

# Zimbabwe National Water ICT Workshop Management System



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# **Zimbabwe National Water ICT Workshop Management System**



**BY**

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## **ABSTRACT**

Zimbabwe National Water Authority ICT workshop was facing challenges with computers pilling up in the workshop due to technicians not being held liable for repairs. Several alternatives were considered to develop the system which included outsourcing, in-house development, improving the current system and in-house development proved to be best amongst the alternatives. A feasibility study was carried out using the economic, operational, technical and social feasibility techniques and from the results it was deemed viable to carry out the system development. Several information gathering techniques such as interviews, questionnaires, observation and document inspection were used to get an understanding of how the current system works and it assisted in formulating functional and non functional requirements. Php and MySQL were used to develop the workshop management system. Implementation was done using the parallel conversion to reduce the risk of loss of information. Continuous maintenance of the workshop management system will be done using the adaptive method because of its flexibility to adopt software package to different operating environment. It is the aspiration of the researcher to add an auctioning module for unwanted machinery.

## DECLARATION

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

Signature \_\_\_\_\_ Date \_\_\_\_\_

## APPROVAL

This dissertation thesis entitled “Zimbabwe National Water Authority ICT Workshop management system” by **Perpetua Rashirai** meets the regulations governing the award of the degree of BSc Honours in Information Systems of the Midlands State University, and is approved for its contribution to knowledge and literal presentation.

Supervisor .....

Date .....

## **ACKNOWLEDGEMENTS**

God we glorify and praise your name. Sincere gratitude goes to my family and friends for being supportive. More so, I would like to thank my supervisor, Mr Madzikanda for guidance. Thanks also go to the ZINWA staff for allowing me to carry out the research for my project.

## **DEDICATION**

The research project is dedicated to my family, relatives, friends and colleagues.

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IT

ZINWA

CBA

**LIST OF ACRONYMS**

Information technology

Zimbabwe National Water Authority

Cost Benefit Analysis

DFD	Data Flow Diagram
ER	Entity Relationship Diagram
EER	Enhanced Entity Relationship Diagram
MySQL	Structured Query Language
NPV	Net Present Value
PBP	Payback Period
PHP	Hypertext Pre-processor
ROI	Return on Investment
SQL	Structured Query Language
Admin	Administrator

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# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

The ZINWA workshop management system is designed to allow employees to track their computer status. The management system notifies the technician on new repairs in the workshop as a way of increasing efficiency and effectiveness. The managers and senior supervisors of the firm are alerted on overdue repairs which assist the managers on monitoring progress. The management system has a knowledge base that supports technicians with solutions, more so there is a chat box that facilitates easier communication between technicians. The managers can also track the performance of employees.

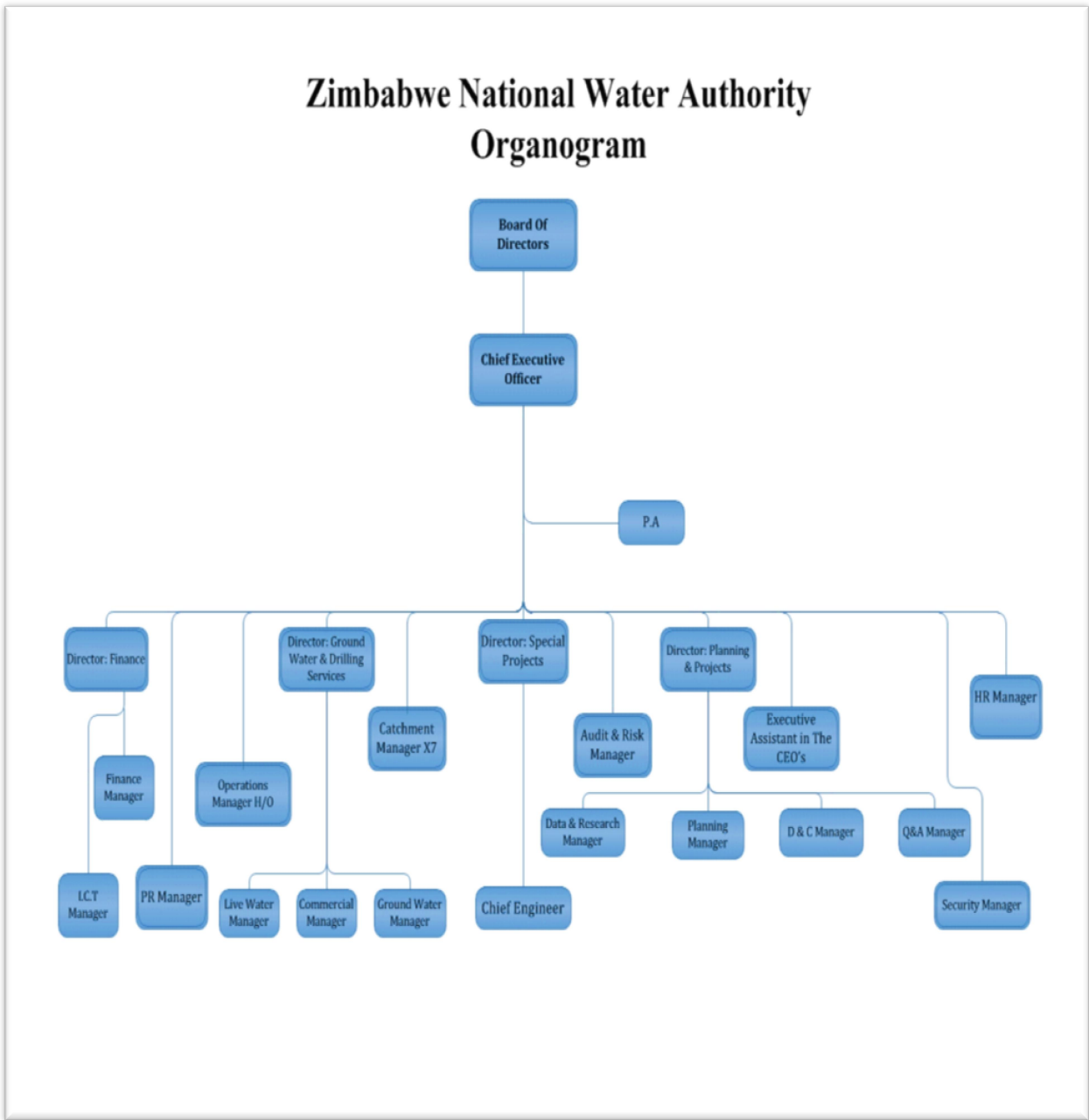
## 1.2 Background of the organisation.

