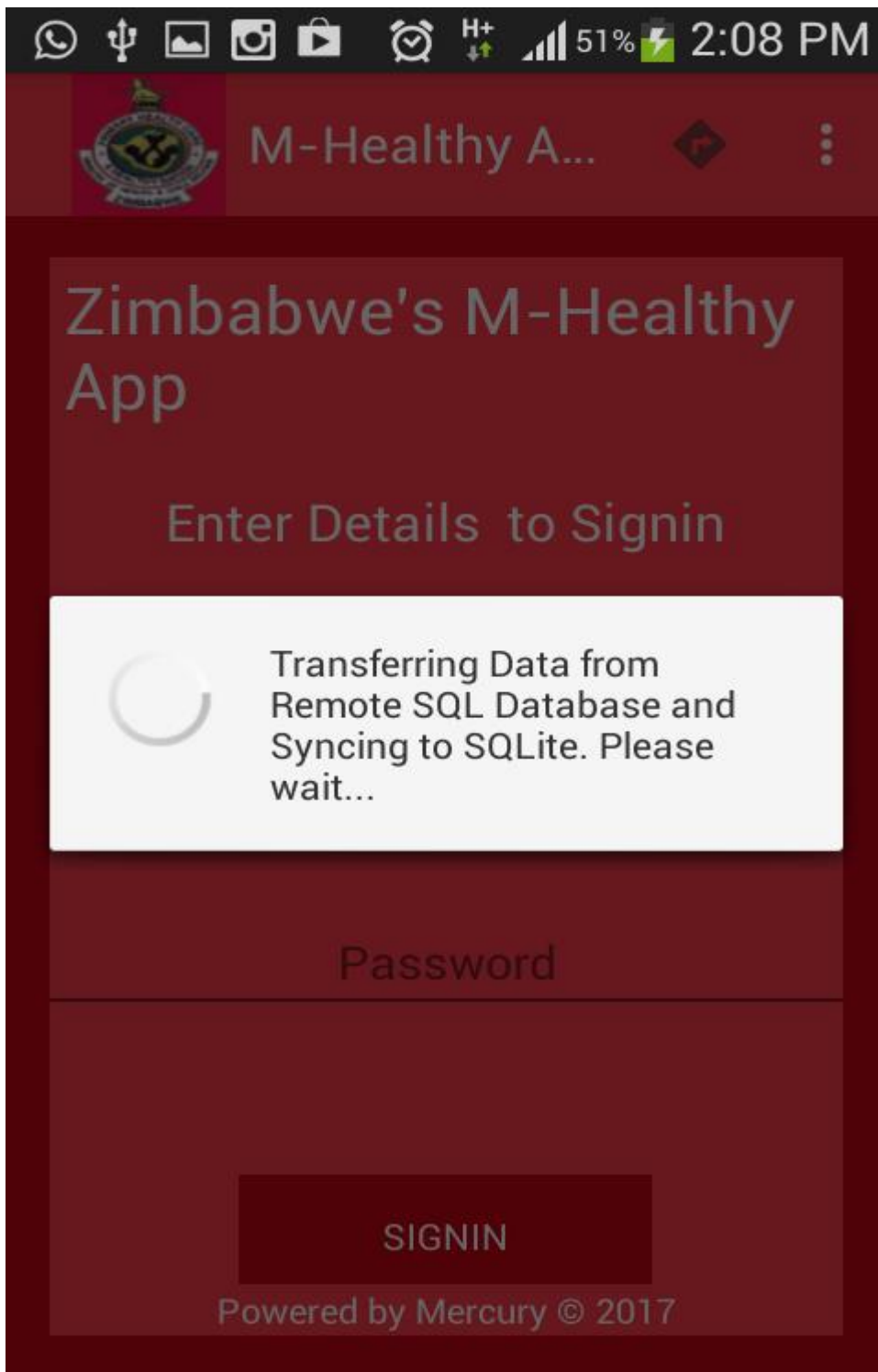
This message will appear when the user input incorrect username and/or password.

Fig 5.2 Login testing

Fig 5.3 Network testing verification

Fig 5.4 Data synchronization verification

5.3.6 Beta Testing (Validation)

This type of 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 the data to be saved is met that the data can be accepted and saved into the system. The system is tested using real data supplied by the workers and all the administrators who would be using the system will also input their data. Errors and omissions in system requirements are discovered and this process continues until system is ready for delivery.

