

# **Econet Base Station Fault Monitoring and Planned Maintenance Scheduling System**



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# **Econet Base Station Fault Monitoring and Planned Maintenance Scheduling System**



BY

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## **ABSTRACT**

The manual Fault Monitoring System lacks immediate retrieval of information such as base station fault history and diagnosis , the system lacks prompt updating for example system user status, when schedules to maintain base station changes; the system does not produce reports which assist management in decision making. The analysis phase saw the researcher using various data gathering methodologies which included observations, questionnaires and interviews among others. From the analysis phase the researcher proposed development of a fault monitoring and planned maintenance scheduling system that keep base station faults, which allows technicians to send fault names and receive instant solutions on their mobile numbers, the systems allows technicians also to take part in system polls and sends maintenance schedules to registered technicians. A detailed study was carried out and it resulted feasible to design the system and an in-house development solution was recommended. Various designing tools were used which included Wamp Server and Adobe Dreamweaver. The system was successfully implemented and parallel changeover was the recommended changeover strategy after weighing its many advantages over other strategies. Perfective maintenance strategy which allows for continual improvement of the system was chosen.

## DECLARATION

I, **Gerald Masvanhise**, hereby declare that I am the sole author of this project. I authorize Midlands State University to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Signature \_\_\_\_\_

Date \_\_\_\_\_

## APPROVAL

This Project entitled “**Econet Base Station Fault Monitoring System and Planned Maintenance Scheduling system**” meets the regulations governing the award of the degree of BSc Information Systems Honours of the Midlands State University, and is approved for its contribution to knowledge and literal presentation.

Supervisor: .....

Date: .....

## **ACKNOWLEDGEMENTS**

I would like to extend my profound gratitude firstly to my supervisor Mr F .Madzikanda who stood and guided me for the past four months. The effort that I put could not have been a success had it not been for Mr Madzikanda. A lot of appreciation also goes to my friends and classmates who were with me throughout the project.

## **DEDICATION**

I dedicate this research to Wife, Linah Mokovere and my two kids Simon and Chloe

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## List of Acronyms

BS	: Base Station
CPU	: Central Processing Unit
DB	: Database
DBA	: Data Base Administrator
DFD	: Data Flow Diagram
DML	: Data Manipulation Language
GB	: Giga Byte
GHz	: Giga Hetz
GUI	: Graphic User Interface
HDD	: Hard Drive
IBM	: International Business Machines
ICT	: Information and Communication technology
IT	: Information Technology
RAM	: Random Access Memory

# **Chapter 1: Introduction**

## **1.1 Introduction**

The Network Field Operations (NFO) department of Econet Wireless Zimbabwe (EWZ) has faced challenges with the maintenance of its base station records, maintaining base station diagnosis details and base station maintenance schedules. The chapter introduces Econet Wireless to a new Base Station Fault Monitoring and Planned Maintenance Scheduling System. The proposed software is for the automation of Base Station Management, it will maintain records of Econet Base Stations, maintaining base station fault diagnosis details and base stations maintenance schedules.

## **1.2 Background of organization**

Econet Wireless is Zimbabwe's largest provider of telecommunications services, providing solutions in mobile and fixed wireless telephony, internet access, mobile money transfer and payment solutions. Econet Wireless opened its doors to the public on the 10th of July 1998 and listed on 17th September 1998 when it launched its network. Econet holds the largest share on Zimbabwe Stock Exchange. In 2012 Econet Wireless invested more than one billion in its network expansion exercise. Econet holds more than seventy five percent share of the country's mobile market, and the number of subscribers has surpassed Eight million to date. Econet Wireless has a wide mobile coverage system that it upgrades continuously in order to cater for increasing number of users and to improve quality of service and efficiency as technology also continues to grow.

In 2009, Econet was the first network operator in Zimbabwe to provide data services under third generation technologies, and in the year 2010, it also launched Zimbabwe's first mobile broadband network making pioneering a key value at the organization. The company's key infrastructure includes six main switch centers that are fed by a wide network of cell sites and the country's biggest fibre optic network. Having a tight based Christian vision and mission, the organization holds a big strategy for the society and the community by investing under the "Econet in the Community" label. Through these many initiatives, the company supports a variety of charitable causes, which include supporting more than fifty thousand destitute

children, public healthcare systems, evangelism programs, and also a scholarship program which has up to now helped more than five hundred scholars.

### 1.2.1 Organizational Structure

The figure below shows information flow within Econet Wireless as well as hierarchy of decision making

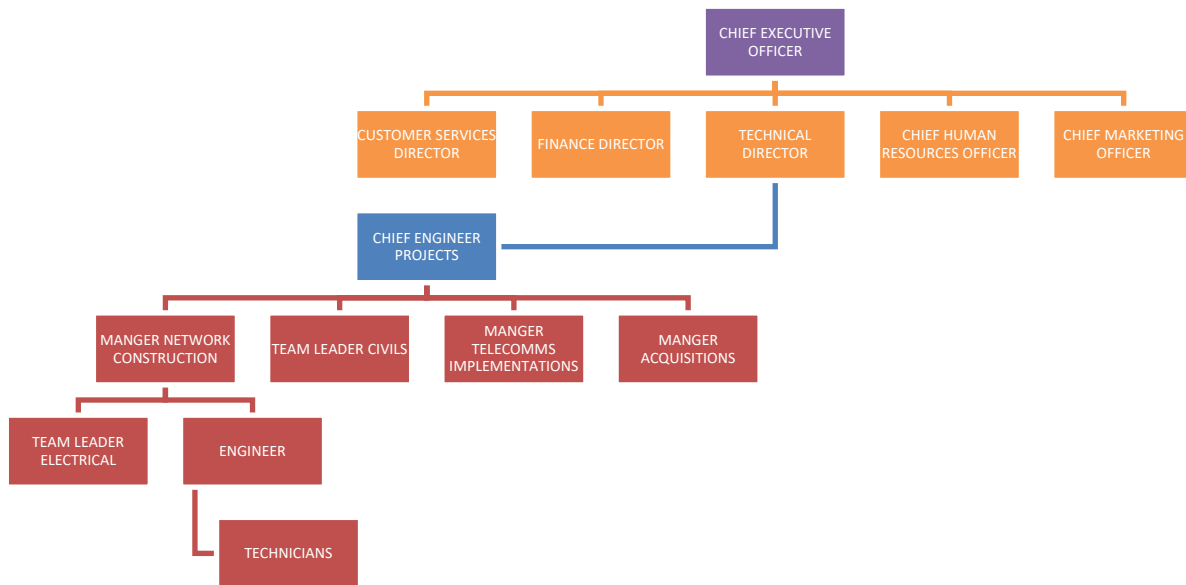


Figure 1.1 Organogram

### 1.2.2 Vision

To provide international standard telecommunication services to all the peoples of the world.

### 1.2.3 Values

- **Pioneering**, Econet Wireless is determined to finding the best possible way, in a rapidly growing and very competitive technological field. To make sure that they stay at the pinnacle, the company shall endlessly follow innovative solutions, and continuously increase its knowledge base with unmatched passion for excellence.

- **Professional**, in all that the organization intends to do, be it in the business environment or in the community that we live in, Econet Wireless always works within an environment that is customer-oriented and also objective with goals that are clearly stated in terms of quality of service delivery. Econet Wireless will, in every professional sector and level of operation carry out its duties both skillfully and diligently at all times.
- **Personal**, from within, Econet Wireless will always acknowledge that it is an entity made up of different individuals. These different individuals are the core of the company. Every one of the individuals is an intrinsically valuable part of the organization regardless of color, race, gender or position. Econet Wireless endeavors in all regards to be the home away from home where individuals care for each other and show concern in a free environment that encourages self-development and work satisfaction. The company has strong beliefs in team work, confident effective cooperation, criticism that is constructive and the fair rewarding of individuals have their place. Whatever Econet Wireless portrays within the inside is supposed to be a true reflection from the outside. The organization's relationship with its subscribers will be full of warmth and poses a great desire to meet all their demands. The company will always extend their arm to their customers in an organic and such holistic approach to make them true stakeholders within the organization.

#### **1.2.4 Mission Statement**

To serve by pioneering, developing and sustaining reliable, efficient and high quality telecommunications of uncompromising world class standards and ethics.

#### **1.3 Problem definition**

1. Lacks immediate retrieval of information for example base station fault history, it is time consuming to retrieve information about base station fault history and diagnosis, a technician has to call superiors like Engineers confirming about fault history and solution.
2. Information generated from transactions such as fault diagnosis does not have immediate storage, information is sent via e-mails until it reaches management

3. Information lacks prompt updating for example when schedules to maintain base station changes; when technicians are suspended or are on leave
4. The current system does not produces accurate and prompt reports since it it difficult to collect information from all base stations in real time and the information collected does not have immediate storage
5. The current system does not have a planned base station maintenance schedule, no alerts and reminders are sent to technicians

#### **1.4 Aim**

To design, develop, and implement an efficient Econet Base Station Fault Monitoring and Planned Maintenance Scheduling System

#### **1.5 Objectives**

1. To manipulate Base Stations names, Engineers and Technicians in the system
2. To send Base Station Maintenance Schedules
3. To add Base Station Faults and Diagnosis
4. To receive alerts and reminders about base station maintenance schedules via SMS
5. To send fault keywords via SMS to receive fault solutions

#### **1.6 Instruments**

- Dreamweaver CS6 (Easy to use software which can be downloaded on the Internet, it contains Php, CSS, HTML and Javascript)
- Wamp Server 2.0 ( An open source software which can downloaded easily, it contains Apache, MySQL and PHP)
- Microsoft Visio 2007 ( cheap licensed software used for drawing diagrams)
- Microsoft Office 2013 ( word processing package for producing system documentation, it is cheap to purchase)

## **1.7 Justification**

The following are the good reasons why the new system is proposed

- the new system has the capacity to make Econet Wireless to remain as the leader in telecommunications industry, it will gain competitive advantage over rivals
- The use of one centralized database minimizes data redundancy because of duplication of records.
- Creating a website and SMS platform will enable easier, faster and constant communication amongst management, engineers and technicians.
- Integration-the system is capable of integrating with other applications and packages to help management.
- Improved decision making-the management have been receiving information late and have been making late decisions due to lack of up to date information and late availability of vital information hence the need for a real-time system.
- Will reduce data loss because of the use of the database.
- Enhances accessibility to the information due to the use of the internet and short message services.
- Increased security to data in the database and to transactions made over the web and via short message services.
- It will allow ad-hoc querying and access to the database.

## **1.8 Conclusion**

In this chapter, the researcher managed to define the problems encountered in the use of the current system, Econet Wireless background, mission, vision , management hierarchy. Research instruments to be used in the development of the proposed system, its objectives and its justification were also clearly discussed in this chapter the next step will be the planning phase.

## **Chapter 2: Planning Phase**

### **2.0 Introduction**

This phase produces an outcome of the project as it weighs reasons of building the new system, business value, feasibility analysis, risks linked to the project and drafting the life span of the all activities that are going to be carried. Outcome from this analysis enables the management and the developer to decide whether the project is feasible or not. The life cycle of system development which includes business value identification, risk analysis and a comprehensive work plan will be carried at this stage.

### **2.2 Reasons for building the system**

- Technicians will be able to get fault solutions anytime around the clock
- The system provide efficient means of communication since it will be able to send reminders to technicians about base station visits dates
- The system eliminates isolation and separation, duplication and redundancy of data
- Employees will be served away from management offices and this will decongest Econet Wireless Offices
- Reports that will be produced by the new system will be used for decision making
- Sensitive data will be protected to unauthorized individuals through the use of passwords and access levels
- Information can be updated quickly
- Storage costs are reduced by using a central database

### **2.3 Business Value**

Business value is seen as all classifications which determine the status of an organization when operating, it also includes stakeholders value and these values cannot be attached a monetary value. This project should to derive a number of benefits to Econet Wireless which include

- Employee productivity will be improved since access to information will faster
- The system can be modified to align with the organization structure and business strategy

- Generation of reports
- Econet Wireless will gain competitive advantage over its competitors since base station faults will be reduced
- Cooperate image will be improved

## **2.4 Feasibility Analysis**

It is the practicality of developing the proposed system and different solutions to encounter challenges which are being faced. It also looks at the recommendations to the best solutions or alternatives. This analysis plays an important part in before making decisions, feasibility analysis will check if it is possible to have an in-house developed system given the current situation in regards to economy, finance, organization and technology. The study is divided into technical, economic, social and lastly operational feasibility.

### **2.4.1 Technical feasibility**

At this stage major concern focus on the success of the project with allocated resources. Technical requirements are also looked into, the organisation has a big Information Systems section and as such it has the infrastructure and technical expertise to develop a system that is capable of running such a project. The analyst must be able to deduce whether the available technical resources can be upgraded or added in order to fulfill the request under consideration.



### 2.4.1.1 Hardware Requirements

Quantity	Item	Specifications	Comment
4	HP Server	2GB DDR3 RAM Quad 4 processor 3GHz Speed 3*500GB Hard Drive (Swappable)	Available
2	HP backup Server	2GB DDR3 Quad 4 processor 2GHz Speed 500GB HDD	Available
20	HP DX2300	1GB DDR3 RAM Pentium 4 processor 2GHz Speed 500GB HDD(Swappable)	Available
20	Canon IP 2700 Printer		Available

*Table 2.1 Hardware Requirements*

### 2.4.1.2 Software Requirements

Software	Comment
Microsoft Windows 2003 Server Enterprise Edition	Available
Windows 8.1 Pro Operating system	Available
Microsoft office 2013 Adobe	Available
Dreamer weaver CS5.5	Available
Mozilla Firefox	Available

*Table 2.2 Software Requirements*

### **2.4.1.3 Technical Expertise**

The system developer has vast experience in software development and the organization's Information Technology department is equipped with professional database administrators, system analysts and hardware, network technicians.

### **2.4.1.4 Economic Feasibility**

The researcher conducted a thorough survey to examine the extent to which the benefits outweigh the costs incurred as to ascertain whether it is viable to continue carry on with the project activities using the proposed budget, and allocated time. The compared feasibility using Return on Investment, Net Present Value, Cost Benefit Analysis and Payback period techniques to compare feasibility:

## **2.4.2 Cost Benefit Analysis**

Cost-benefit analysis measures the expenses to be faced as a result of the newly proposed system, it compares these costs with the probable benefits of the proposed system. Benefits have no monetary value attached to them they are classified as intangible and tangible, different estimation techniques will be used during the comparison purposes. Projects that has costs that outweighs will be noted from the proposed system.

Benefits are classified as tangible and intangible benefits.

### **2.4.2.1 Tangible Benefits**

They are easily quantifiable and they can be given a monetary value. Some of the tangible benefits include:

- Comprehensive reports improve information flow and availability to all levels of management
- Secure password policy enhance information integrity to all system users
- Information loss is reduced by back up facility

### 2.4.2.2 Intangible benefits

They cannot be given a monetary value. Some of these benefits include

- Increased staff moral
- Reduced time in fault identification and solution finding
- Improved corporate image
- Improved decision making

### 2.4.2.3 Costs Table

	<b>Year 2014</b>	<b>Year 2015</b>
<b>Benefits</b>		
Tangible		<b>2000</b>
Intangible		<b>1500</b>
<b>Total benefits</b>		<b>3500</b>
<b>Costs</b>		
Development	<b>1000</b>	
Running	<b>1000</b>	
<b>Total costs</b>		<b>2000</b>
<b>Net benefit</b>		<b>1500</b>

*Table 2.3 Cost*

### 2.4.2.4 Return on Investment

Return on Investment is mathematically found using the formula below

$$\text{Return on Investment} = \frac{(\text{Tangible Benefits} - \text{Operational Costs}) * 100}{\text{Development Costs}}$$

**Total Benefits expected: \$3500**

**Total Costs: \$2000**

**Therefore**  $ROI = \frac{3500 - 2000}{2000} \times 100\%$

**=75%**

### **Comments**

The project is favorable, as noticed from the positive Return on Investment.

### **2.4.2.3 Payback Period**

It measures the total time it taken to recover the initial investment. Payback period can be calculated as follows:

$$\text{Payback Period} = \frac{\text{Total Investment}}{\text{Annual Profit}}$$

$$\text{Payback Period} = \frac{2000}{1500}$$

$$\text{Payback Period} = 1.33$$

$$\text{Payback Period} = 1 \text{ year } 4\text{months}$$

### **2.4.2.4 Economic Feasibility Overview**

The project is worthwhile to carry on since the benefits outweigh the costs

### **2.4.2.5 Social Feasibility**

- Employees will know in time the dates they will visits base stations
- Peace of mind since fault solutions can be found on the go

- Arguments are eliminated at work place

## **2.5 Risk Analysis**

It is a process meant to identify the important risks linked to the project and therefore assists management in the making of decisions before stopping or varying on different activities of a project, examples of risks which should be put on the table are:

- Connection errors to the database for a particular Base Station
- handling of equipment without proper care rises the costs of operation
- system intruders pose threats to system security

### **2.5.1 Economic or Budgetary Risks**

The project may fall beyond the allocated funds which results to it being abandoned due to lack of insufficient funds, this can be encountered by using available resources effectively and the project should be monitored tightly.