ZINWA is a parastatal that came into being with the aim of ensuring water resources are utilized equally and are readily available. The organization was established in 2000 following the review of the Water Act in 1998. In that year the authority only supplied raw water to local city and town councils but with growth taking place in the company, ZINWA now has diversified its operation to going in borehole drilling, supply of bottled mineral water, through its other arm Kumakomo Spring Waters. In 2005 ZINWA took over water supply stations in Harare, the takeover meant that ZINWA had total control over all the water activities in Harare City Council. In 2007 ZINWA was granted the rights to run all the water activities around the entire of Zimbabwe except for the city of Bulawayo and Masvingo. ZINWA was set up to benefit water resources to the majority of Zimbabweans and to create a condition where water resources are utilized efficiently for the overall benefit of the organization. Currently ZINWA have seven catchments throughout the country and its main headquarters is in Harare.

### 1.2.1 Organizational structure

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Organizational structure portrays the positions in the organisation and the way they are arranged. Below is ZINWA's organogram.



**Fig 1.1 Organogram**

**1.2.2 Vision**

To be a promoter of sustainable economic growth and improved livelihoods through the provision of clean and safe water by 2025

### 1.2.3 Mission Statement

ZINWA is dedicated develop, manage and consistently supply water of appropriate quality and quantities to the nation in a sustainable and equitable manner. Mission Statement is a starting point that tells the firm's desired public image (Bateman 2011).

### 1.2.4 Core values

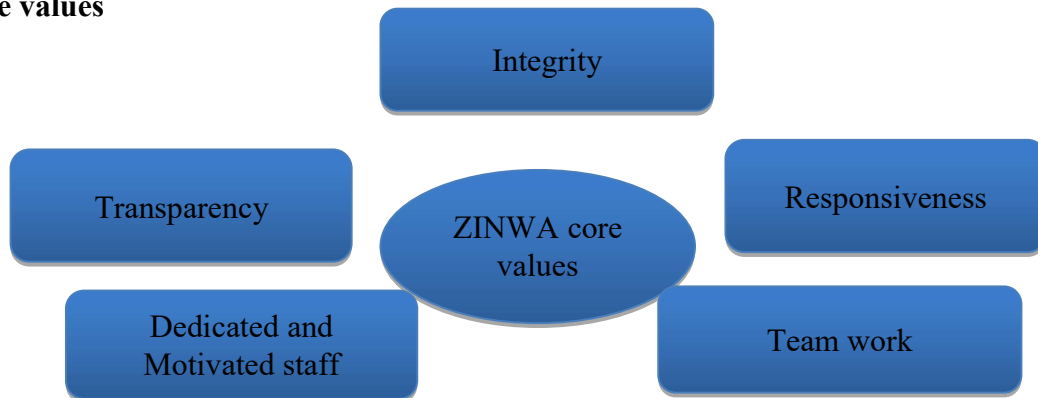


Fig 1.2 Core values

### 1.3 Problem Definition

ZINWA is still lagging behind in technological development since some of its departments are not fully computerized;

The researcher identified the following problems

- Computers are piling up in the workshop due to the fact that technicians not being held liable for repairs
- Due to the fact that records of the past are not kept there is no accountability.
- There is no recognized way of assessing the technicians' performance.