5.3.6.1 Validation of null values

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.
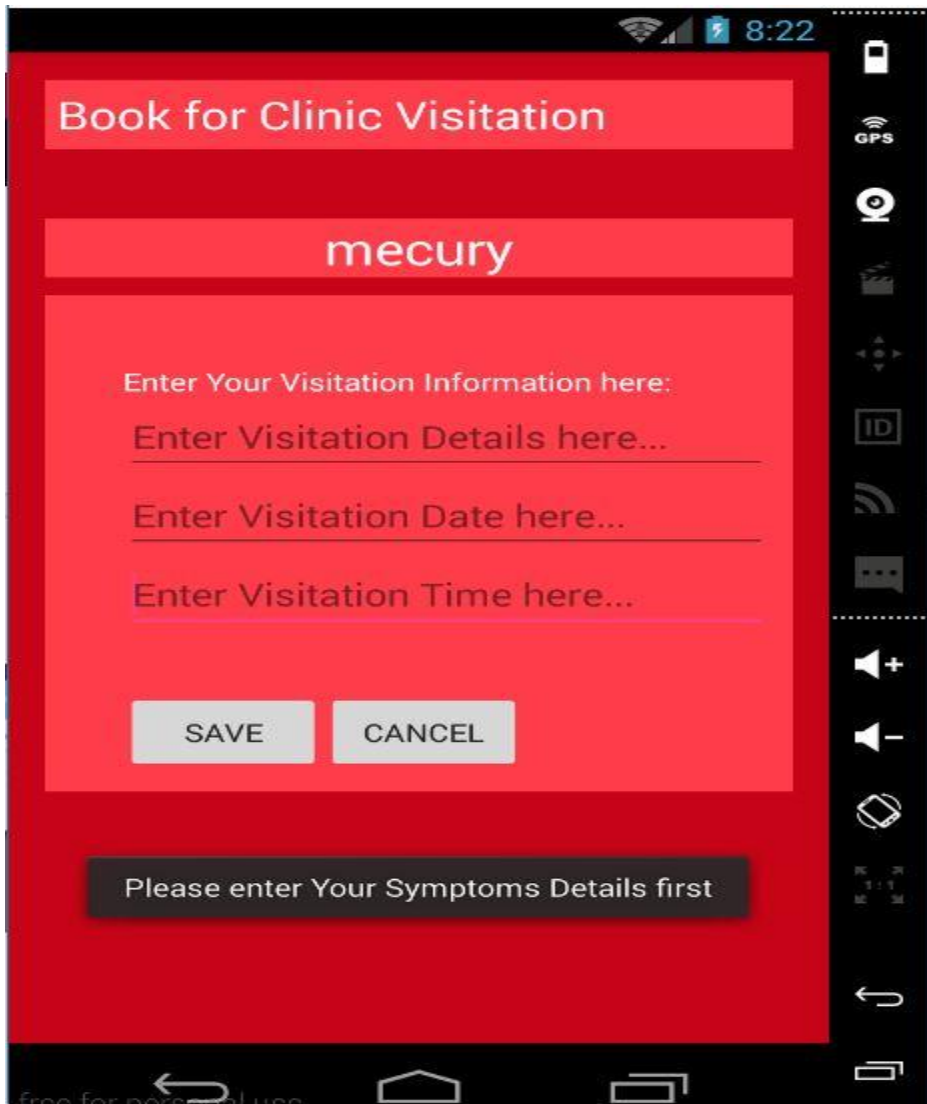
FIG 5.5 Validation for null values
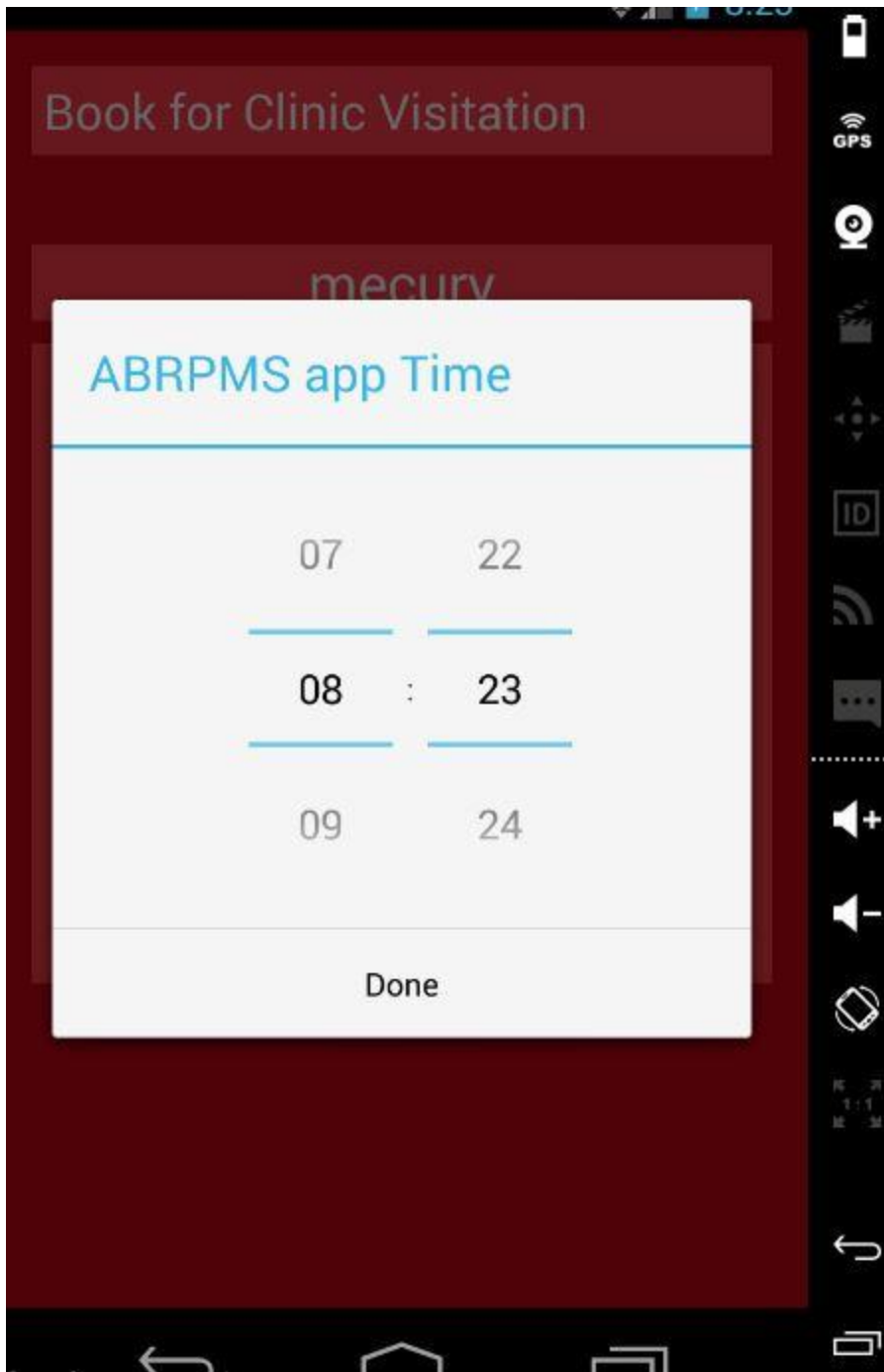
Fig 5.6 validation of time field

5.3.7 Purpose of Testing

- To find bugs. A bug can be defined loosely as non-conformance to specifications
- Debugging is the process of fixing and correcting such bugs.

- It is useful to separate successful if a bug is discovered since this demonstrate that the test was designed and applied correctly.
- The fig below shows a modified version of the Waterfall model that incorporates discrete testing stages.

5.4 Installation

Mathers, M. (2015), installation is when the developed system is being installed. Users are changing from using the old manual system to using the new system. In this phase the required software is installed on the appropriate hardware converting from the as-is system to the to-be system. Users are moved from using the old system to using the new system. The system is installed within the m-Health app network as defined within the design documentation.