### **2.5.2 Technical Risks**

System users will may have problems in restoring the when it crushes especially when their requirements are not met, because when the system is installed , it should be supported regularly and maintenance should not be stopped it is an on-going process.

## **2.6 Project Plan**

The table below shows the stages of System Development Life Cycle with their respective start dates and end dates

**Table 2.1 Work Plan**

<b>Phase</b>	<b>Starting Date</b>	<b>Completion date</b>	<b>Duration in weeks</b>
Project proposal	28/06/2014	01/07/2014	1
Planning	29/07/2014	08/08/2014	2
Analysis	08/08/2014	22/08/2014	2
Designing	22/08/2014	10/09/2014	3
Coding	10/09/2014	17/09/2014	1
Testing	17/09/2014	20/09/2014	1
Implementation	23/09/2014	30/09/2014	1
Maintenance	01/10/2014	Ongoing Process	Ongoing

*Table 2.4 showing the project work plan*

### **2.6.1 Gantt Chart**

The chart below illustrates time estimates and all activities to be done in development of the system; it is used to track the progress of the project.

Activity/ Period	1	2	3	4	5	6	7	8	9	10	11
Proposal	■										
Planning		■	■								
Analysis				■	■						
Designing						■	■	■			
Coding									■		
Testing										■	
Implementation											■
Maintenance	■	■	■	■	■	■	■	■	■	■	■

*Table 2.5 Gantt Chart (NB: Period is in weeks)*

## 2.7 Conclusion

This stage outlined how the and when the activities of the project will be carried, risks were clearly highlighted. The project was seen as feasible, properly scheduled: time frames of all activities suits the work to be done, there for the project was approved by management to be embarked on.

## **Chapter 3: Analysis phase**

### **3.0 Introduction**

This phase highlights the operation of the current system, results expected by all stakeholders. System analysis provides a detailed description of system, links between system processes and activities. Various information gathering methods will be employed to gather data which will assist on how the system executes. The results of the phase highlight strengths and weaknesses in the current system and alternatives to the systems weaknesses will be discussed.

### **3.1 Information gathering methodologies**

The researcher interviewed stakeholders, submitted questionnaires that were collected after a certain period and observed technicians, engineers and management so as to find more about the processes, activities of the current system. The methods used outlined the strengths and weaknesses of the current system that will be used in the designing and development of another new system. All the facts found were recorded.

#### **3.2.1 Interviews**

It was a formal conversation that consists two or more parties, the main aim of the discussion was to exchange information. There was direct communication with the stakeholders of the organization such as management, technicians and engineers so as to gain an understanding on the operation of the current system, difficulties which were being faced and expectations from the new product.

#### **Advantages of interviews**

- There was direct communication, parties had chances to clarify on areas which were not clear
- Information was collected and recorded immediately
- Body language, facial expressions and other social cues were used
- Interviewee was motivated by the interviewer
- Analyst could modify, add more questions during the process



- Challenges met in the current system were communicated easily

### **Disadvantages**

- Interviewee had brief background on the issues discussed
- Biased data was gathered
- Interviewer's ethnic background, speech patterns and dress influenced interviewee responses

### **3.3.2 Questionnaires**

They are a list of pre-designed list of questions as a research instrument to gather information from the organization stakeholders. . Questionnaires are often used because they assists in the statistical analysis of information collected. Below are identified strengths and weakness of using the method

#### **Advantages of using questionnaires**

- large amounts of information were collected in a short period of time
- Collected information was easily and quickly quantified
- High chance of receiving unbiased information since anonymity was guaranteed
- They were easy and cheap to construct and distribute
- Questionnaires were done in a short period of time
- They were high chances of getting accurate responses
- Results produced were standard

#### **Disadvantages of questionnaires**

- Respondents interpreted questions differently
- There was inability to understand some form of the information such as respondent's feelings and emotions.
- Respondents did not attempt to answer some crucial questions

### **3.2.3 Observations**

Researcher accurately watched how the existing system operates, processes and procedures were also noted with regard to the cause and effect of their mutual relations. Below are the noted advantages and disadvantages of this information gathering technique:

#### **Advantages of observations**

- Cameras were used therefore observations were done over a larger period of time
- Dependency on respondents responses was eliminated
- Collected data was accurate

#### **Disadvantages of observations**

- Problems of the past and opinions were not studied by this technique of information gathering
- A lot of time was wasted waiting a certain event to occur
- Researcher depended on available documents

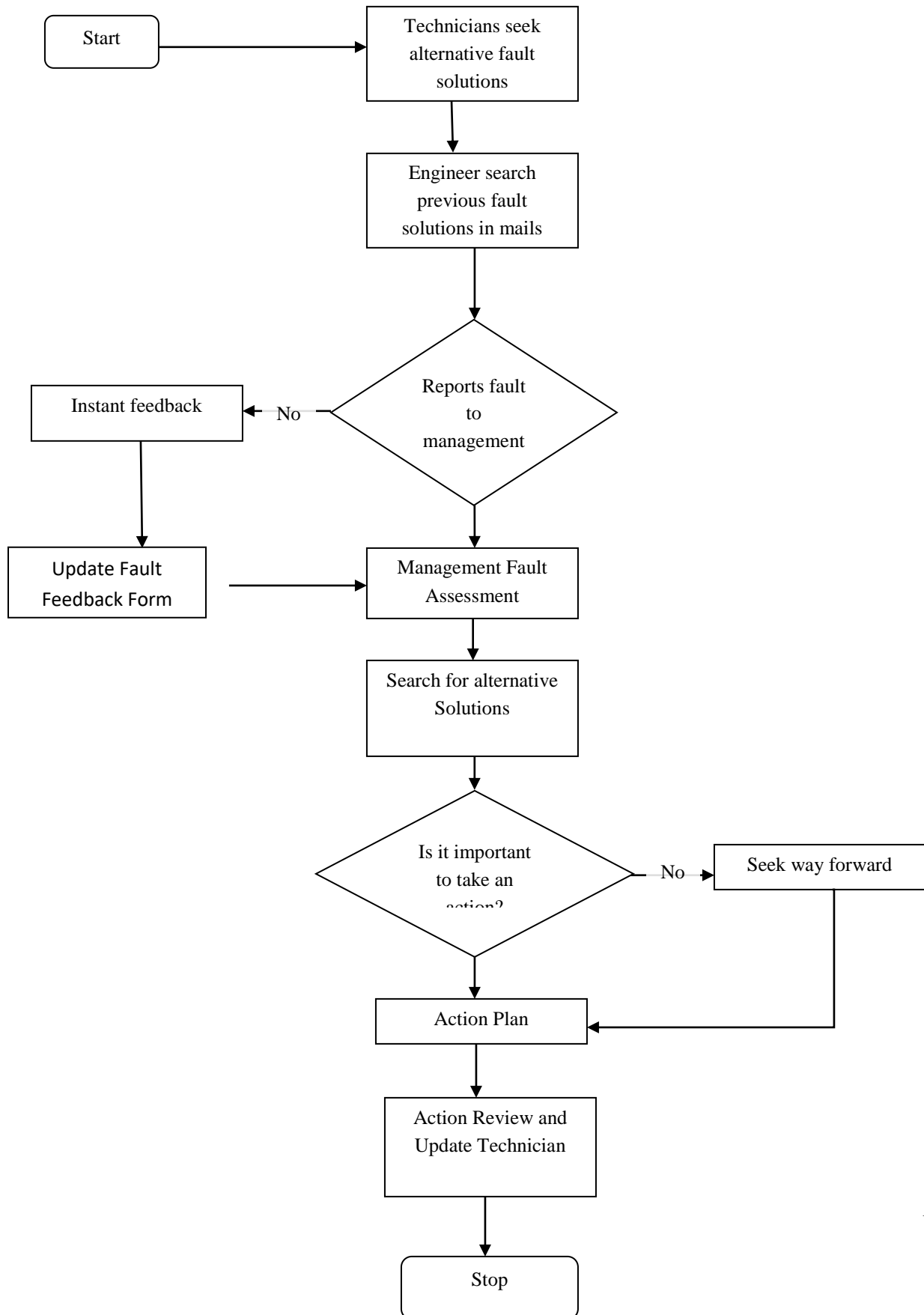
### **3.3 Analysis of existing system**

The system which was place at the organization was not automated; production of reports was done through compilation of information from different files. When technicians discovered faults at base stations they seeked alternative solutions from engineers and specialist via e-mails and sometimes through voice calling and depending on the complexity of the situation engineers and specialists provided immediate response or sometimes respond after a long time, also some could not be reachable and this increased time before faults were resolved. When base station equipment was due for maintenance technicians were reminded through electronic mails. The system was not user friendly since all processes were done outside any information system.


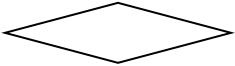


### **3.4 Process analysis**

The activity diagram below displays the sequence of activities of the old system, work flow of the system from the start point to the finishing point, decision paths that exists in the system and situations where parallel processing occur during the execution of some activities.

Figure 3.1 Activity diagram of the current system



## Key to the Activity diagram of the current system

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

### Inputs

- Fault feedback form
- Maintenance schedule
- Base Station Name

### Processes

- Search previous fault occurrence
- See possible solution to fault
- Complete fault feedback form

### Output

- Fault report
- Completed fault feedback form

### 3.5 Data Analysis

The context diagram below shows relationships, communication between system entities of the current system.

#### Context diagram of the current system

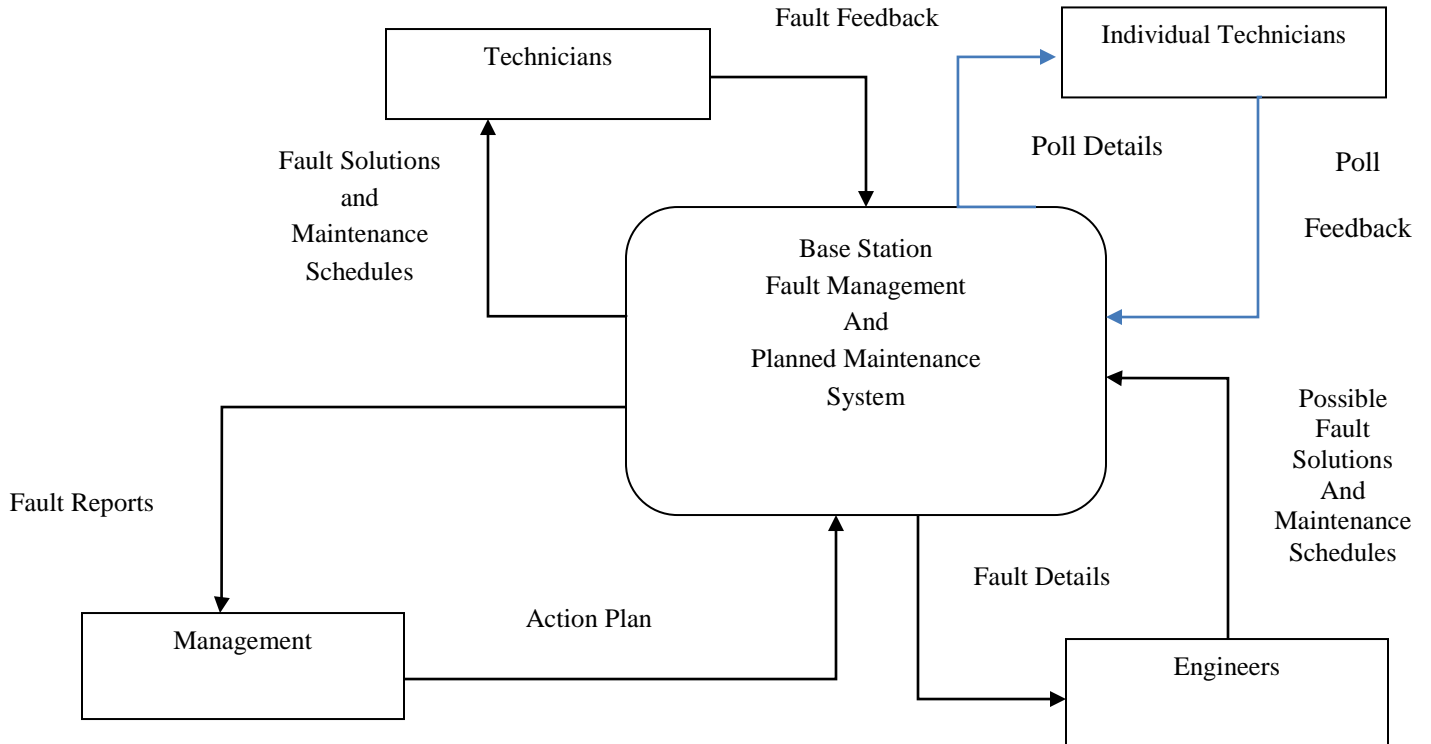


Figure 3.2 Context diagram of the current system

### Data flow diagram

An illustration of the current system can be shown on the data flow diagram below.

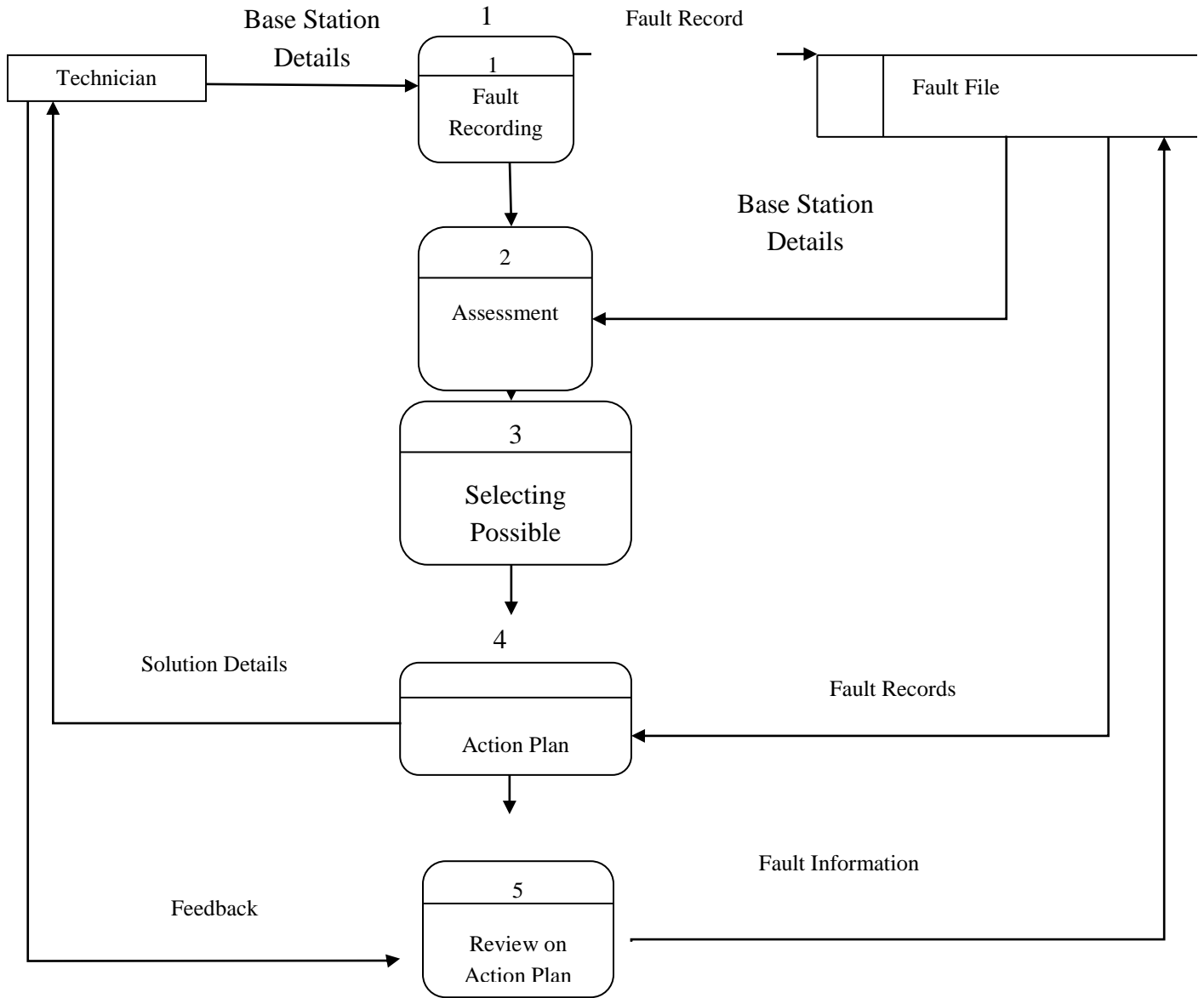
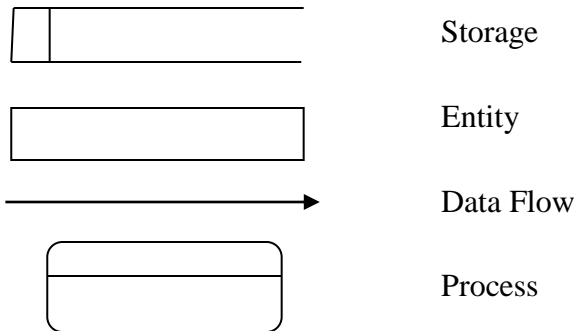


Figure 3.3 Data Flow diagram of the current system

### Key to the data flow diagram



### 3.6 Weaknesses of current system

- Previous fault details and solutions are difficult to track
- There is too much paper work
- Information retrieval takes consumes too much time
- Important information is prone to unavailability for future use
- There is no security to organizational data
- Information takes a lot of time to reach stakeholders
- It is difficult to produce reports

### 3.7 Evaluate Alternatives

There are also several ways that can be used to monitor fault management and scheduled maintenance but have a lot more short comings as to the proposed Fault management and scheduled maintenance system. Some of the alternatives are as follows;

- i) Each base station can have its own fault monitoring device that can be monitored from one central switch/node and have all the faults remotely cleared by the person monitoring the central switch hence there will be no need for a technician to attend. The challenge with this system is that if there is to be a power fault and the stand by supply goes down then the base station cannot be monitored at all and no clue of the fault is left and you wouldn't know whether to send a power person, transmission person, IT person or radio person to attend.
- ii) Satellite monitoring can be used to manage all base station and remotely resolve all faults but the system is very expensive to install, monitor and maintain.