### 1.4 Aim

To develop ZINWA workshop management system.

### 1.5 Objectives

- To enable clients to track their computer status on repairs.
- To notify technician on a new jobs.
- To alert the management on jobs overdue.
- To enhance communication among technicians through chat box.

- To have a knowledge base with solutions to questions.
- To allow managers to assess the performance of IT technicians.

## **1.6 Instruments**

With the problems being faced by ZINWA's ICT a solution has to be set. A list of necessary tools to create the system is detailed below.

PHP - is downloaded freely and is an easy language to study and appreciate.

MySQL Server - support other platforms such as java script, PHP, Html and Oracle, Greenspan (1996)

Java scripting- strong language that enables the researcher to develop complex codes.

## **1.7 Justification**

The system will notify the management on jobs overdue this increase performance of the technicians since they will be monitored. The system will allow quick interaction between technicians and tracking of computer status will be made easier. Responsibility and duties will be clearly laid out and also quick solutions are readily available in the knowledge base

## **1.8 Conclusion**

A comprehensive background of the organization and its organizational structure has been laid out. The problems of the current system operations were looked at and some objectives of the proposed system were set. A hypothesis of developing a computerized system to solve the problems currently being faced by the company was also made, tools were clearly defined and the development of the system was justifiable. The planning stage follows and it includes feasibility study of the proposed system.

## **CHAPTER 2: PLANNING PHASE**

### **2.1 Introduction**

The planning phase looks at the reason why a system should be built and focuses on whether it is viable to develop the proposed system. The phase examines the feasibility study of the system and whether it is going to be profitable or not. It also looks at the reasons for building the system and business value which shows if whether the proposed system improves the organizational image. Risk analysis and program of activities on the work plan will also be looked at.

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

ICT workshop management system will be implemented to:

- To advance business efficiency and to motivate users since the system is going to be faster and reliable.
- To facilitate quick business decision-making for the management through keeping up to date customer records and generating reports
- To improve security through access levels.
- To advance on effectiveness and quality of information
- To reduce cost of buying stationery.

### **2.3 Business Value**

It focuses on the accomplishment of the business in using information systems to achieve its long term objectives. The system will benefit ZINWA through:

- Flexibility: the system can be modified to meet the perpetually changing business environment.
- Fewer disruptions of business operations through backup facility.
- Less usage of stationery and networking which will result in office
- Performance monitoring will increase productivity.
- Availability of up-to-date information to all users which improves efficiency.

### **2.4 Feasibility Study**

It focuses on determining whether the firm has the capability to support the development of the system with respect to technicality, economical, social and operational aspects and clearly outlines why the project is feasible or infeasible.

### 2.4.1 Technical Feasibility

It determines if the organization have the hardware , software and technical expertise to support the development of the proposed system.

#### 2.4.1.1 Hardware Specification

Items recommended	Specification required	Quantities	Availability	Comments
Laptop Machines	2Gig Random access memory, 3.2Gz, DVD/RW,	10	YES	Ready for use
100 /10 /100 Base T Ethernet Cable	40 meter Reel	2	YES	Ready for use
Database Server	4Gig RAM, 2 x200HDD, 3GHz+ Dual Core Processor,	1	NO	Available on the market management has agreed to purchase
GSM/GPRS	Modem	X 4	NO	Available on the market management has agreed to purchase.
Network Switch	24port CISCO Switch	X 3	YES	Ready for use

**Table 2.1 Hardware Specification**

### 2.4.1.2 Software Specifications

Required	Required version	Availability	Comment
Windows OS	Windows 10	Not available	Available on the market and the management has agreed to purchase
Macromedia Dreamweaver	CS6	Available.	Ready for use
WampServer	5.1.7.2	Not available.	Available on the internet and can be downloaded freely
Esset Anti-Virus	2015	Available	Ready for use

**Table 2.2 Software Specifications**

### 2.4.1.3 Technical Expertise

The table below shows the skills that a particular individual needs to at least have for the implementation of the system.