5.4.1 Steps for Application Software Installation

➤ The system is installed from the software C.D
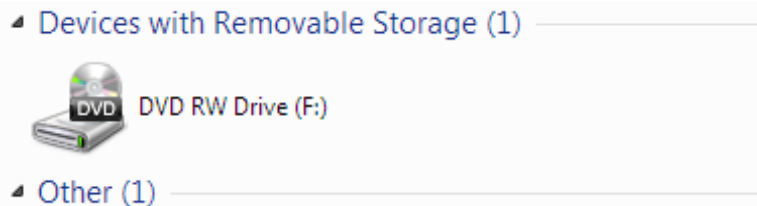
Fig 5.8 Step 1 in Application software installation

➤ Install system to path. (It is recommended that the system be installed to the program files folder (local disk C).)

Fig 5.9 Step 2 in Application software installation

➤ Verify that the system is installed properly that is all folders are installed.
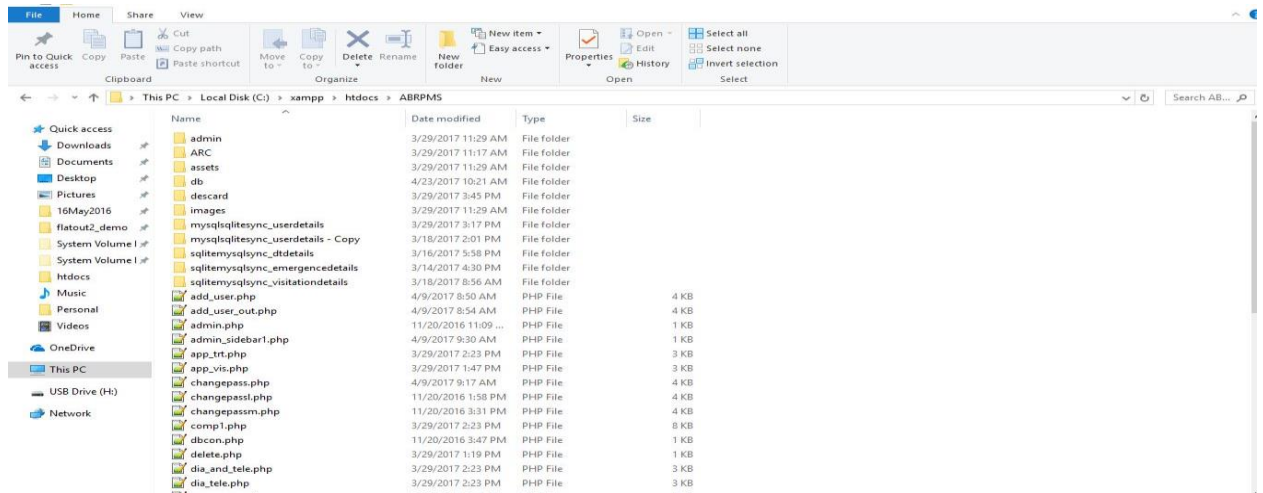
Fig 5.10 Step 3 in Application software installation

> ➢ Add the system data source.
> ➢ Connect data source to the database on the main server housing the system database.
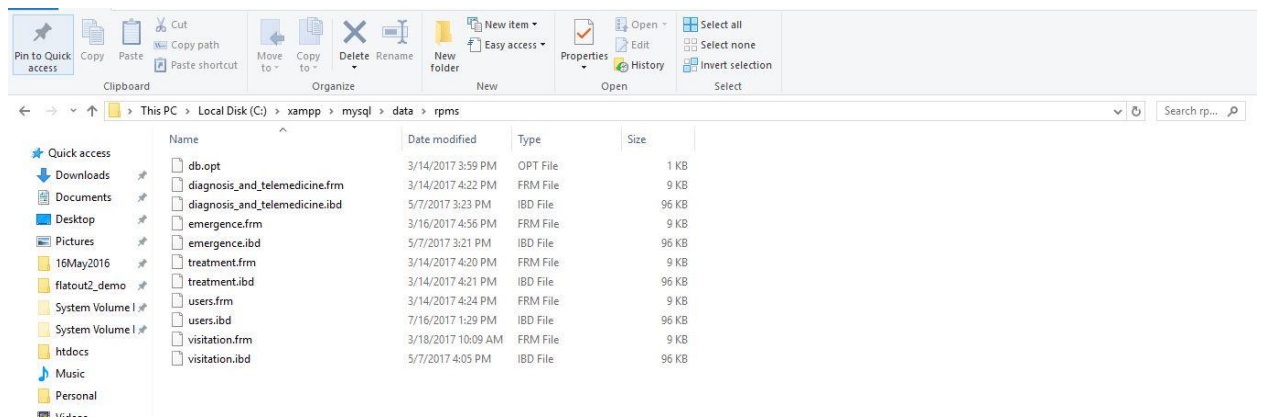
Fig 5.11 Step 4 in Application software installation

5.4.2 Database Installation

The database management system (DBMS) will use Microsoft SQL Server 2012. The DBMS is installed on a central server, which will serve all the other terminals and thus is the Central database.

5.4.3 Methods of conversion

Several methods were taken into account before selecting the best conversion method to use. The methods that were taken into account include the following:

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

5.4.3.1 Pilot conversion

Cliff (2014), 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.

5.4.3.2 Direct conversion

According to Cliff (2014), this 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 system.

5.4.3.3 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.

5.4.3.4 Parallel conversion

This 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 due to the existence of backup options provided by still operating the existing system.

Why choose parallel conversion

Parallel conversion allows changing the current system with the new system. It helps by:

- Giving the user a better background and backup to refer back to.
- If the new system fails, the old system can be used without any extra cost incurred.
- No loss of essential data as the system is installed in parallel.

5.5 Maintenance

Tannenbaum (2013), having the system handed over to the organization, the system must be checked continuously so that it performs its operations efficiently.