### **3.7.1 Outsourcing**

This is buying already software that so as to address challenges that are being faced being faced by an organization

#### **Advantages**

- It is fast to adopt
- Less manpower is needed
- Development expenses are cut to zero

#### **Disadvantages**

- Outsourcing is expensive
- User training and maintenance is expensive
- Expensive in the long run.
- Some are fixed they cannot be upgraded or cannot be modified to suit the ever changing environment

### **3.7.2 Improvement of the current system**

The system should not be improved for the following reasons

- The is no other way to update the system because it is not computerized
- Operating costs remains high because it involves paper work
- Retrieval of information would be still time consuming

### **3.8.1 Development of a new system**

System developer should work with organization stakeholders for them to quickly perceive the usefulness and ease of use of the new system and to provide solutions to the problems identified.

The following are the reasons why the proposed system should be developed:

- User requirements are delivered
- System maintenance will be easy due to the availability of the development team



- User training cost will be reduced
- There is no need to pay on-going license costs

### **Recommendations**

The proposed system should be developed since it yielded the benefits above and it is perceived as ease to use and usefulness to the organization.

### **3.8 Requirements Analysis**

If this stage is properly done the project will execute in the shortest period of time since there will be no delays in correcting the software, user requirements will be given to system analysts and programmers. The categories of requirement analysis are discussed below

#### **3.8.1 Functional Requirements**

- Security and improved retrieval of information should be ensured
- Technicians should get instant responses on fault history and solutions
- Easy flow of information should be granted for example notifications about base station maintenance should be received as text messages on the go
- Timely reports should be produced for quick decision making
- System should allow database backup and recovery solutions

### 3.8.1.1 Use Case Diagram

The diagram below shows a case diagram to provide a use-case model

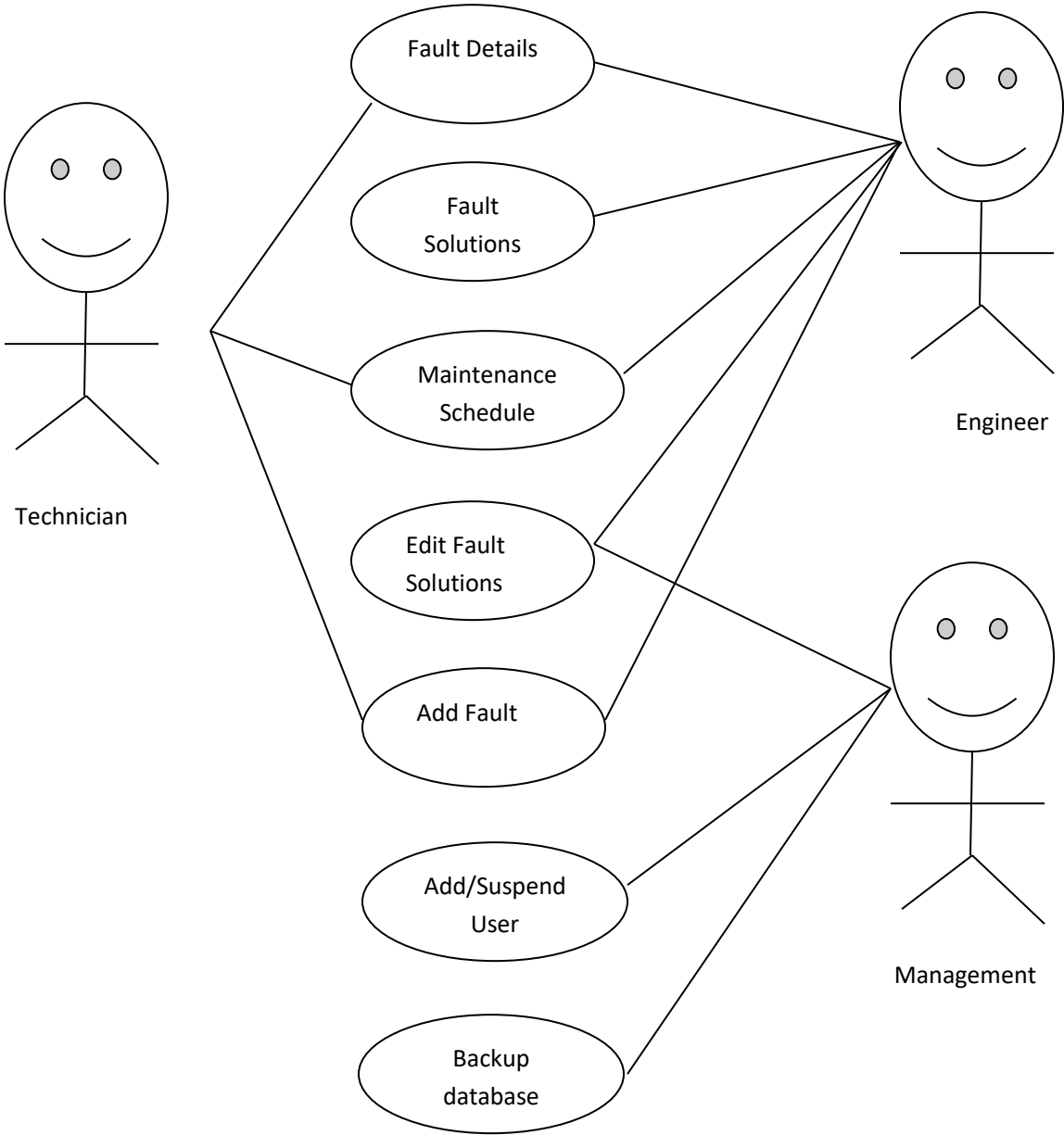
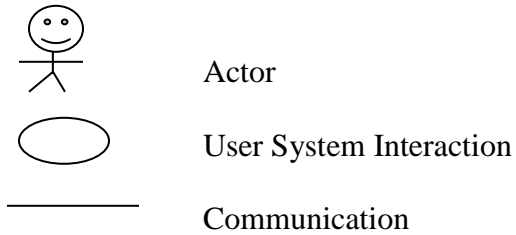


Figure 3.3 Use Case Diagrams

## Key to diagram



### 3.8.2 Non-functional requirements

- Self-explanatory links
- Encryption of passwords
- Improved processing speed
- System colours should match organizational corporate colours
- Errors should be handled easily

#### 3.8.2.1 Constraints

- Response time should be minimized
- Many transactions should be able to take place per minute
- The system should be easy to maintain

### 3.9 Conclusion

System analysis has been thoroughly done and it has been found that a new system should be developed after considering all alternatives, functional and non-functional requirements have been identified.

The next phase will look on the description and operation of the proposed solution to be developed.

## **Chapter 4: Design Phase**

### **4.1 Introduction**

Design phase gives description of the Fault Monitoring and Planned Maintenance Scheduling system. Information flow in the new system will be elaborated by dataflow and context diagrams. The physical, interface, database, architectural and program design of the system will be also outlined during this phase.

### **4.2 System Design**

To specify the user requirement the researcher defines and developed the architecture, components, modules, interfaces and data of the new system. The stage looks on the technologies to be used in the new system, the environment where the system is going to reside on.

The following is an outline of the duties of system users:

#### **System Administrator**

- Login to the system
- Add system users
- Delete/suspend system users
- Manage access levels
- Backup system data
- Prints and view system reports

#### **Engineers**

- Login to the system
- Add fault solutions to the system
- Broadcast base station maintenance dates
- Update fault keywords
- Set polls to collect information from technicians
- View and prints system reports

## Technicians

- Update their profiles
- Receive base station maintenance dates
- Search fault solutions by sending keywords to the system
- Participate in system polls

Econet Wireless ICT Department will be responsible for the ongoing system maintenance process.

### 4.2.1 Context Diagram and DFD of the proposed System

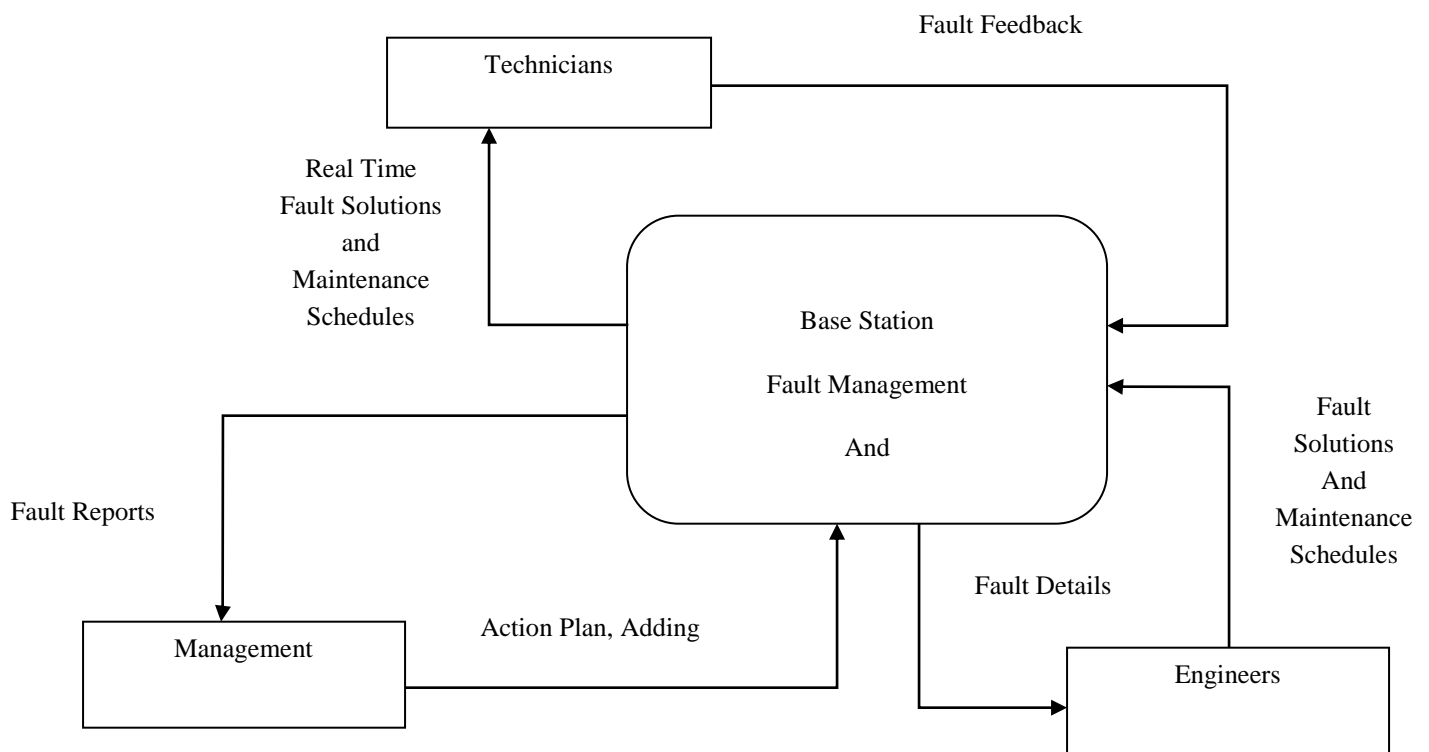


Figure 4.1 Context diagram of the proposed system

### 4.2.2 Data flow diagram of the proposed system

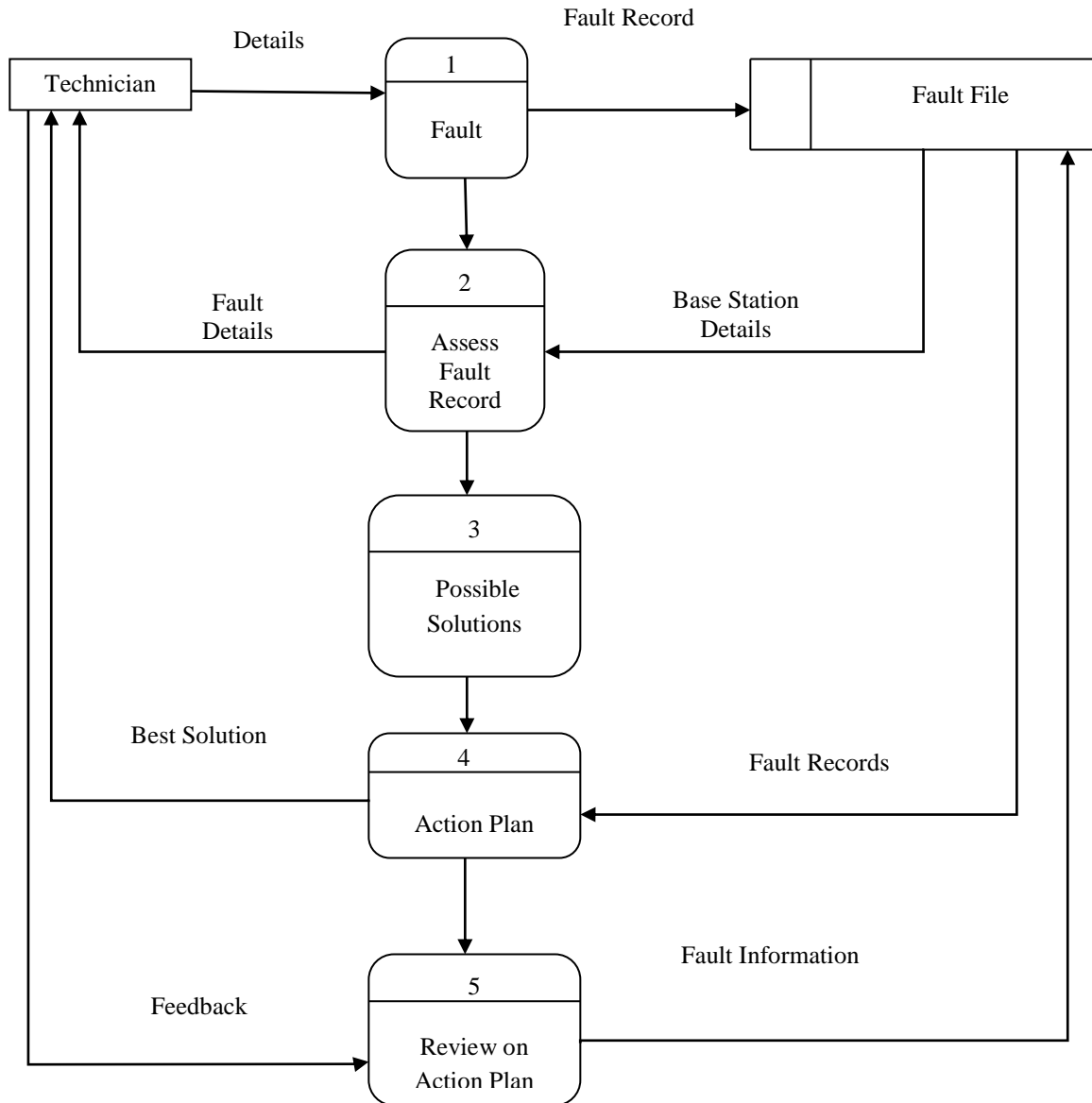


Figure 4.2 Data Flow Diagram of the proposed System

### 4.3 Architectural design

Researcher will specify the application architecture that outlines technologies to be used by proposed system and making decisions on the operation of processes and interfaces to be seen through different organization environments.