- Thus the systems need to be administered, audited and modified as business's needs change and as the users identify errors within the new system.
- Initially, reviews are carried out on a monthly basis and later on, they will be done yearly. This is because during the first days, if there are any problems arising or that may have been identified; they are corrected as a matter of urgency.
- Later on, after some time the system will have stabilized. Annual reviews are conducted so that if there are any changes they will be attended to and the system continues to functions in a way that boost the business status.
- The system will need to be reviewed and this is done through system maintenance.
- The management was taught that maintenance is an important process to be given good attention if the system is to live longer while delivering goods.
- The system maintenance is important because:
  ✓ A system continues to change and evolves as it is used.
  ✓ The changes will be arising, change and evolve as it is used.
  ✓ The changes will be arising from change request due to the problems.
  ✓ Reports from operating groups who identifies the bugs in the system that must be fixed.

    ✓ Changes will be arising from users.

- There are three different types of system maintenance, which are:
    - ✓ Corrective maintenance
    - ✓ Perfective maintenance
    - ✓ Adaptive maintenance

The Maintenance Process
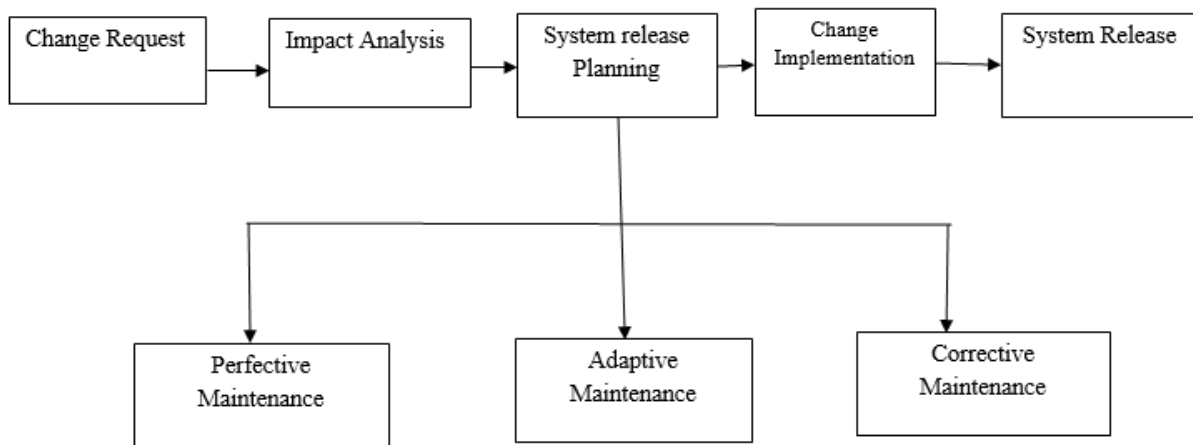
Figure 5.12 Maintenance process
5.5.1 Corrective Maintenance

This is concerned with correcting discovered and reported error. Errors range from wrong implementation (dividing instead of multiplying) to completely not performing. Once an error has been reported, investigations are to be launched to establish the root and cause of the errors. As soon as these are established, a design is mapped out for how to effectively correct the error, followed by the correction (implementing the corrective design). Once a correction has been made, weekly reviews or follow ups should be made to make sure that everything is in place, and to make sure that no new bugs were introduced during the fixing. All the correction activities from the investigations to the implementation are documented.

5.5.2 Adaptive Maintenance

Like any other system, the m-Health app operates in an ever-changing environment. The changing of the environment also detects that the system be accordingly changed. During adaptive maintenance, the situation or condition calling for a change is analyzed to get a better understanding, leading to designing how to integrate or introduce the design into the existing system, and finally implementing the change. Once a change has been implemented, monthly reviews, depending on the size of the change, are to be done to make sure that the implementation was correct, and to make sure that no bugs were introduced during the implementation of the change. All adaptive maintenance change activities, from analysis all the way to the implementation should be documented.

5.5.3 Perfective Maintenance

During development it is not always the case that the best implementation is implemented. It is not by design that the best implementations are not implemented, but at times situations such as schedule constraints or even ignorance, detect that it be like that. During perfective maintenance the goal is to implement a better version of what already in place, as well as to add missing functionalities. This is achieved by first assessing whether it is worth the effort to perfect the system to those extents. If it is, then design specifications should be drafted and when approved implemented. As with any other maintenance activity reviewing is done. All activities ranging from analysis to implementation are to be recorded.

5.5.4 Software Application Backup Services

The system developer will provide the application backup service. For system code related problems, system code debugging and modifications the organization will need to consult the developer or any computer software developer who is familiar with the PHP and Java language. As for the operating system backup service the operating system software suppliers will provide this.

System Security

This 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 business.

Physical Security

This 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 where the backup information is going to be located and the server will be fitted air conditioners to prevent the machines from overheating.

Software Security

➤ Administrators' passwords and usernames will be used to gain access to the system, to ensure that privacy prevails and to avoid data destruction by malicious-users. Only authorized users will have usernames and passwords for the system.

➤ Directors and Management 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 data.

5.5.5 Performance in relation to Objectives

The newly developed system works satisfactory so to say. It has managed to meet the following objectives as originally specified:

• Electronic Prescribing (e-Prescribing) and work flow integration: Through electronic Prescribing and workflow integration from clinical systems which link up legacy systems of health care pharmacy players, instead of using handwritten or faxed notes or calling in prescriptions.

• Push notifications for preventative care on pandemic spread

• Booking appointments: Patients being able to book appointments with the doctor from a mobile application.

• Messaging providers: Enabling the patients to contact the providers from an android application making their queries known.

• Accessing after visit summaries and Electronic lab test results.

5.6 Recommendations

Given that the system was successfully implemented and that parallel conversion is being used, there is room for further improvements and partial automation to the System. Below is what can be done to enhance the system.

- Since the system is a combination of mobile and web based system there is need to for continuous improvement and make use of new technological system to an extra mile on providing products that are of higher quality, as well the system should also be integrated with a private hospital systems so that all information on patience can be easily viewed from both governmental and private hospitals and clinics without any hustles and will be efficient.

5.7 Conclusion

The objectives having been met and the system having been implemented successfully, the project can be said to be a sounding success. Proper verification and validation of the system was done so as to come up with a system with data integrity. Finally the overall objectives stated in the initial stages of the project were met.

Appendix A: User Manual

Below is a login page of Android Mobile Health system, this is where the users of the system enters their login credentials using their respective usernames and passwords in the space provided.
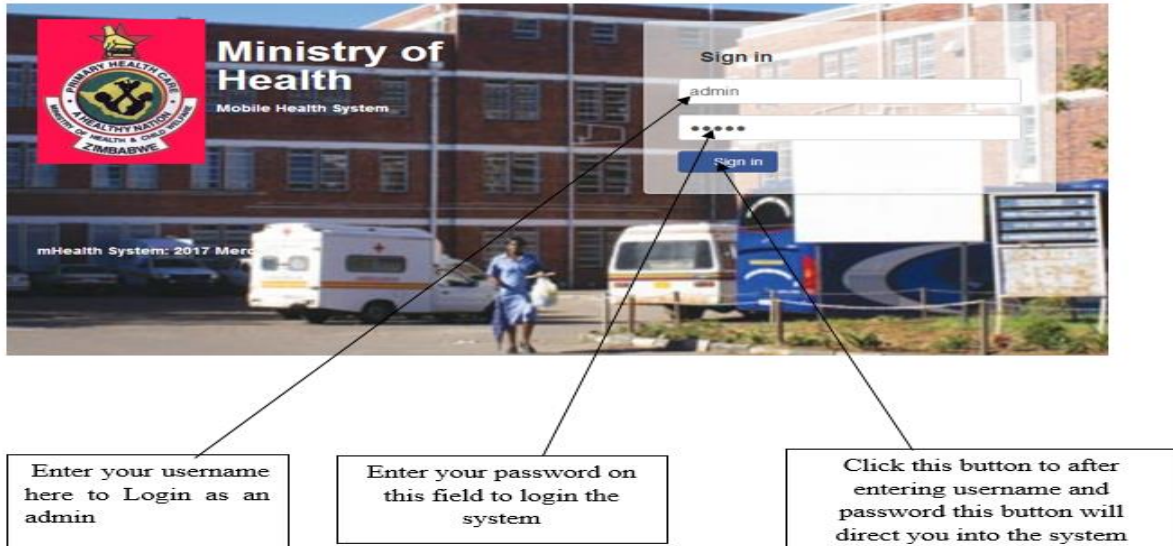
Mobile health dashboard

This is the main entry of the system after the admin has logged in successfully, the admin will be directed to this page.
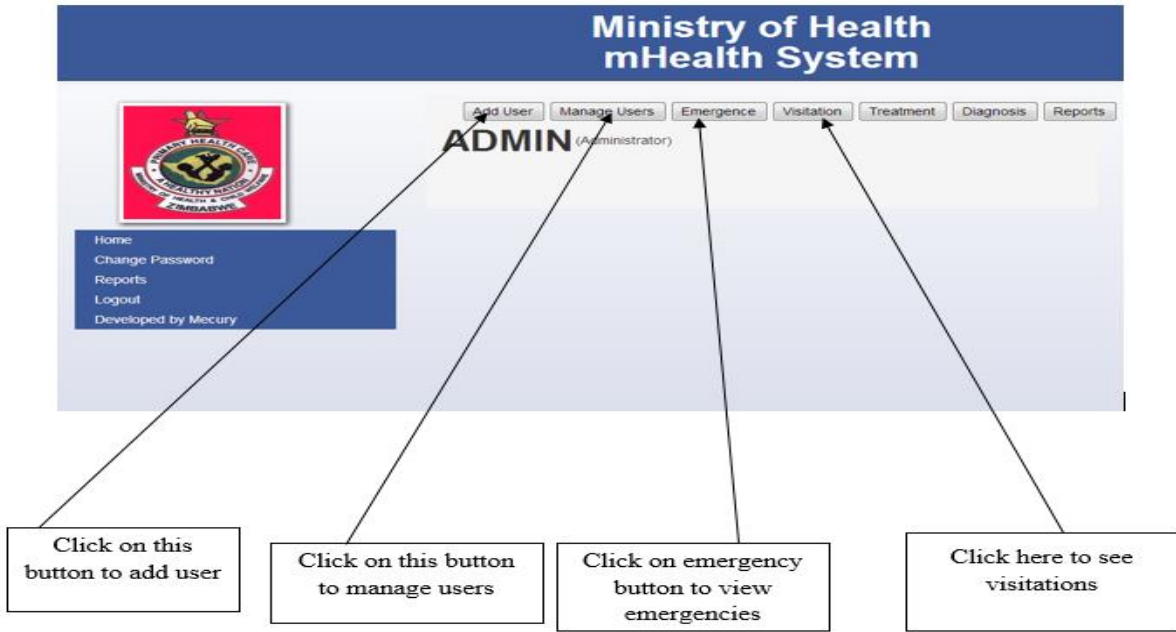
Add user
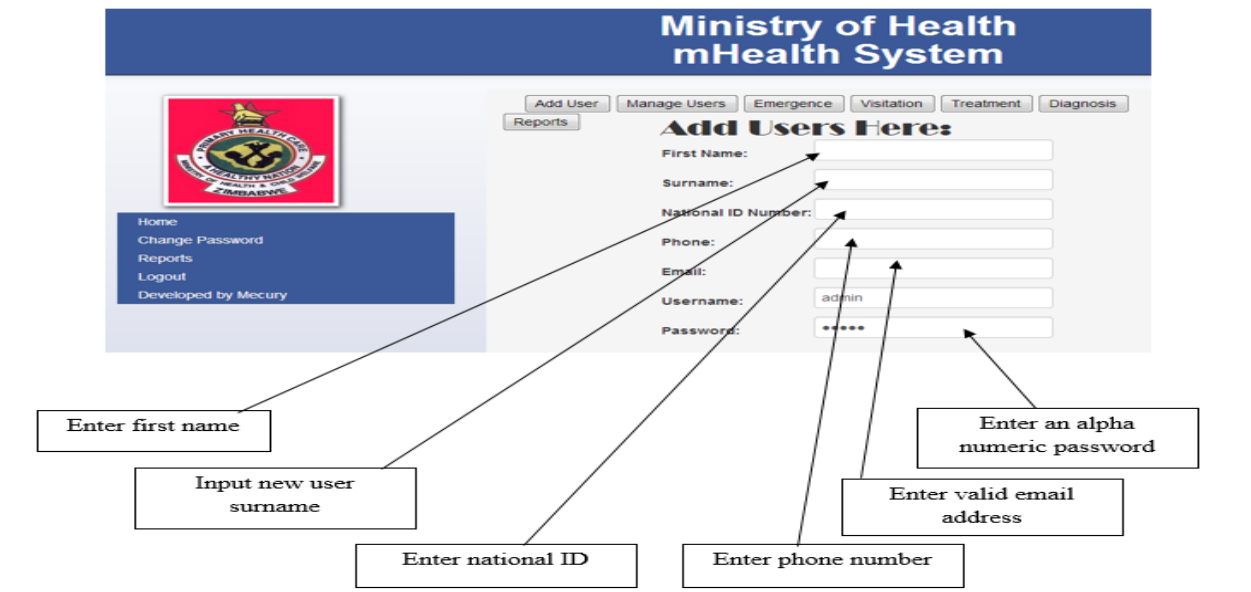
Change password module