#### 4.3.1 Architectural designs

1. **User’s machines**

All the machines in the IT department shall be loaded with the new system and will be integrated into the local area network (LAN).

2. **Application and Database server.**

The database server will act as an application server for other users.

3. **Active directory.**

Technicians will use their cell phones to access fault solutions

### 4.4 Physical design

Physical design shows the proposed system internal and external entities, and how data flows into and out of the entities. The system developer divides the physical portion of system design into three sub-tasks which are

- User interface design (input and output of information)
- Data design (data presentation and storage)
- Process design (flow of information throughout the system)

### Hardware requirements

Below are the specifications for the hardware of the proposed system.

Item	Specifications	Comments
Processor	2 * 2.4GHz	Available
Cache Processor	2 * 500MB	Available
Memory	5 * 10Gb	Available

Hard Disk Drive	5* 500Gb	Available
Network Card	10/100 LAN	Available
DVD Writer Rom Drive	24x	Available
Printer	Canon IP7200	Available

*Table 4.1 Hardware requirements*

### **Network specifications**

The table below shows the network specifications for the proposed system

<b>Item</b>	<b>Specifications</b>	<b>comments</b>
Switch	Cisco 24port C9600	Available
Patch Panel	Cisco 32 port C1600	Available
Connecting Cables	UTP Cat 5e	Available
Cabinet	42u	Available
UPS	Power Backup 220Va	Available

*Table 4.2 Network specification*

### **Software specification**

<b>Software</b>	<b>comments</b>
Adobe Dreamweaver 6.0	Available
MySQL Server 5.0	Available
Apache Webserver 2	Available



Apache Tomcat 7.0	Available
Netbeans 7.0	Available
MySQL-client 5.0	Available
Redmine 3.42	Available

Table 4.3 Software specification

**How software and hardware interact**

The diagram below illustrates how hardware will interact with the software in the new system

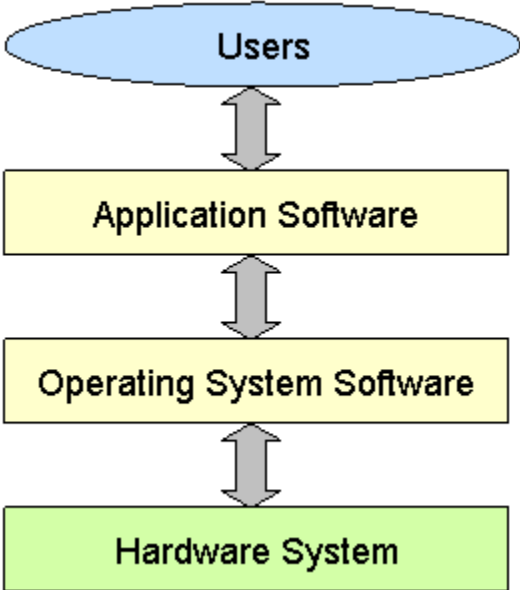


Figure 4.3 Hardware and software interaction

**4.5 Database design**

The system developer adopted database approach since they yielded the following benefits over traditional file based approach

- Reduction in data redundancy as files will be integrated.
- Use of passwords and access levels improves security.

- Changes to the structure of the database will not affect programs that access the data.

### Database architectural design

The following are the three phases of database design

- Conceptual database design
- Logical database design
- Physical database design

Diagrammatic representation of the database levels is shown below:

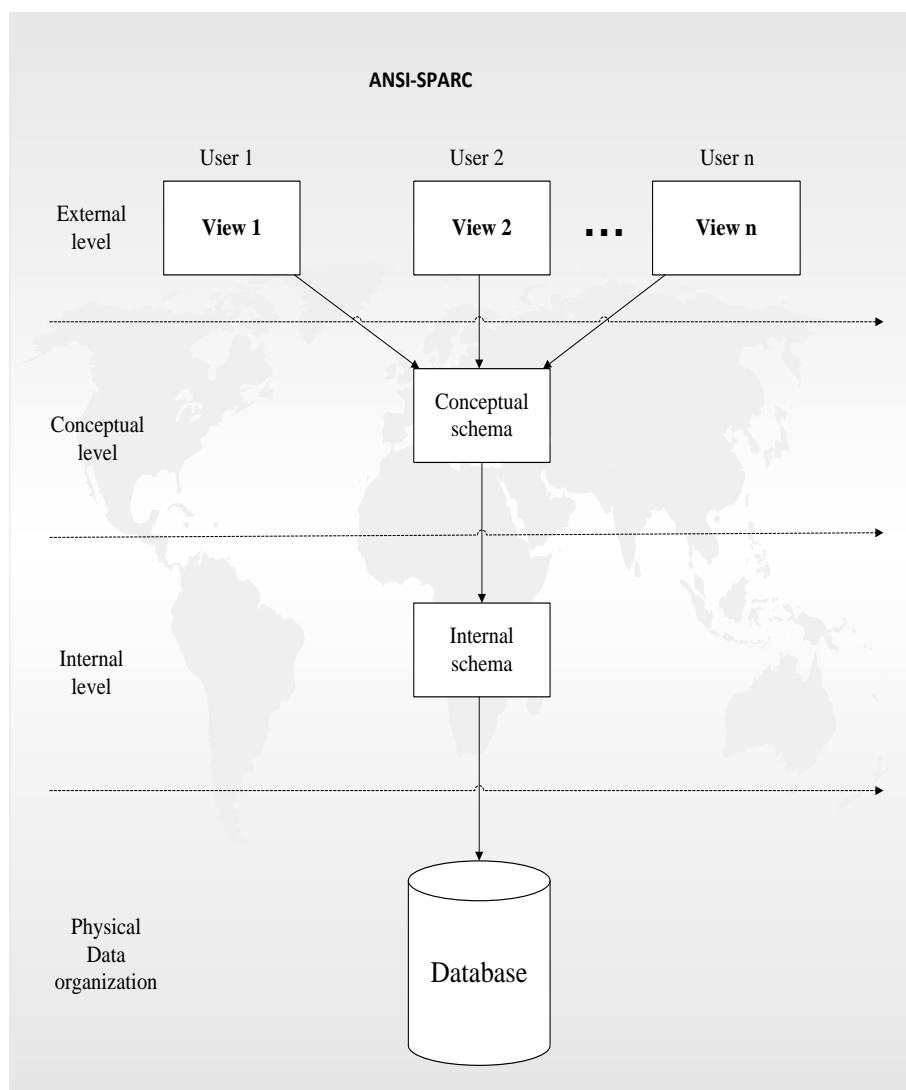


Figure 4.4 Database architecture for the newly proposed system

### The external level

At the external level users of the system interact via application programs and system users have different views about the database. DDL (Data Definition Language) and DML (Data Manipulation Language) are the only tools used at the external level.

### Conceptual Level

It gives a description of the information stored in the database and the relations among the data. Database Administrator (DA) can see the conceptual level as the logical structure of the system database because it does not reveal the physical storage structure, it gives a description of entities, relationships, user constraints and operations and lastly data types

### Internal Level

The internal level shows the type of data in the system database.

### 4.5.3 Database tables

The tables below gives a detailed description of metadata used for the system database design.

#### System users

FIELD NAME	DATA TYPE
Username	Varchar(100)
Password	Varchar(100)
Full Name	Varchar(100)
Access Level	Varchar(10)
Region	Varchar(100)
Position	Varchar(36)

Employment Code	Char(36)
Status	Varchar(50)

*Table 4.4 System users*

#### **Fault and Solutions table**

FIELD NAME	DATA TYPE
<u>Fault Number</u>	Int(100)
Fault Description	Varchar(100)
Keyword	Varchar(100)
Solution	Varchar(1000)

*Table 4.5 Fault and solutions table*

#### **Maintenance schedule table**

FIELD NAME	DATA TYPE
Base Station Name	Varchar(100)
Region	Varchar(100)
Tasks	Varchar(100)
Maintenance Date	Date(100)
Comments	Varchar(100)

*Table 4.6 base station maintenance schedule table*

#### **4.6 Program design**

Program design guides software developer through the entire problem solving process. It consists of steps needed by a programmer before using any certain type of language to come up with the

program code. This section will explore in detail the conceptual design of the program and the software developer will adopt Object oriented design methodology.

#### 4.6.1 Package diagram

It shows a clear view of system modules, how they interact. Developer grouped different classes into packages so as to understand better the newly proposed product

Figure below show the package diagram of the proposed system

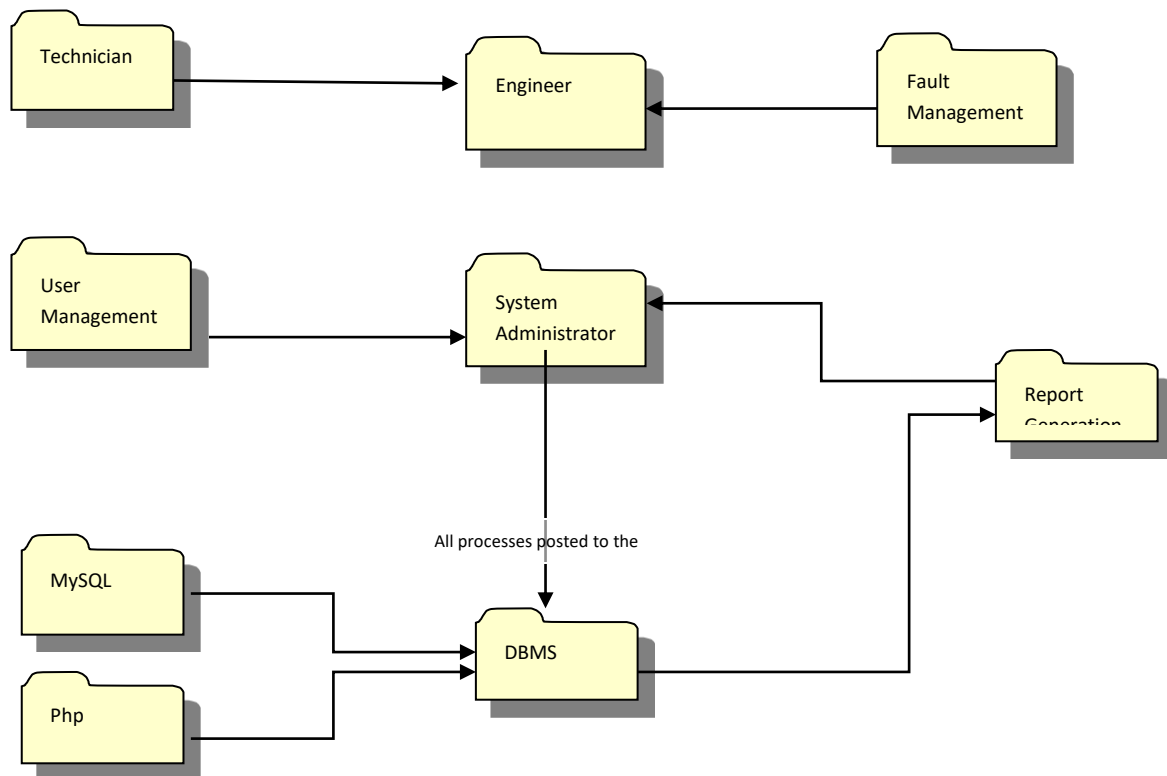


Figure 4.5 Package Diagram of the proposed system

### 4.6.2 Class diagram

Proposed system Class Diagram which can be used to outline relationships and types of objects is shown below