This module enables the user to change the password

DIAGNOSIS DASHBOARD

Visitation dashboard

Visitation dashboard

Click here to see the visitations

This grid shows the visitations details

Manage Users Dashboard

Click here to logout

Allows the admin to add a user

Allows the admin to delete a user

Emergencies

Ministry of Health mHealth System

Add User | Manage Users | Emergence | Visitation | Treatment | Diagnosis
Reports

Home
Change Password
Reports
Logout
Developed by Mecury

Emegences:

PATIENT ID	DESCRIPTION	DATE	TIME	STATUS	ACTION
mecmuj	i am not feeling too well. feeling very weak and sweating , please come pick me up at 4 windsor park	10/15/2017	13:22	Pending	
mecmuj	i have been vommiting since morning, feeling weak and sweating. I need emergency	10/15/2017	21:18	Pending	

Click the button to view emergencies

This table shows information relating to emergencies

Appendix B: Interview Checklist
Ministry of health

Interview Details

1. Name of Interviewer _____

2. Position of Interviewee _____

3. Department of Interviewee _____

Interview Questions

1. For how long have you worked for the health sector?

_____

2. How would you rate the current system that prescribe the patient

_____
_____
_____
_____
_____
_____

3. What are the problems that are arising from this current system?

_____
_____
_____

4. What is the average time taken in making decisions?

_____
_____
_____

5. Do you manage to keep track of all your patients and respond to their symptoms?

_____

_____

_____

6. Are there any reports that are needed and how long does it take to compile one, if any?

_____

_____

_____

_____

7. Do you think everyone is comfortable with the current system?

_____

_____

_____

_____

8. What do you suggest be done to improve the current system?

_____

_____

_____

_____

9. Do you think the introduction of a mobile health system would be appropriate? Why?

_____

_____

_____

10. How well do you think the above change will be accepted by the other employees?

_____

_____

_____

11. Do you think this change will overcome the problems that the current system has?

_____

_____

_____

12. Any other comments or additions?

_____

_____

_____

Signature _____

Stamp
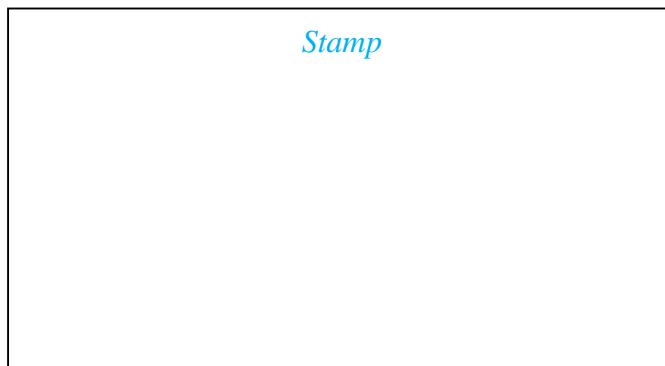
Appendix C: Questionnaire
MINISTRY OF HEALTH

QUESTIONNAIRE

NOTE: PLEASE TRY TO ANSWER ALL QUESTIONS SINCE THERE IS CONFIDENTIALITY AND TICK ONE BOX WHERE APPROPRIATE.

	Yes	No
1. Are you satisfied with the current system?	☐	☐
2. Do you think decisions that are made using the current system are accu	☐	☐
3. Do you experience any difficulties with the current system?	☐	☐
4. Do you keep track of your patients?	☐	☐

_____
_____
_____
_____
_____

5. How do you feel about introducing a mobile health system?

_____
_____
_____
_____

7. What do you think will be the benefit/s of having a mobile health system?

_____

_____

_____

_____

_____

8. Any further comments or suggestions?

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for your cooperation.

Stamp
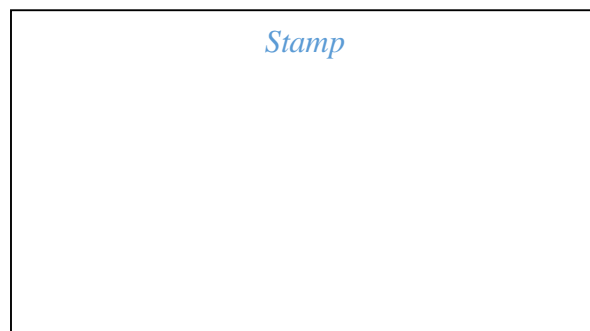
Appendix D: Observation Score Sheet
MINISTRY OF HEALTH

OBSERVATION SCORE SHEET

Observer _____

Department _____

Date _____

Observation

_____

_____

_____

_____

_____

_____

_____

_____

Conclusion

_____

_____

_____

_____

Stamp

Appendix E: Code Snippet
Login

```
<form name="login" method="post" action="">

        <fieldset style="width:60%; border-radius:5px; background-color:#09F; opacity:.9;">

                <legend>Login Here</legend>

                <table>

                <input type="text" name="user" id="textfield" size="40" placeholder="Reg
Number" required /><br/><br/>

                <input type="password" name="pwd" id="textfield" size="40"
placeholder="Password" required/><br/><br/>

                <input type="submit" name="loginbtn" value="Login" id="button" />

                </table>

                <?php

                error_reporting(0);

                include_once('connections/db_connect.php');

                @$reg_number = mysql_real_escape_string($_POST['user']);

                @$pwd = mysql_real_escape_string($_POST['pwd']);

                if(isset($_POST['loginbtn'])){

                $selection = mysql_query("SELECT * FROM users WHERE reg_number =
'$reg_number' AND pwd = '$pwd'")or die (mysql_error());

                $counter = mysql_num_rows($selection);

                        if($counter == 1){

                        $object = mysql_fetch_object($selection);

                        $access_level = $object->access_level;

                        $reg_number = $object->reg_number;

                        $surname = $object->surname;
```