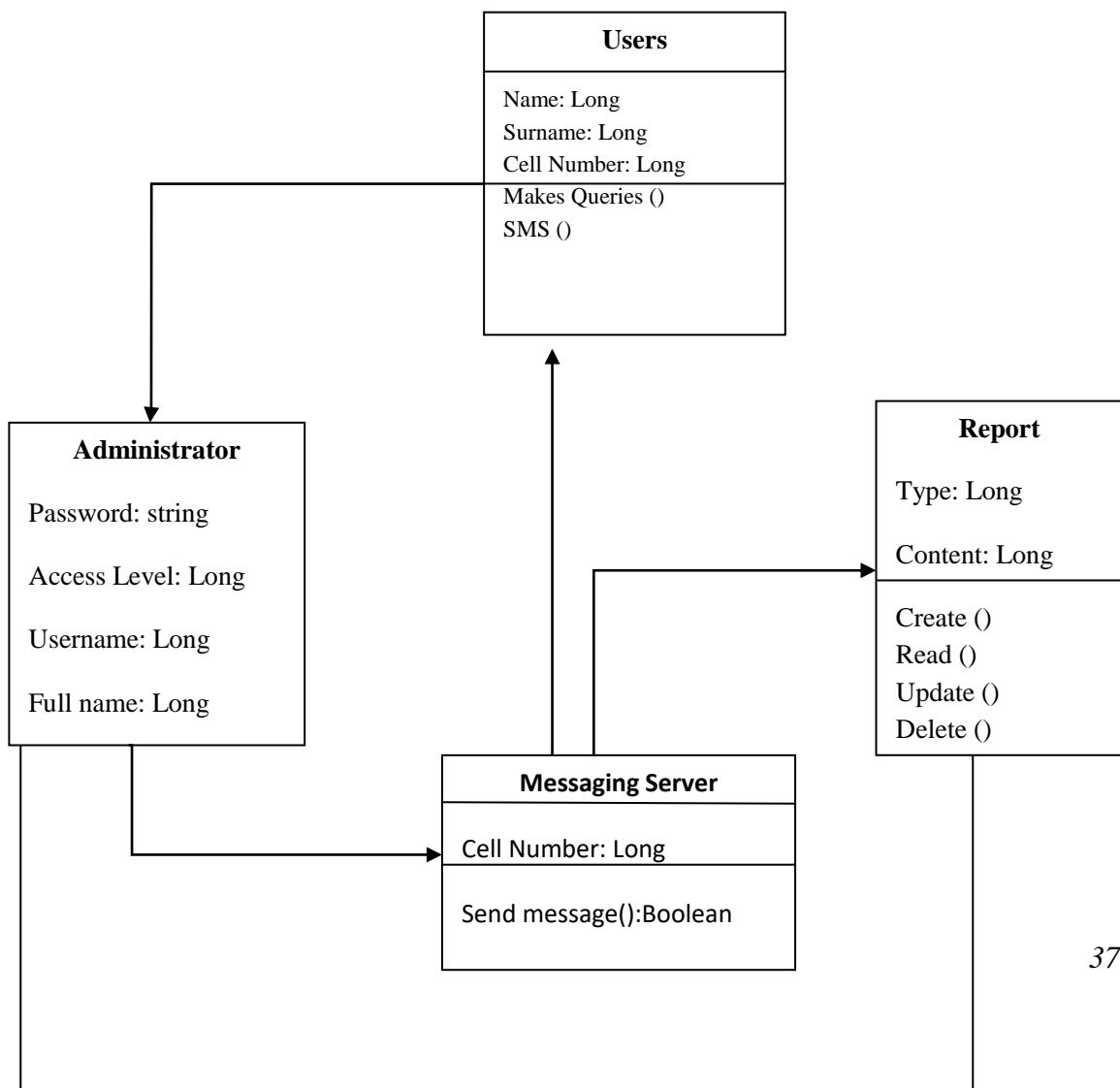


Figure 4.6 Class Diagram

### 4.6.3 Sequence Diagram

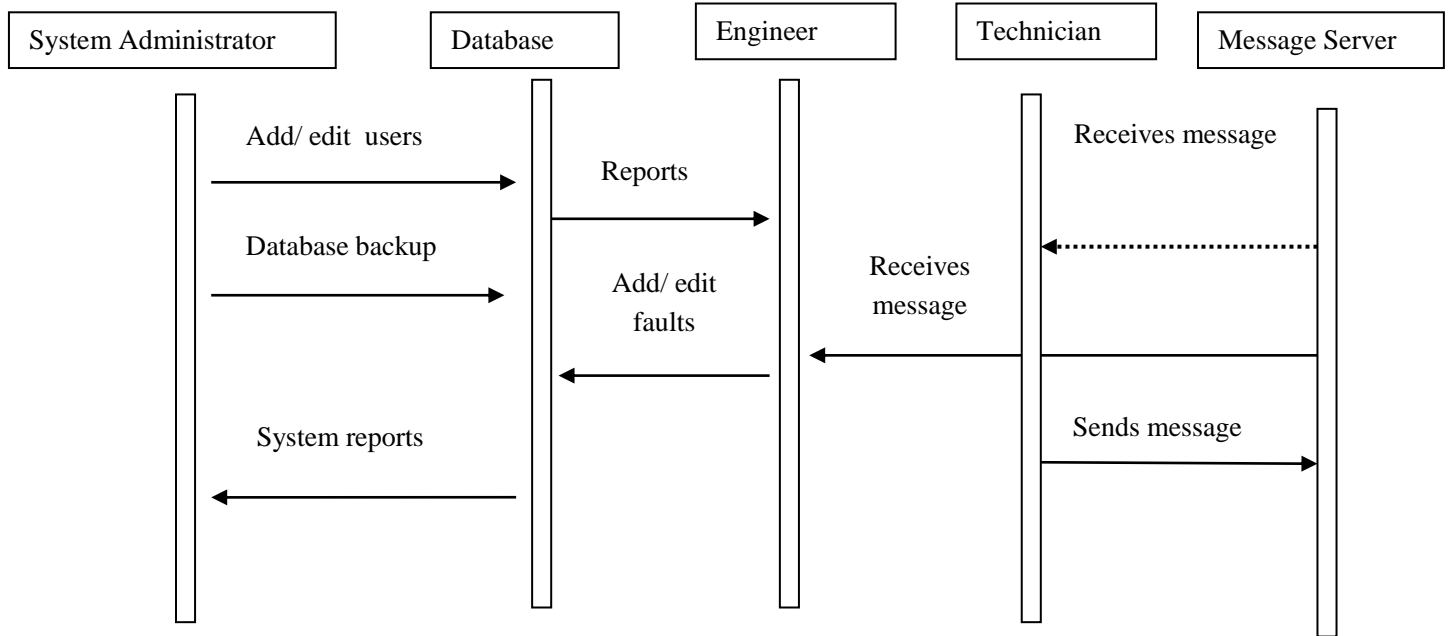
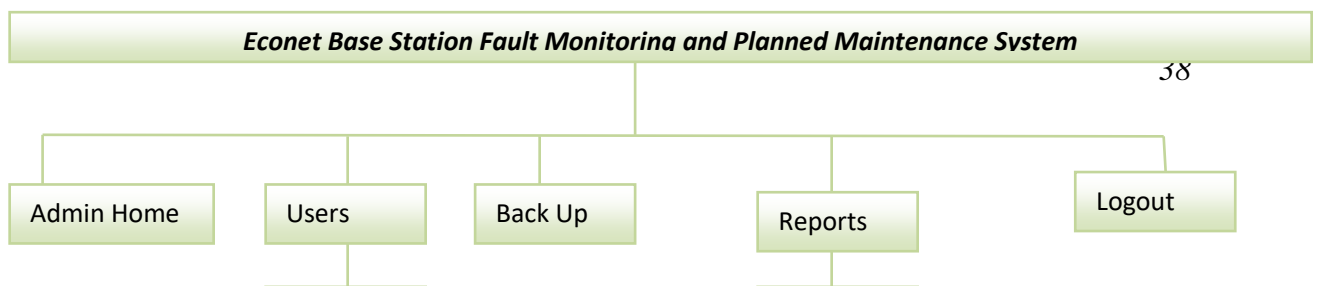


Figure 4.7 Sequence diagram of the proposed system

### 4.7 Interface design

It provides a mode of communication between the system and its users. The system developer designed a user friendly system that will be easy to use.



*Figure 4.8 Interface design*

#### **4.7.1 Input design**

The following will be used to capture necessary information from system users

- Buttons
- Text boxes
- Hyperlinks ( they will activates options)

All system input pages should validate data on entry into the system and captured data should be stored in the database.

#### **Add Fault Solution Form**

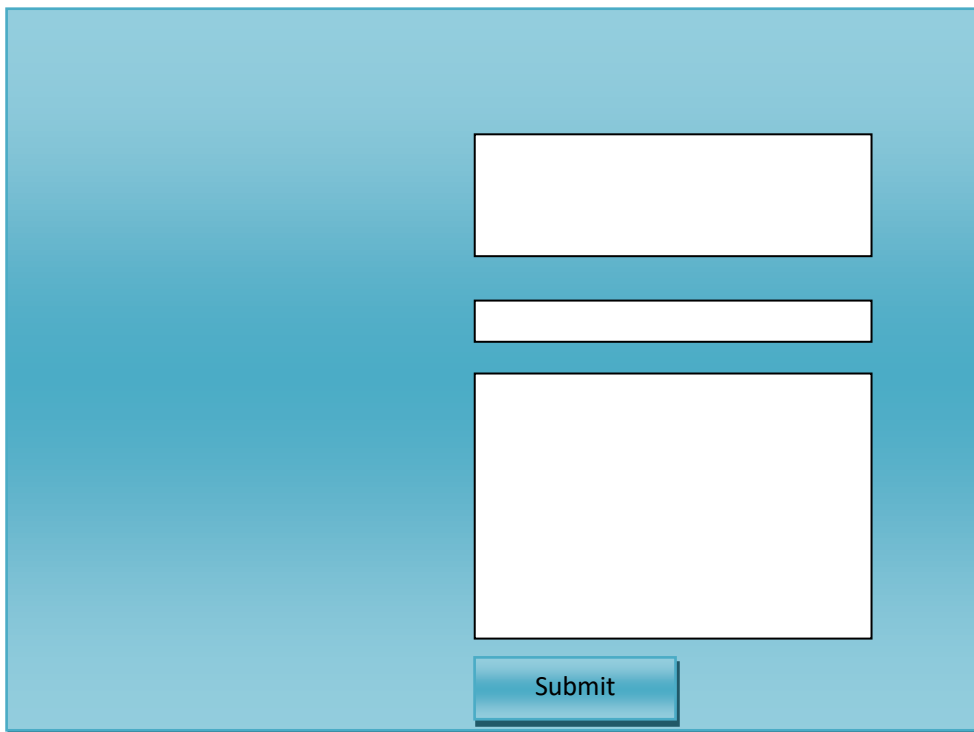
The screenshot shows a web form titled "Base Station Fault Monitoring and Planned Maintenance System" in red text at the top. The form has a light blue background and contains three input fields on the right side, each with a label on the left: "Fault Description" (a large text area), "Keyword" (a single-line text box), and "Solution" (a large text area). At the bottom right of the form is a blue "Submit" button.



*Figure 4.9 Add Fault Solution Form*

Add fault solution form is the initiates the fault monitoring system as the Engineer adds all faults and possible solutions. The system can validate the fault solutions to prevent data duplication.

#### **Add Base Station Maintenance Schedule**



The image shows a web form with a light blue background. It contains three input fields: a wide text box at the top, a narrow text box in the middle, and a larger text box at the bottom. A 'Submit' button is located at the bottom right of the form.

*Figure 4.10 Add Base Station Maintenance Schedule*

The form above captures information to be received by Technicians on their mobile phones when base stations are due for maintenance.

### Add Polls

**Base Station Fault Monitoring and Planned Maintenance System**

Base Poll Name

Poll Parameters

Figure 4.11 Add Polls Form

The form above allows users to participate in polls so as to find other important information from technicians

### New Technician Registration

**Base Station Fault Monitoring and Planned Maintenance System**

Name

Surname

Nat ID Number

Phone Number

Sex

#### 4.7.2 Output forms

Below are reports that will be generated by the new system

- Faults and their Solutions
- Base Station Maintenance Schedules
- System Users

### Base Station Maintenance Schedule Report

The figure below shows a summary of base station maintenance schedule

<i>Station</i>	<i>Date</i>	<i>Tasks</i>
Gweru BSC	21 November 2014	Install Cameras on the site

*Figure 4.12 Maintenance Schedule report*

### Fault Solutions Report

The figure below shows a summary of faults and their solutions

<b>Keyword</b>	<b>Fault Description</b>	<b>Fault Solution</b>
Power off	Switch board is off and warning siren is on	Switch off the mains and press the reset button

Figure 4.13 Fault Solutions Report

### System Users

<b>Status</b>	<b>Position</b>	<b>Full Name</b>
Suspended	Engineer	Gerald Chazunguza
Unspended	Engineer	Gedza Mutusva

*Figure 4.14 System Users*

The report above will show system users status (if they are suspended or active), their job titles and full names.

#### **4.8 Conclusion**

This chapter enabled the developer to fully understand and realize how the proposed system is going to operate. The system developer will code the system and take various tests so as to minimize system failure after installation since Input forms, output, database and reports were designed. System installation and other activities will be discussed in the next chapter.

## **Chapter 5: Implementation Phase**

### **5.1 Introduction**

In this phase, the new product is installed using the most suitable method, end user training will be finished, documentation will be printed and copies given to users, project review meeting will be held. After the completion of this phase, the new system will be discussed to ensure that we met all of the proposed objections in the project plan for a satisfactory result.

### **5.2 Coding**

System developer coded modules which were assembled into one system. The code was written using Php and MySQL database. System developer opted for MySQL since they support large volumes of data and end users.

#### **5.2.1 Pseudo code**

Functionality of the system was illustrated by pseudo code before converting it into actual PHP and SQL statements, this was done so as to enable the analysts programmer to have a clear understanding of the system, and what end users expect.

- **Pseudo code of verification of login page**

Get Username and Password

If (Username and Password = Entered Username and Password)

Then

Successful Login in the User

Else

Login failure

EndIf

- **Creating a new record**

Validate Record Information

If Correct Input is entered

Save details

Else

Display Error

- **Searching for a record**

Get the record key

If record if found

Display data

Else Report error

- **Deleting records**

Get the record key

If no record is not fund

Report error

Else Allow end user to delete data

End

- **Viewing records in the database**

Get the records ID

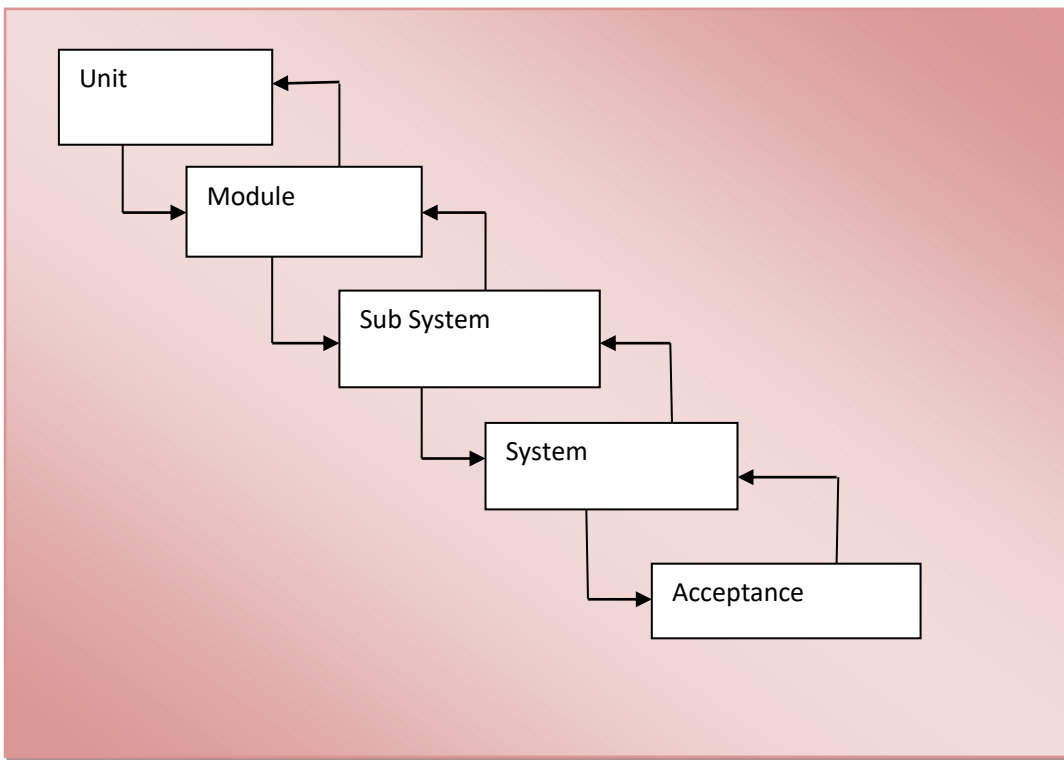
If ID is correct display all records

Else Report Error

End

### 5.3 Testing

These are activities of running a system so as to identify and find if system is producing correct results. System testing involves activities aimed at evaluating attributes of a system and checking that it produces expected results. This was done before installation so as to ascertain, the diagram below show test activities carried in their order

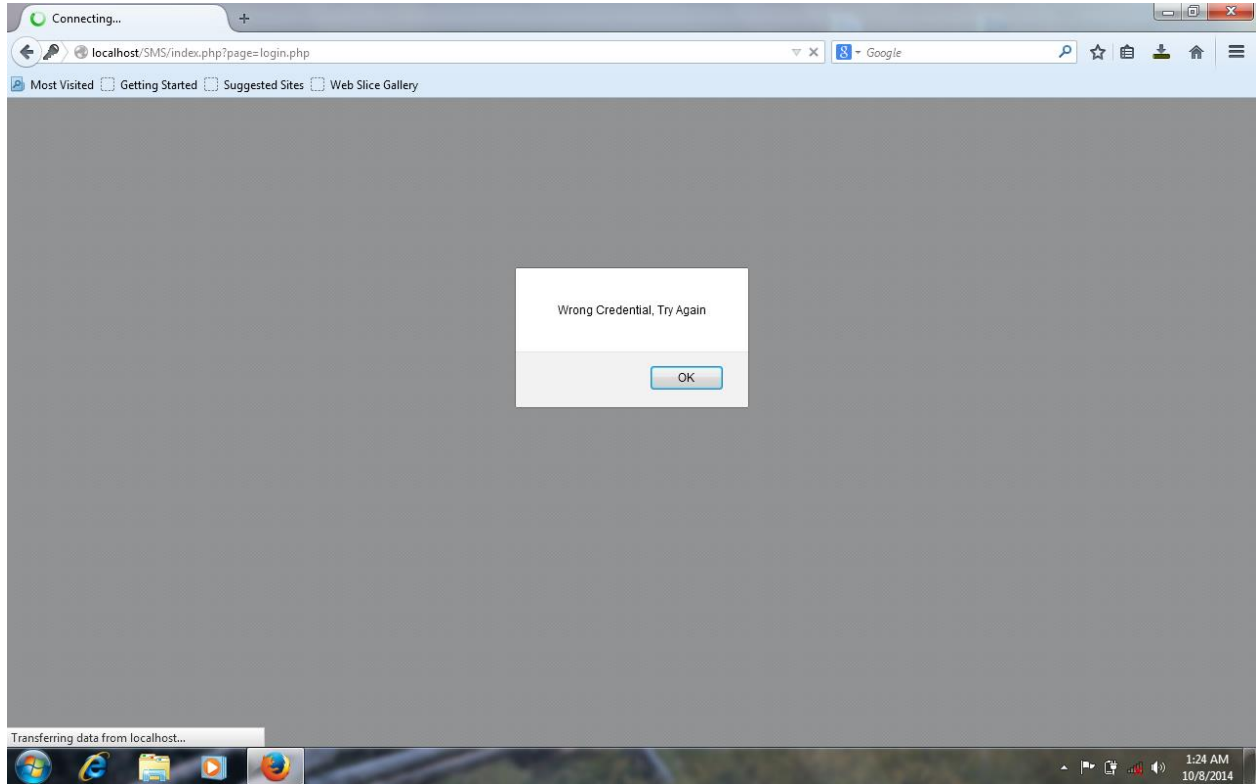


*Figure 5.1: System Testing Procedures*

#### 5.3.1 Unit Testing

Unit testing is testing of a program or module. Unit testing follows has two categories which are white box and black box testing. It is done in an isolated environment for example when the developer tested the technician login form to check if it validates login credentials.





*Figure 5.2 Testing Process Flow*

### **5.3.1 Black Box Tests**

It simulates end-users experience, inputs and outputs of the system are tested. The system testers entered invalid data to the system so as to check the output; the system testers will have to do the process without changing the code of the system. All errors which affect the performance of the system will be noted for example interface errors and data structure errors.

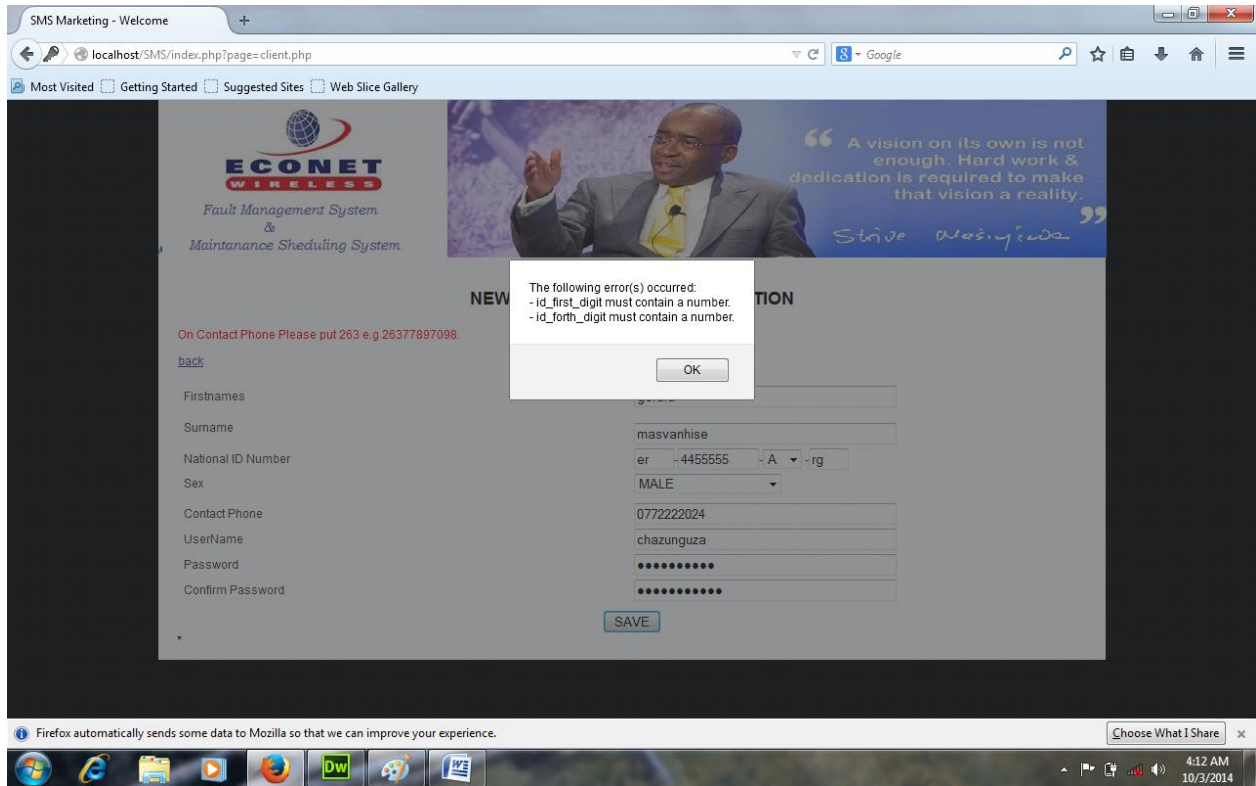
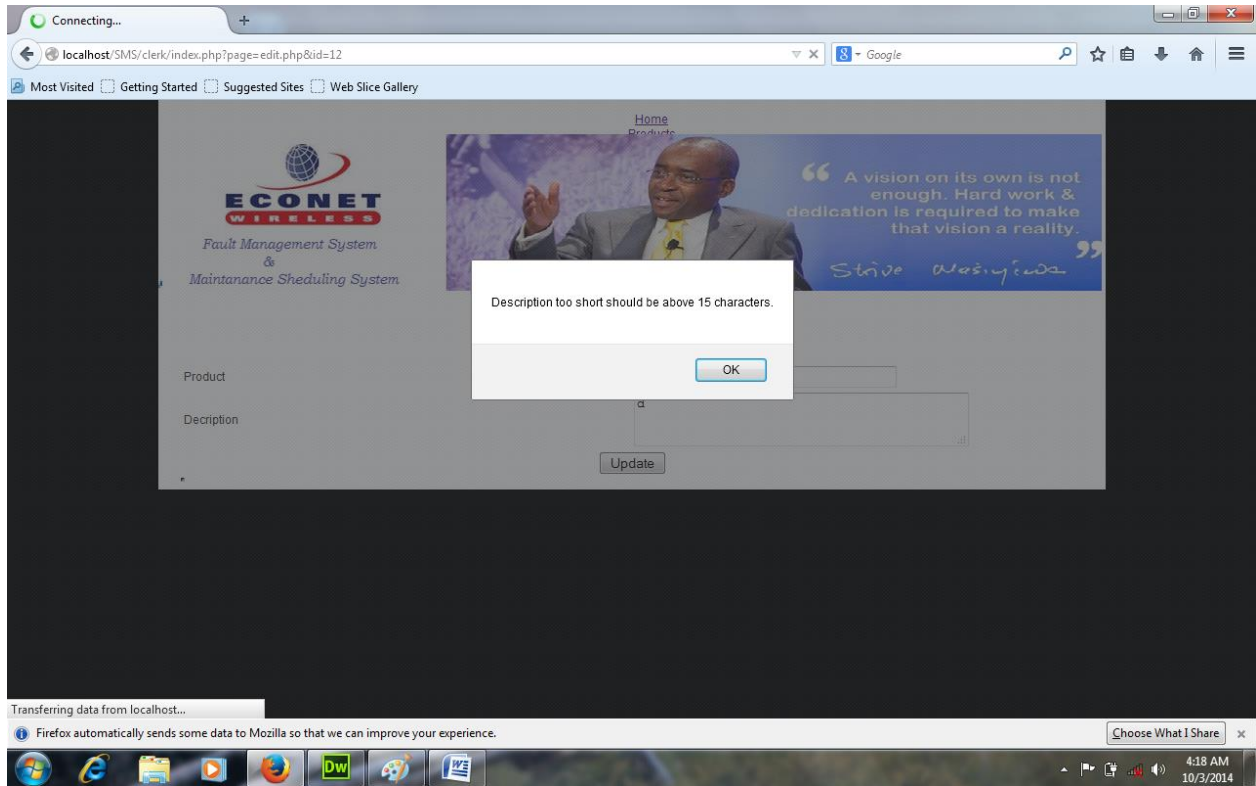


Figure 5.3 Black Box Testing

### 5.3.2 White Box Tests

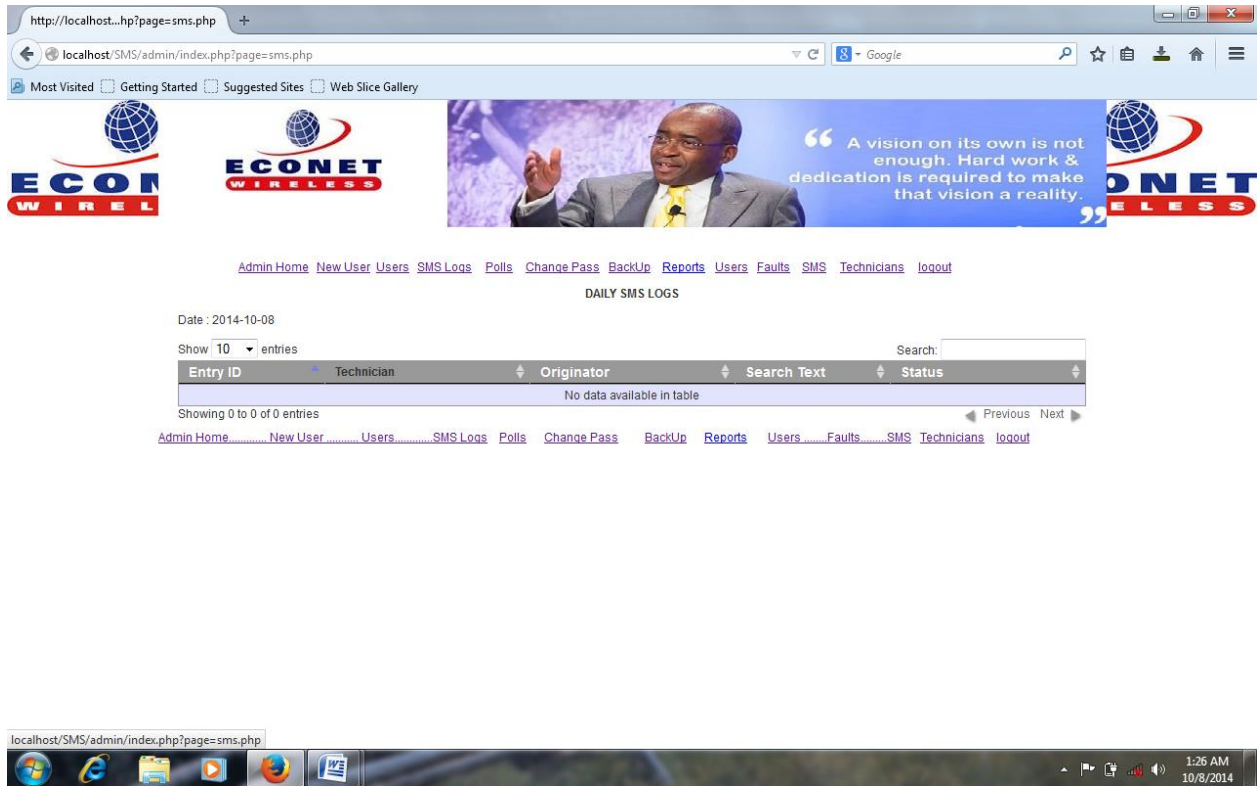
This is also known as glass box, clear box, and open box testing. It is based on an analysis of internal workings and structure of a piece of software, access to source code is essential for white-box testing where you look at the code of the program to find other possible tests. There is creation of test cases by looking at the code to detect any potential failure scenarios. Below is a fault description text box where description was too short



*Figure 5.4 White Box Testing Screenshot*

### **5.3.3 Module Testing**

To measure the functionality of modules, system objectives were used to check if they were achieved. A single module was tested without alone, one at a time, for example to checking if the module had send auto responses to registered technicians on a certain date and it showed no data was available in the table. System developer tested each form for verification of desired performance this objective was met and conclusion made that the system was working as expected.



*Figure 5.5 Module Testing Screenshot*

### **5.3.4 Subsystem Testing**

Subsystem testing was carried to check if two or more linked modules can work together. System developers checked if System Administrator can suspend Engineers from having access to the system, and after the act the Suspended Engineer failed to login in to the system.

### **5.3.5 System Testing**

Software compatibility to the hardware environment, system efficiency and effective was done during the phase of system testing, and the system proved that it was wonderfully made since it managed to achieve user requirements and invalid access to information was also prevented.

### **5.3.6 Acceptance Testing**

This type of testing was carried so as to check if the users perceive the ease of use and usefulness of the system. It was noted that all users made it easy to navigate the system and noted how the

system is useful in their day to day work, Econet Wireless accepted the system since it brought employee satisfaction.

#### **5.3.7. Alpha testing**

Fault Management and Scheduling System was delivered to the organization's site where it will be used for the end users to note and report any problems and errors. All system errors and problems were corrected.

#### **5.3.8 Beta testing**

It was conducted by Administrative users so as to improve the quality of the product, beta testing ended within one week.

### **5.4 Test strategies**

Verification and Validation were the test strategies that were used

#### **5.4.1 Validation**

System objectives were tested to see if they had been achieved. For example an unregistered technician should not receive base station maintenance schedules and auto responses to faults.

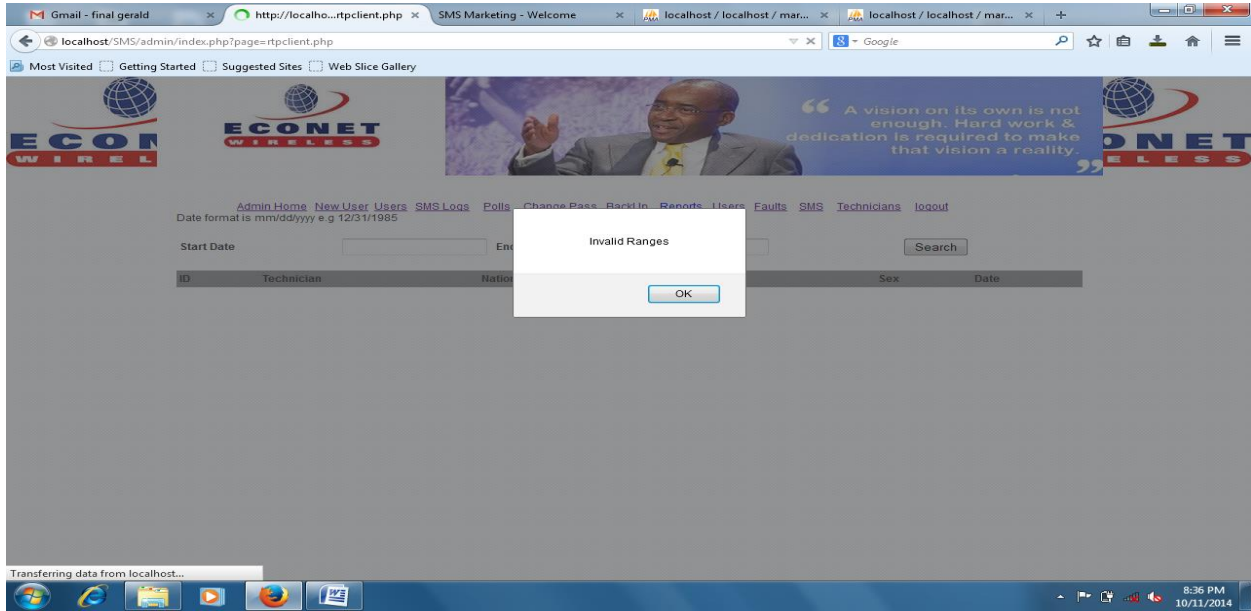


Figure 5.6 Validation screen short 1

On figure above the system user entered invalid date range and the system prompts an error, when invalid date ranges are selected the system will not search the database. Figure below shows a results of correct date range.

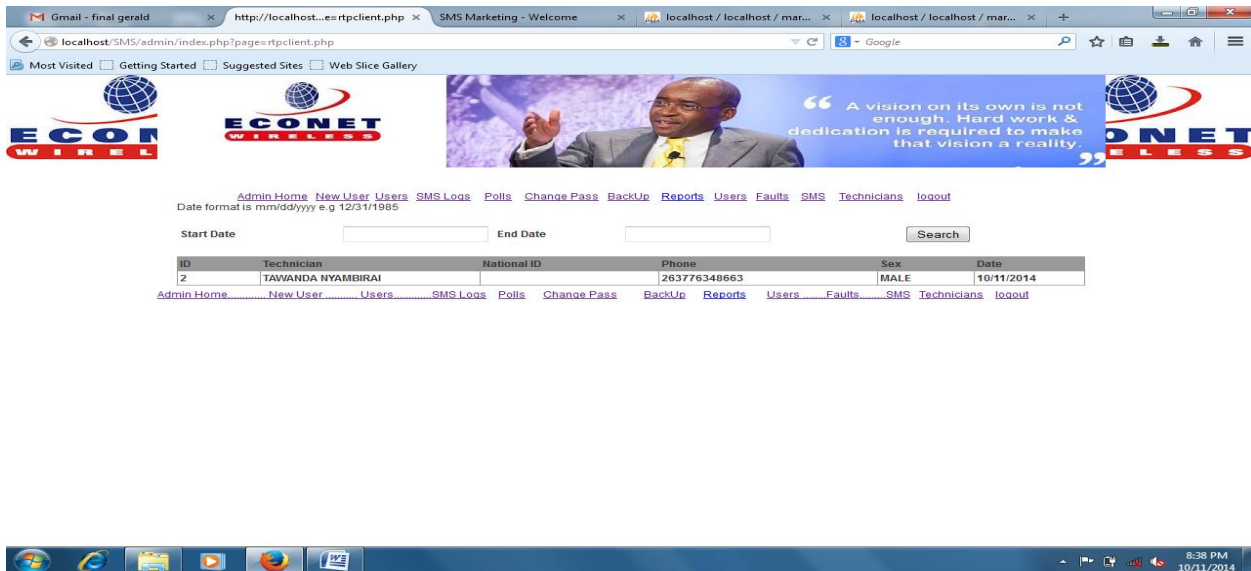
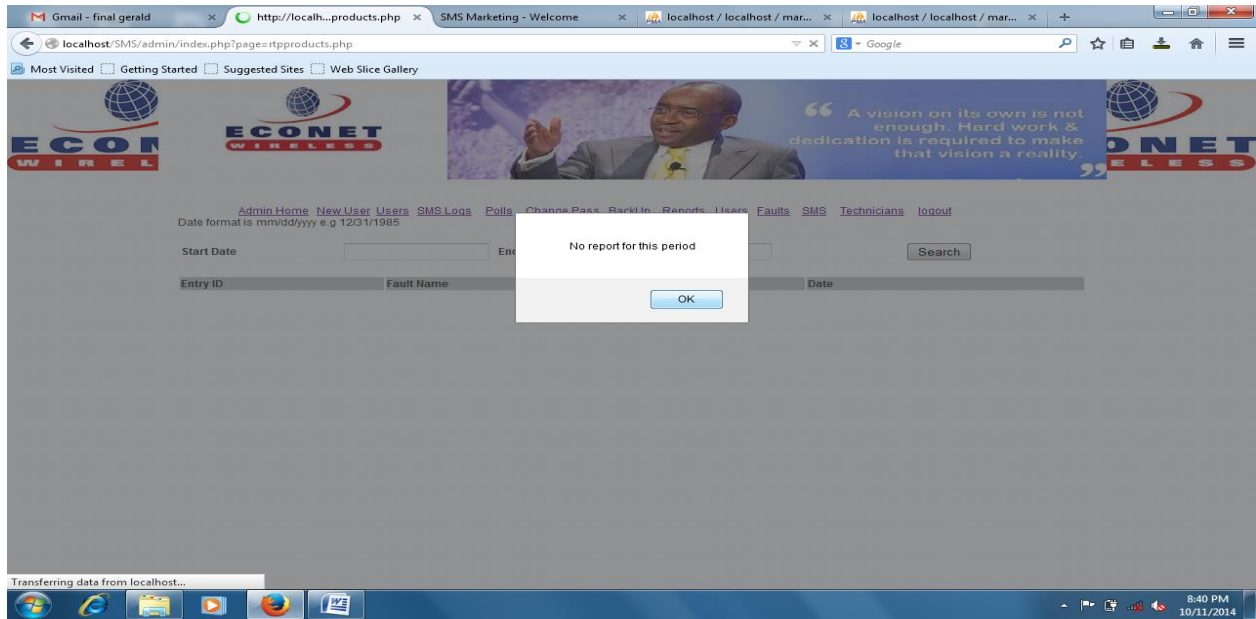


Figure 5.7 Validation screen short 2



*Figure 5.8 Validation screen short 2*

## **5.4.2 Verification**

Verification was done to check if the product was made right, to see if it met the user specifications and requirements. There is high likelihood in software development of coming up with a very good system which does not satisfy the user problems. Close comparison was made between the system and specifications in the requirements document, design diagrams and pseudo.