96

```php
$first_name = $object->f_name;

$mobile_number = $object->mobile;

$fullname = $surname." ".$first_name;

$level = $object->level;

$staff_name = $object->staff_name;

$profile_pic = $object->profile_pic;

        session_start();

        switch($access_level){

        case "student":

        $_SESSION['accessLevel'] = $access_level;

        $_SESSION['regNumber'] = $reg_number;

        $_SESSION['name'] = $fullname;

        $_SESSION['level'] = $level;

        $_SESSION['mobile'] = $mobile_number;

        $_SESSION['profilePic'] = $profile_pic;

    echo ("<script> window.location='students/index.php';</script>");

    break;


        case "Project Cordinator":

        $_SESSION['accessLevel'] = $access_level;

        $_SESSION['name']  = $staff_name;

        $_SESSION['profilePic'] = $profile_pic;

echo ("<script> window.location='project_cordinator/index.php';</script>");

        break;

        case "Supervisor":
```

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```php
                              $_SESSION['accessLevel'] = $access_level;

                              $_SESSION['name'] = $staff_name;

                              $_SESSION['profilePic'] = $profile_pic;

              echo ("<script> window.location='supervisors/index.php';</script>");

                              break;


                              case "Chair Person":

                              $_SESSION['accessLevel'] = $access_level;

                              $_SESSION['name'] = $staff_name;

                              $_SESSION['profilePic'] = $profile_pic;

echo ("<script> window.location='person/index.php';</script>");

                              break;

                              default:

                              echo "Service not available";

                              break;

                              }

                  }

                  else{

                  echo ("<script> alert('Invalid Login');</script>");

                  exit();

                  }

              }

              ?>

      </fieldset>

</form>
```
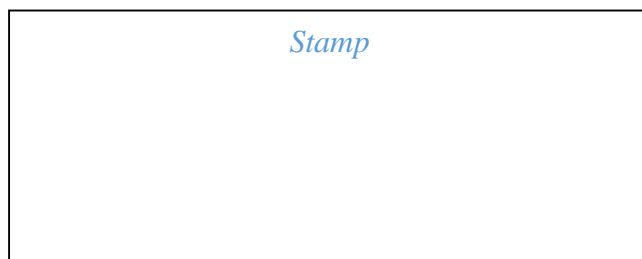
```html
<form  method="post" enctype="multipart/form-data" action="">
<fieldset style="border-radius:5px; background-color:#09F; opacity:.9;">
<legend>Create your account:</legend>
<table width="95%" cellspacing="0" class="peteTable">
        <tr>
                <td><label>Reg Number:</label></td>
                <td><input type="text" name="reg_num" id="textfield" size="40" value="<?php
if(@$_POST['reg_num']!= ""){ echo @$_POST['reg_num'];} ?>" required /></td>
        </tr>
                <tr>
                        <td><label>Surname:</label></td>
                        <td><input    type="text"    name="surname"    id="textfield"    size="40"
value="<?php if(@$_POST['surname']!= ""){ echo @$_POST['surname'];} ?>" required /></td>
                </tr>
                <tr>
                        <td><label>First Name:</label></td>
                        <td><input    type="text"    name="first_name"    id="textfield"    size="40"
value="<?php if(@$_POST['first_name']!= ""){ echo @$_POST['first_name'];} ?>" required
/></td>
                </tr>
                <tr>
                        <td><label>Mobile number:</label></td>
                        <td><input    type="text"    name="phone"    id="textfield"    size="40"
value="<?php if(@$_POST['phone']!= ""){ echo @$_POST['phone'];} ?>" required /></td>
                </tr>
                <tr>
                        <td><label>Academic Level:</label></td>
                        <td>
                        <select name="level" id="compobox">
                                <option value="2.1">2.1</option>
```

```
                    <option value="3.1">3.2</option>
            </select>
            </td>
    </tr>
    <tr>
            <td><label>Project code:</label></td>
            <td>
            <select name="project" id="compobox">
                    <option value="HCS 208">HCS 208</option>
                    <option value="HCS 401">HCS 401</option>
            </select>
            </td>
    </tr>
    <tr>
            <td><label>Degree Program:</label></td>
            <td>
            <select name="program" id="compobox">
                    <option        value="Information        Systems">Information
Systems</option>
                    <option value="Computer Science">Computer Science</option>
            </select>
            </td>
    </tr>
    <tr>
            <td><label>Profile Picture:</label></td>
            <td><input type="file" name="profile_pic" id="textfieldsearch" /></td>
    </tr>
    <tr>
            <td><label>Password:</label></td>
            <td><input   type="password"   name="pwd"   id="textfield"   size="40"
value="<?php if(@$_POST['pwd']!= ""){ echo @$_POST['pwd'];} ?>" required/></td>
```

```
                    <td><label>Re-try Password:</label></td>
                    <td><input  type="password"  name="pwd1"  id="textfield"  size="40"
value="<?php if(@$_POST['pwd1']!= ""){ echo @$_POST['pwd1'];} ?>" required /></td>
            </tr>
            <tr>
                    <td></td>
                    <td><input type="submit" name="register" value="Register" id="button"
```

include_once('connections/db_connect.php');

if(isset($_POST['register'])){

@$reg_nu = $_POST['reg_num'];

@$reg_num = strtoupper($reg_nu);

@$surnam = mysql_real_escape_string($_POST['surname']);

@$surname = strtoupper($surnam);

@$sur = ucwords($surnam);

@$first_nam = mysql_real_escape_string($_POST['first_name']);

@$first_name = strtoupper($first_nam);

@$f_name = ucwords($first_nam);

@$mobile = mysql_real_escape_string($_POST['phone']);

@$level = mysql_real_escape_string($_POST['level']);

@$project = mysql_real_escape_string($_POST['project']);

@$program = mysql_real_escape_string($_POST['program']);

@$pwd = mysql_real_escape_string($_POST['pwd']);

@$pwd1 = mysql_real_escape_string($_POST['pwd1']);

@$access_level = "student";

///prof pic upload

@$filename = $_FILES["profile_pic"]["name"];

@$tmpname = $_FILES["profile_pic"]["tmp_name"];

@$filesize = $_FILES["profile_pic"]["size"];

@$filetype = $_FILES["profile_pic"]["type"];

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```php
@$fileerror = $_FILES["profile_pic"]["error"];


if($fileerror > 0){
        message("Sorry an error ocurred when uploading");
        exit();
}



$allowed = array('.pnj','.jpg');
//$ext = pathinfo($filename,PATHINFO_EXTENSION);
$ext = substr($filename,-4);
if(!in_array($ext, $allowed)){
        message("The file type you tried to send is wrong");
        exit();
}
if($filesize > 6291456){
        message("Document too large, maximum limit is 6 MB");
}
move_uploaded_file($tmpname,"prof_pics/".$filename);
if(strlen($reg_num )!= 8 && substr($reg_num,0,1) != "r"){
message("Reg number is not in the required format");
exit();
}

        if(substr($mobile,0,2) != "07" || strlen($mobile)!= 10 || !is_numeric($mobile))
          {
      message("Invalid phone number");
                exit();
    }


if($pwd <> $pwd1){
```

```
message("Please match your passwords");
exit();
}
//check if the student is in the desired level
$flag = mysql_query("SELECT * FROM students WHERE reg_number = '$reg_num' AND
surname = '$surname' AND f_name = '$first_name'") or die (mysql_error());
$reade = mysql_num_rows($flag);
if($reade == 0){
message("Sorry $surname $reg_num $first_name you do not qualify to Sign Up on this site");
exit();
}
            $no_duplicate = mysql_query("SELECT reg_number FROM users WHERE
reg_number = '$reg_num'") or die (mysql_error());
            $counter = mysql_num_rows($no_duplicate);
            if($counter ==1){
            message("$reg_num already registered");
            exit();
            }


$insert                 =                 mysql_query("INSERT                 INTO
users(reg_number,surname,f_name,mobile,level,project,program,profile_pic,pwd,access_level)V
ALUES('$reg_num','$sur','$f_name','$mobile','$level
','$project','$program','$filename','$pwd','$access_level')")or die(mysql_error());
if($insert){
echo                 ("<script>                 alert('$reg_num                 successfully
registered');window.location='index.php?page=register.php';</script>");
exit();
!DOCTYPE html>

<?php
 include('header_dashboard.php');
```

```php
?>
  <body id="class_div">
            <?php include('navbar_admin1.php'); ?>
    <div class="container-fluid">
      <div class="row-fluid">
                      <?php include('admin_sidebar1.php'); ?>
         <div class="span6" id="content">
           <div class="row-fluid">
                        <!-- breadcrumb -->
                        <ul class="breadcrumb">
```

```php
<?php
session_start();
$user = $_SESSION['username'];
$log = $_SESSION['admin'];
if ($log != "log"){
        header ("Location: login.php");
<a href="add_user.php"><input type="submit" name="Adduser" value="Add User"></a>
```

```php
<a    href="manage_user.php"><input    type="submit"    name="adduser"    value="Manage
Users"></a>
```

```php
<a href="emergence.php"><input type="submit" name="adduser" value="Emergence"></a>
```

```php
<a href="visitation.php"><input type="submit" name="adduser" value="Visitation"></a>
```

```php
<a href="treatment.php"><input type="submit" name="adduser" value="Treatment"></a>
```

```php
<a href="dia_and_tele.php"><input type="submit" name="adduser" value="Diagnosis"></a>
```

```php
<a href="comp1.php"><input type="submit" name="adduser" value="Reports"></a>

<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>


<?php
include 'sql.php';
if (isset($_POST['edit'])) {

        include 'sql.php';

        $pasc = $_POST['upasc'];

        $pas1 = $_POST['upas1'];

        $pas2 = $_POST['upas2'];

                echo("<SCRIPT LANGUAGE='JavaScript'> window.alert('Password too short it
should have at least 8 characters!, Try Again')

                 javascript:history.go(-1)

                        </SCRIPT>");

                        exit;

        }




        $SQL = "SELECT * FROM users WHERE username = '$user'";

        $result = mysql_query($SQL);

        while ($db_field = mysql_fetch_assoc($result)) {

                $a= $db_field['password'];

                if ($pasc == $a){

                        if($pas1 == $pas2){
```

```php
                              $SQL = "UPDATE users SET password  = '$pas1' WHERE
username = '$user'";

                              mysql_query($SQL);

                              mysql_close($db_handle);

                              $msg = "Password change successfull.";

                   }

                   else{

                              $msg = "Password did not match.";

                   }

            }

            else{

                   echo("<SCRIPT    LANGUAGE='JavaScript'>    window.alert('Current
password error, Try Again')

             javascript:history.go(-1)

                   </SCRIPT>");

                   exit;

                   $msg = "Current password error.";

            }

      }

}


      print("<div style='top:300; left:320; position:absolute; z-index:1;'>");

      print("<form name='edit_form' method='post' action='changepass.php'>");

      print("<table>");

      print("<tr>");

      print("<td align = 'right'><b>Current Password:</b></td>");
```

```
print("<td><input name = 'upasc' type = 'password' value = ''></td>");

print("</tr>");

print("<tr>");

print("<td align = 'right'><b>New Password:</b></td>");

print("<td><input name = 'upas1' type = 'password' value = ''></td>");

print("</tr>");


print("<tr>");

print("<td align = 'right'><b>Re-type Password:</b></td>");

print("<td><input name = 'upas2' type = 'password' value = ''></td>");

print("</tr>");


print("<tr>");

print("<td colspan = '2' align = 'right'><font color = 'red' size = '3'><b>$msg</b></font></td>");

print("</tr>");


print("<tr>");

print("<td></td>");

print("<td align = 'center'><input name = 'edit' type = 'submit' value = 'change password'></td>");

print("</tr>");

print("</table>");

print("</form>");

print("</div>");

</table>
```

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