Figure below shows that when a user enters a national ID which is already in the database the system will not accept the values



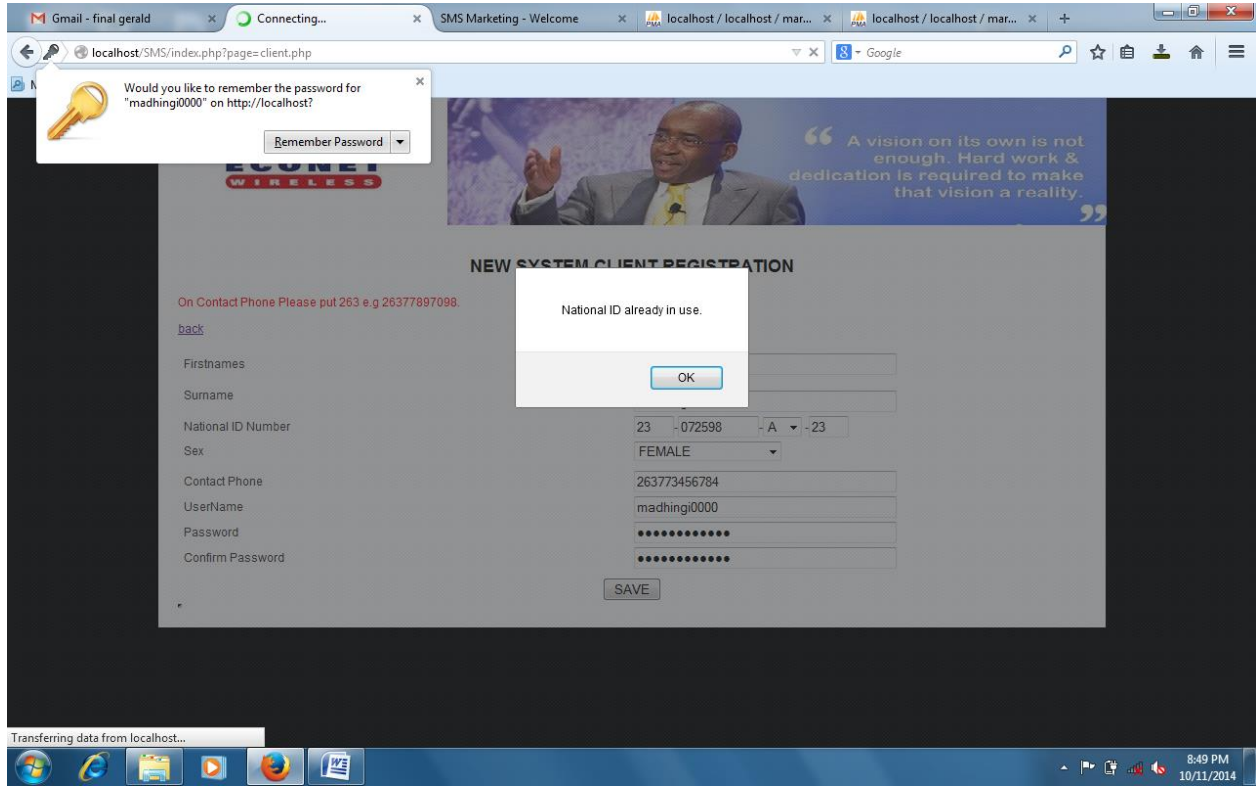


Figure 5.9 Verification 1

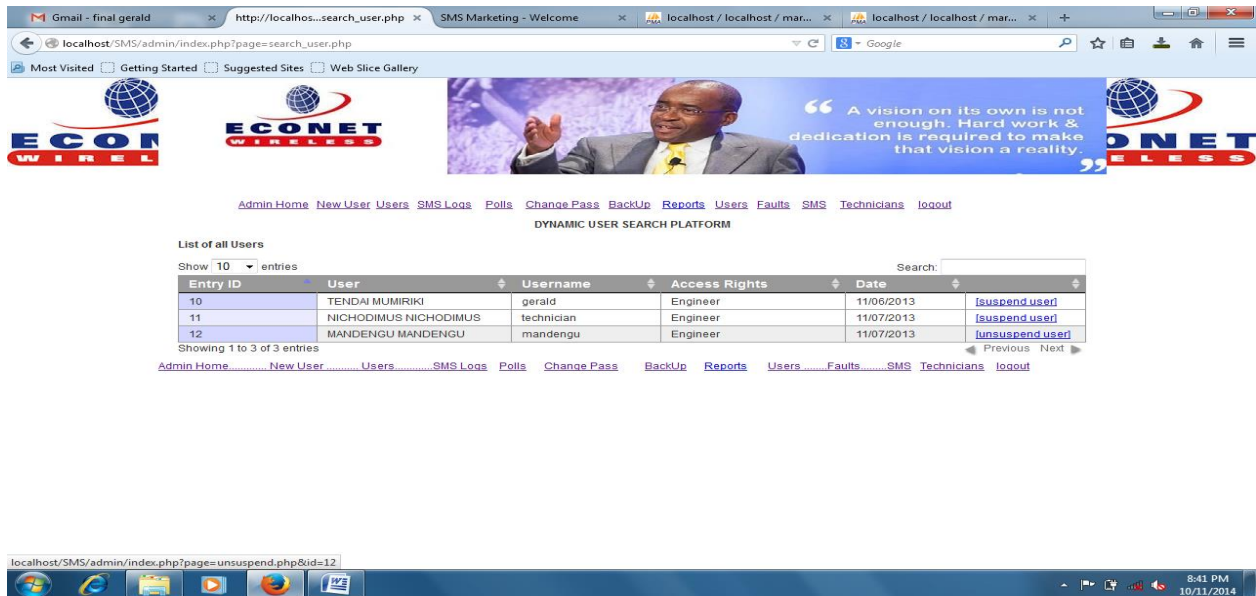
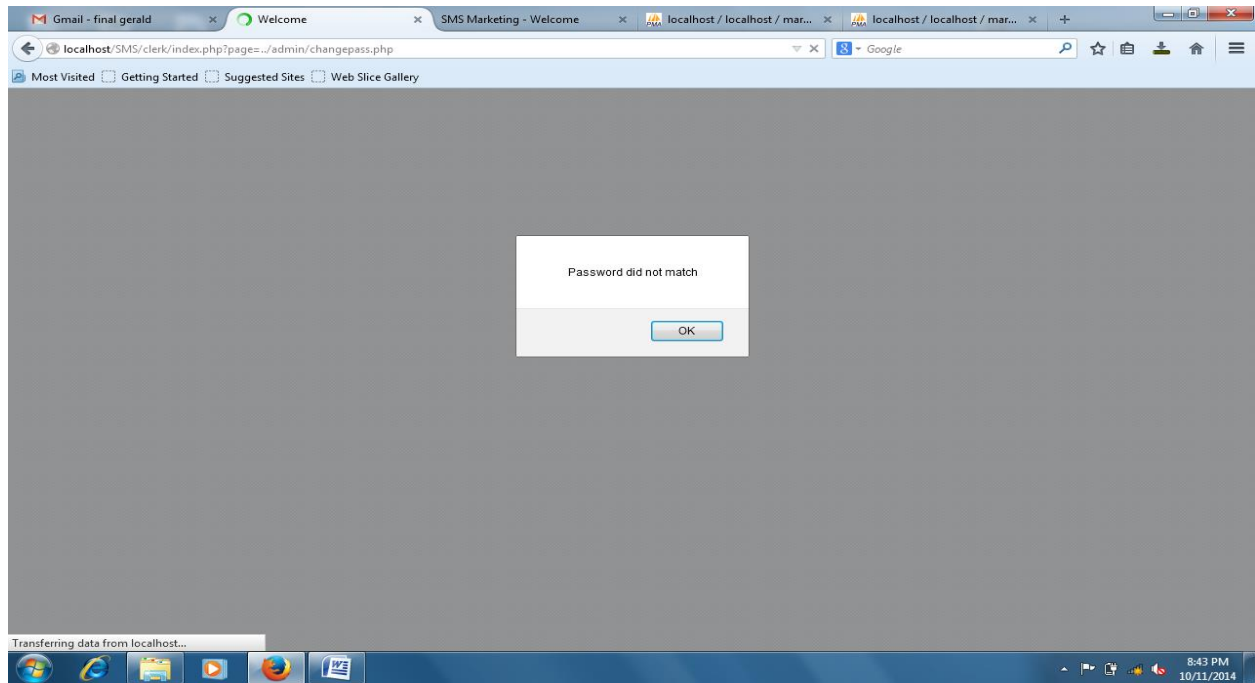


Figure 5.10 Verification 2



The form above shows that when a user is suspended, the user will not have access right to view information in the system



*Figure 5.11 Verification 3*

Form above shows that when passwords did not match one cannot continue the process of changing a password

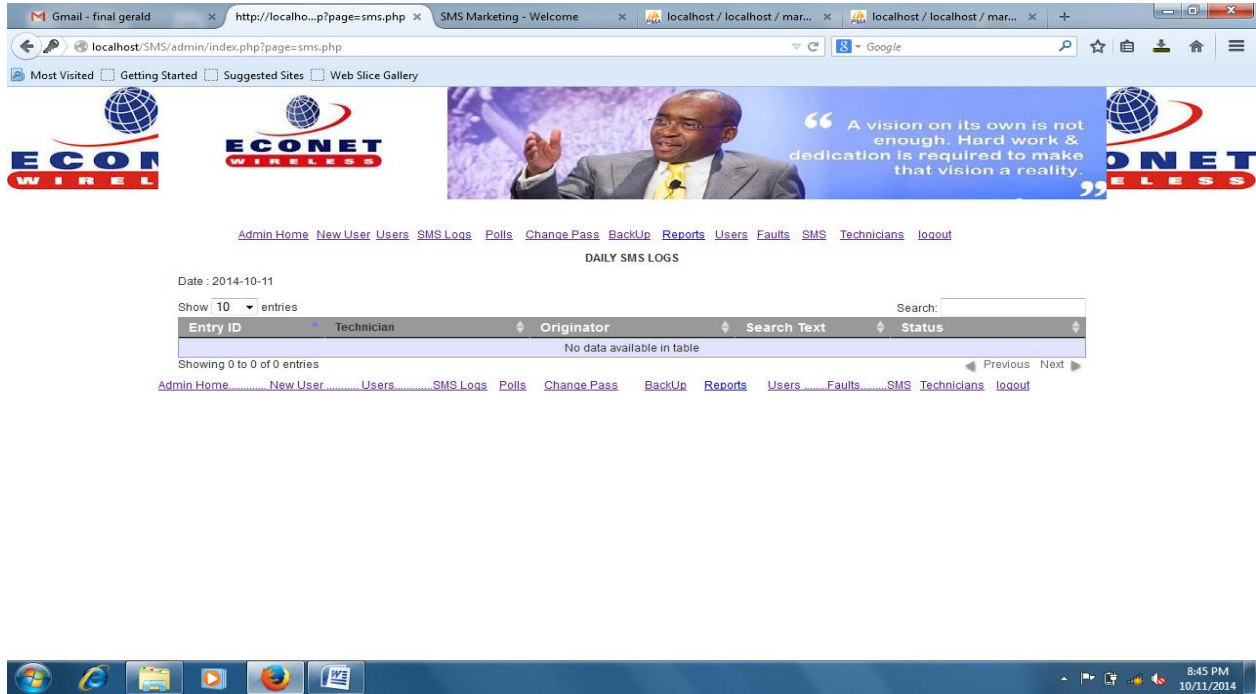


Figure 5.12 Verification 4

Figure above shows that when there are no registered technicians, in the system there will be no daily SMS logs displayed by the system

### 5.4.3 System Security Testing

This will be done so as to avoid information loss through unauthorised access, and natural disasters. The system uses access levels and secure password, there are some forms of security in place such as security guards and burglar bars. Backup facility will be used and stored off site in case of information loss it will be used for recovery.

### 5.5 Installation

The system will be run on a web server and the database will also be installed on a database server. All system users will access the information on the web or via SMS.

### **5.5.1 User Training**

To familiarise end users with the system, workshops were held to train the users on how to use the new system, Analyst Programmers and System Administrators helped in the facilitation of the workshop.

### **5.5.2 Operation Environment**

Operation environment checked so as to verify the overall performance of the system regarding before the installation and use of the system. The system developer noted that all were performing well.

### **5.5.3. Method of conversion**

Many different conversion practices can be used to change from the old to the new system and some of them include direct, parallel, pilot and phased conversion. The merits and demerits of each method are outlined below

#### **5.5.3.1 Direct Changeover**

This is the replacement of the old system instantly after failing to handle certain tasks. Below are the merits and demerits of direct change over

##### **Merits**

- No duplication of work only one system is used
- Reduced expenses

##### **Demerits**

- The system may fail and leads to data loss
- It needs proper maintenance

#### **5.5.3.2 Parallel Running**

All systems are run concurrently until the new system has been adopted permanently

### **Merits of parallel running**

- Availability of backup reduce information loss

### **Disadvantages of parallel running**

- It can be used for similar systems and it is quite expensive since it requires too much labour and stationery for printing of reports

#### **5.5.3.3 Pilot Operation**

A group of employees will use the new system at a different site, while the rest of the employees will continue with the old system until the prons and cons have been identified.

#### **Merits**

- Reduced risks and expenses

#### **5.5.3.4 Phased changeover**

The system will be installed in stages across the firm. It takes take time to implement the whole system but it is not too expensive since the implementation is not done at once and risks are reduced.

#### **5.5.4 Post Implementation Evaluation or recommendations**

The system performed very well on the provided environment, users perceived the usefulness and ease of use, it was early adopted by the organisation since end users were highly satisfied. The maintenance of the system will be an ongoing process.

#### **5.4.5 Justification**

The new system was installed using a parallel change over strategy. Chances were that not all the technicians would adopt the new system in one go, as a result, parallel method was ideal to ensure that late adopters will still get support services the old way.

## **5.5 Maintenance**

System maintenance is an on-going process that will be used to modify the whole system so as to fit with the ever changing business environment, addition of enhancements and correcting errors in case when it fails, maintenance of the system will be an ongoing process, system review is also done through system maintenance

### **5.5.1 Adaptive maintenance**

It is done, so as to modify the product to suit new technologies for example touch screens, computer memories, it will be undertaken when there is need. For example database will be upgraded when it can no longer hold the base station faults and user details.

### **5.5.2 Corrective maintenance**

This type of maintenance is done to mitigate errors encountered during the implementation and design phase of the new system, since code errors are common during the installation phase.

### **5.5.3 Perfective maintenance**

It is done after reviewing the system already in place if it is worth to perfect the system the specifications should be planned and approved by stakeholders before carrying on with the process. Perfective maintenance mainly focuses on the upgrading of the product so that it may have the best results.

### **5.5.4 Preventive maintenance**

This is a modification of a software product after delivery to detect and correct latent faults in the software product before they become effective faults. There is also a notion of pre-release maintenance which is all the good things you do to lower the total cost of ownership of the software. Preventative is designed to preserve and restore system reliability by replacing inefficient system components before they fail.

## **5.6 Recommendations**

System developer recommends system users to be trained thoroughly, users should adhere to security procedures so as to ensure data integrity and confidentiality and system maintenance and

backup should be an on-going process to prevent data loss. To avoid data loss through, theft, loss, fire, flood, corruption, or some form of malware, backups will be done on external hard drives, compact disks and on cloud storage.

## **5.7 Conclusion**

The Base Station Fault Monitoring and Maintenance Scheduling was a success since it was completed without delays, stated end user requirements were met, and the system was successfully implanted after testing and checking all errors. System maintenance will be an ongoing process.

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## **Appendices**

### **Appendix A: User manual**

Econet Base Station Fault Monitoring and Planned Maintenance Scheduling System is installed using the procedures below :

#### **A 1.1 Guide for System Administrator**

##### **Open the Installation CD with the software**

Unzip the folders named

1. BSFMPMS folder
2. DB folder

Read, understand and follow the steps below to properly install the product

##### **BSFMPMS folder**

Copy the unzipped folder paste it in C:\wamp\www

##### **DB folder**

The unzipped folder contains an sql file which should be correctly imported to the database server for the system to run properly

##### **How to import the database**

Choose your preferred browser and in the address bar type the address localhost/phpmyadmin

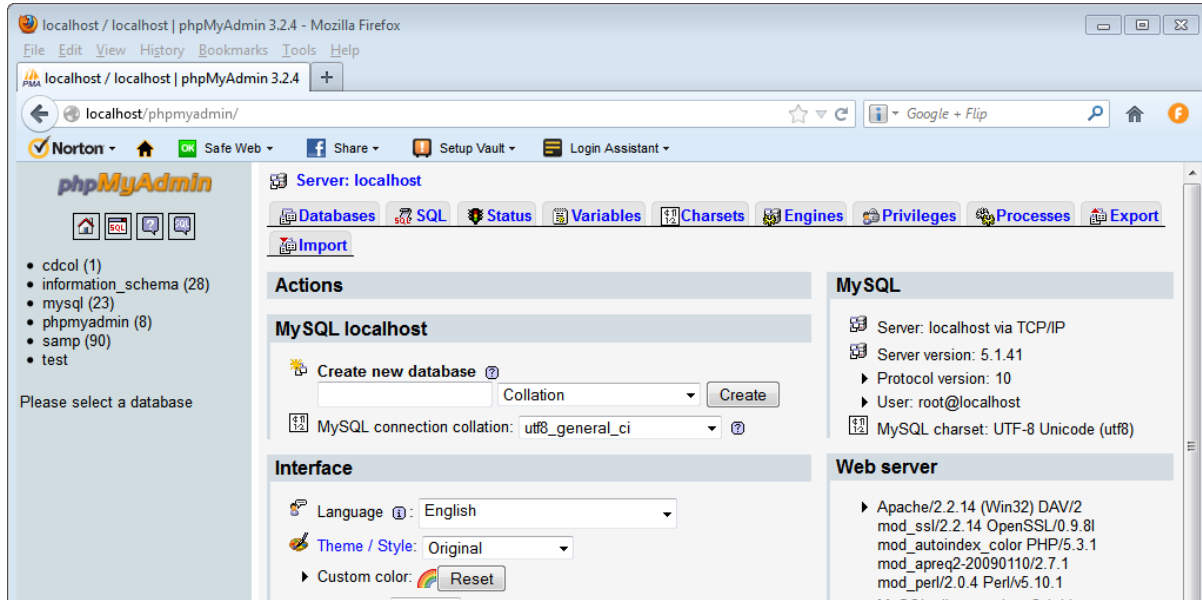
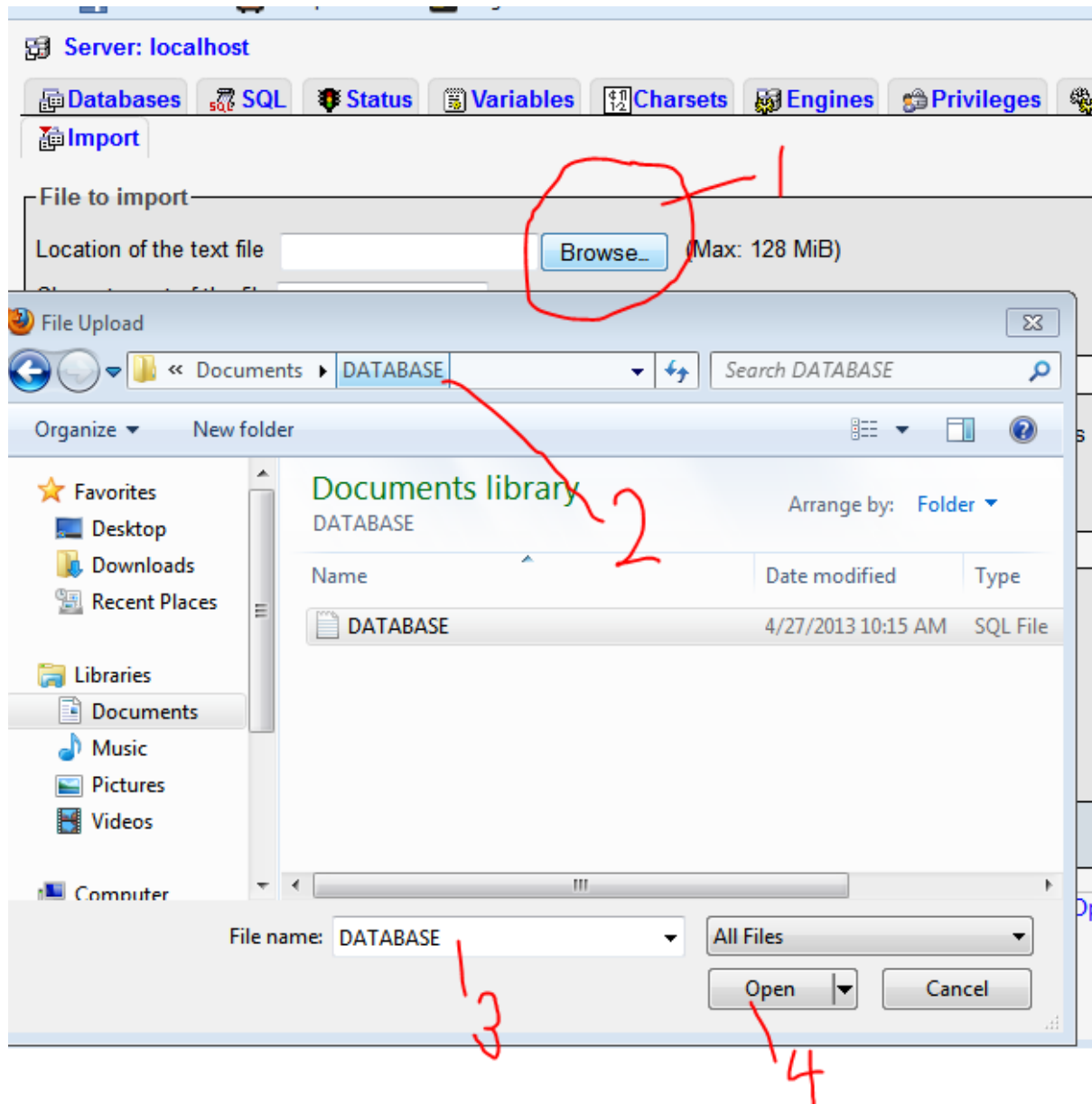


Figure A1.0 localhost/phpmyadmin/ webpage

Move the mouse to import and click on the link, when it opens B Browse the location of the .sql file



**Uploading the database**

step	description
1	Choosing the location of the database
2	Type the address of the system database
3	Select database file
4	Uploading the database

## Initializing the System

Open the your preferred browser and type localhost/Econet

*Login as Administrator with the following credentials*

*Username admin*

*Password chazunguza2014*

The screenshot shows a web browser window with the URL `http://localhost...hp?page=user.php`. The page displays the Econet logo and a navigation menu. The main content area is titled "SYSTEM USER REGISTRATION" and contains the following form fields:

- Firstnames
- Surname
- UserName
- Password
- Confirm Password
- Access Rights (with a dropdown menu showing "---- Select Access ----")

A "Save" button is located at the bottom of the form. The browser's taskbar at the bottom shows the system time as 1:26 AM on 10/8/2014.

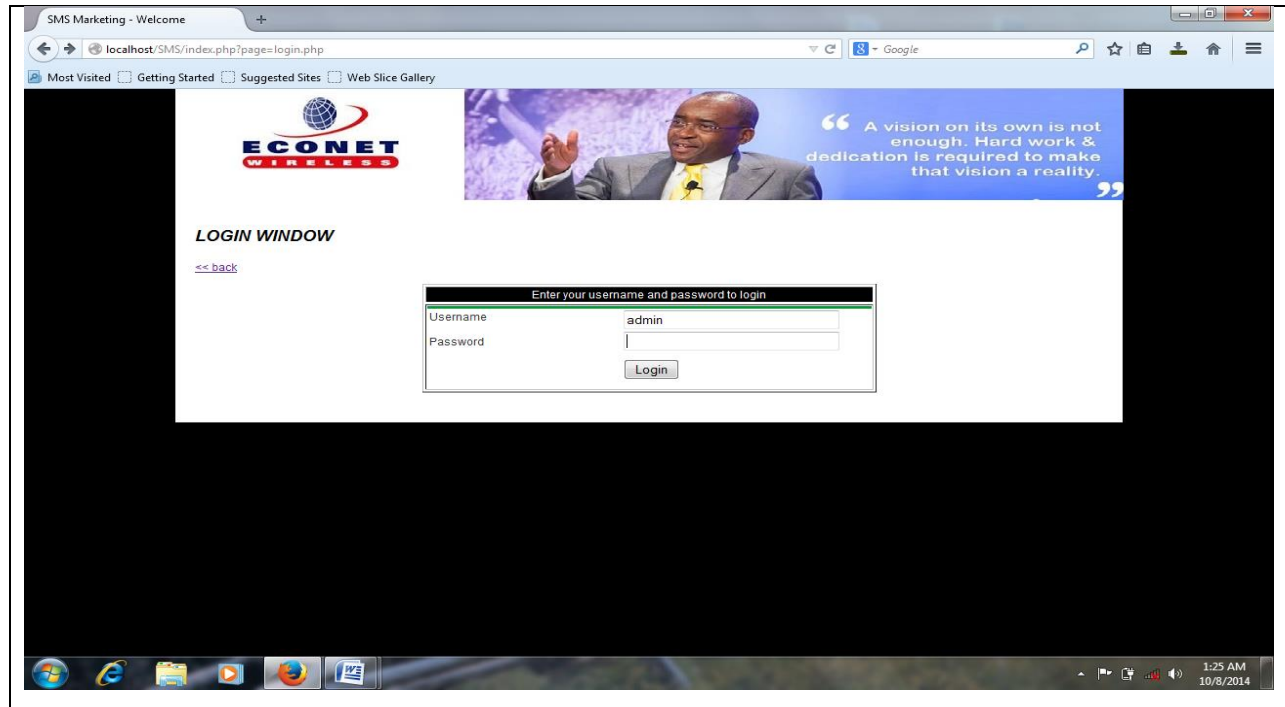
## Steps in new user registration

Fill in the details in the form above and choose save after completing, don't forget to choose access rights

## A1.2 The user guide

### A2 Log in

After a new user has been created and assigned a password. The user can now access the system through a username and a correct password



### Steps in logging into the system

Step 1: in the URL of any browser open localhost/Econet

Step 2: input a valid username in the username field

Step 3: input the correct password.

Step 4: click on login to access the main dashboard of the system

### A3 The main dashboard

This is the main page where links to different system operations are accessed



Fig A2 the main page

## **Appendix B: Interview checklist**

### **B.1 Interview with the technicians**

- How does your current system operate?
- What is the main problem of the system currently in use?
- What are the inputs and outputs of the current system?
- What are the records you keep in your file cabinets?
- For how long are these records kept in the files?
- To what specific uses do you put the above-specified information?
- Who are the users of this information and what specific aspects of it do they require?
- What challenges are you facing in storing information?
- What are the requirements you wish to be added to the new system?
- How much time do you take to fix base station faults?
- What information do you gather from outside the organization which is useful to you?
- What information does management require from the current system?
- How often are they required?

### **B.2 Interview with Engineers**

- What problems are you facing with the current system?
- What are your suggestions to the problems which are being faced?
- Specify requirements which you need to be included in a computerized system?
- Are you happy with the interventions?

**Appendix C: Questionnaire checklist**

**Gender**      male                   female

Job Title .....

**1. Give a brief description of your service you offer?**

.....  
.....  
.....

**2. What are the processes involved in solving base station faults? (Number your processes)**

.....  
.....  
.....

**3. How long does it take to complete processing to solve faults?**

.....  
.....  
.....

**4. How do you store the all details relevant to your work?**

.....  
.....  
.....

**5. Suggest improvements which you wish to see in the current system?**

.....  
.....  
.....

6. Briefly describe how you retrieve information from your storage places

.....  
.....  
.....

7. Is there a need for a fully computerized system? Yes/no

.....  
.....  
.....

if yes specify why you need it?

.....  
.....  
.....

**Thank you for your contribution.**



## Appendix D: Observation Score Sheet

<b>Econet Base Station Fault Monitoring and Planned Maintenance Scheduling System</b>	
<b>Observation Sheet</b>	
<b>Date</b>	10/20/2014
<b>Time</b>	1000..hrs
<b>Observations</b>	
<p>Technician send fault description to his superiors ( Engineers and Line Manager) requesting for a solution, the information was sent via electronic mail, all the mails were lately responded since the superiors mobile numbers were not reachable. Two hours were elapsed before the technician found the fault solution.</p>	
<b>Conclusion</b>	
<p>The organization needs a central database where faults can be stored together with their solutions, so that when the same fault occurs at a certain base station technicians can search them, the platform should use short messaging services or web services.</p>	

**Table D1: Observation score sheet**

## Appendix E: Snippet of Code

### Code to receive auto responses

```
<?php
    include "opendb";

    $rsn = mysql_query("select * FROM sms_received WHERE status = '0'");
    while($row = mysql_fetch_array($rsN))
    {
        $r = mysql_query("select * from client_contact where phone =
'$row[cellphone]'");
        if(!$r_ = mysql_fetch_array($r))
        {
            mysql_query("insert into response values(NULL, '$row[cellphone]', 'Sorry,
Cellphone number not registred', '0', '3')");
            mysql_query("update sms_received set status = '3' where id =
'$row[id]'");
        }
        else
        {
            $res = mysql_query("select * from product where product like
'%$row[message]%'");

            if($rw = mysql_fetch_array($res))
            {
                $rs_ = mysql_query("select * from productdata where productid =
'$rw[id]'");
                while($row_ = mysql_fetch_array($rs_))
```

```

        {
            mysql_query("insert into response
values(NULL,$row[cellphone'],$row_[message'],'0','1')");
            mysql_query("update sms_received set status = '1' where id =
$row[id]");
        }
    }
else
    {
        mysql_query("insert into response values(NULL,$row[cellphone'],'Sorry,
Product could not be found','0','2')");
        mysql_query("update sms_received set status = '2' where id = '$row[id]'");
    }
}
}
?>

```

### Code to add System Users

```

<?php
    if(isset($_POST['button']))
    {
        include 'opendb.php';
        {
            ?>
            alert("check your passwords");
        }
    }
</script>

```

```
<?php
    exit;
}
if (strlen($_POST['password']) < 8)
{
    ?>
<script language="javascript">
    alert("Password length should be 8 characters and above");
</script>
<?php
    exit;
}
if(strlen($_POST['phone']) < 11)
{
    ?>
<script language="javascript">
    alert("Contact Phone too short.");
</script>
<?php
    exit;
}
if($_POST['type'] == '0')
{
    ?>
    alert("Please select gender.");
</script>
<?php
    exit;
}
```

```

        $rs = mysql_query("select * from client_nationalid where nationalid =
'$nationalid'");
        if($row = mysql_fetch_array($rs))
        {
            ?>
            alert("National ID already in use.");
            </script>
        <?php
            exit;
        }
        $rs_username = mysql_query("select * from client where username
='$_POST[username]'");
        if($row_username = mysql_fetch_array($rs_username))
        {
            ?>
            alert("Username <?php echo $_POST['username'] ?> already in
use.");
            </script>
        <?php
            exit;
        }

        $firstnames = strtoupper(ucwords($_REQUEST['firstnames']));
        $surname = strtoupper(ucwords($_REQUEST['surname']));
        $date = date('m/d/Y');
        mysql_query("insert into client
VALUES(NULL,'$firstnames','$surname','$date','0','$_POST[username]','$_POST[password]')")
;
        $rs_last = mysql_query("select * from client order by id desc LIMIT 1");
        $row_last = mysql_fetch_array($rs_last);

```

```

$lastid = $row_last['id'];

mysql_query("insert into client_contact VALUES('$lastid','$_POST[phone]");

mysql_query("insert into client_nationalid VALUES('$lastid','$nationalid)");
mysql_query("insert into client_personal VALUES('$lastid','$_POST[type]"); or
die(mysql_error());

?>
<script language="javascript">
    alert("Client Recorded Successfully");
    parent.location = 'index.php'
</script>
<?php
    }
?>

```

### **Code to Suspend System Users**

```

<?php
    include "../opendb.php";
    mysql_query("update user_login set suspend = '1' where id = '$_GET[id]'");
    ?>

<script language="javascript">
    alert("User Suspended Successfully");
    parent.location = 'index.php?page=search_user.php'
</script>
<?php
?>

```