Persons	Required skill	Recommended skill	Available skill	Comments
User	Computer literate	Any ICT course	Short computer course.	The users are computer literate.
Developer	Knowledge programming and web development	PHP and JavaScript	Knowledge in PHP and OOP languages.	Is knowledgeable

**Table 2.3 technical expertise**



## 2.4.2 Economic Feasibility

It clearly shows the evaluation benefits and the cost by using cost benefit analysis, return on investment, net present value and payback period. If the benefits to be realised are more than the cost then it will be worth considering going ahead with the project

### 2.4.2.1 Cost-Benefits Analysis

Is a formal approach to balancing cost and benefits.

#### 2.4.2.1.1 Costs

They are two types of cost that is development and operational costs.

- Development costs refer to the cost that are incur during development of the project.
- Operational costs refer to the costs which incur during system operation. Estimated development and operational costs are shown in the table below respectively.

#### Development costs

Description	Quantity	Price(US\$)
Full set of adobe	1	100
HP colour Printer	1	250
Uninterrupted Power Supply	1	700
<b>Total cost</b>		<b>1050</b>

Table 2.4 Development costs

#### Running/operational costs

Description	2015 (US\$)	2016 (USD)	2017(USD)
Maintenance costs	250	230	200
Labour	400	200	100
Stationery	150	100	50
User Training	150	70	50
Other expenses	50	40	30
<b>Total cost</b>	<b>1000</b>	<b>640</b>	<b>430</b>

Table 2.5 Running/operational costs

### 2.4.2.1.2 Benefits

Benefits are favourable results such as the decrease in payroll, decrease in personnel and reduction in inventory(O'Brien 2006).

#### Tangible benefits

Tangible benefits can be measured in terms of hard dollar savings or profits (Sumner1999)

Description	2015 (USD)	2016 (USD)	2017 (USD)
Reduction in labour	800	1400	1500
Reduction of stationery	200	250	270
Estimated saved expenses	1000	1050	1200
<b>Total costs</b>	<b>2000</b>	<b>2700</b>	<b>2970</b>

**Table 2.6 Tangible benefits**

#### Intangible benefits

These are difficult to estimate such as customer service or faster and more accurate information for management. Below is a diagram with intangible benefits.

Description	2015(\$USD)	2016(\$USD)	2017(\$USD)
Improved efficiency	1 000	1 600	2 000
Increased customer fulfilment	300	600	1000
Time saving	200	600	1200
<b>Total Intangible Benefits</b>	<b>1500</b>	<b>2800</b>	<b>4200</b>

**Table 2.7 intangible benefits.**

The benefits to be realised from the system can be weighed against the expenses and it can be indicated as a table as underneath:

Description	2015 (USD)	2016 (USD)	2017 (USD)
<b>Benefits</b>			
Tangible	2000	2700	2970
Intangible	1500	2800	4200
<b>Total benefits</b>	<b>3500</b>	<b>5500</b>	<b>7170</b>
<b>Costs</b>			
Development	1050	0	0
Running	1000	640	430
<b>Total costs</b>	<b>2050</b>	<b>640</b>	<b>430</b>
<b>Net benefit</b>	<b>1450</b>	<b>4860</b>	<b>6740</b>

**Table 2.8 Cost-Benefits Analysis**

### **Comment on cost benefit analysis**

It can be noted that advantages exceed the expenses by \$1450 for year 2015 and it is worthy considering continuing with a venture.

### **2.4.2.2 Return on Investment (ROI)**

It is how much they will be gained in return for the outlays (Stutely 1999).

$$ROI = \frac{TB - TC}{TC} \times 100$$

TB: \$3500

TC: \$2050

$$ROI = \frac{3500 - 2050}{2050} \times 100 = \underline{\underline{70.73\%}}$$

TB = total benefits

TC = total cost

ROI = return on investment

### Comment on Return on investment

For this situation a rate of 70.73% is a good figure and the venture can be considered because ROI figure is high.

### 2.4.2.3 Payback Period (PBP)

It focuses on the time that is required to recover the cost of an investment. The table below shows the payback period.

Period (years)	Cash flow (US\$)	Cumulative (US\$)
0	(2050)	(2050)
1	1450	600
2	4860	-
3	6740	-

**Table 2.9: The Payback Period**

Therefore  $PB = 1\text{year} + \left(\frac{600}{4860} \times 12\right) = \text{one year one month two weeks one day}$

PB = payback

### Comment on payback period

The payback time is 1 year 1 ½ months which is a reasonable time to consider going ahead with the project.

### 2.4.2.4 Net Present Value

It alters future expenses and communicates them as far as the present dollar subsequently considering the estimation of cash and the project with the highest value is favourable (Stutely 1999).

$$DF = \frac{1}{(1+r)^t}$$

$$(1+r)^t$$

$$PV = \text{Value in Year} * DF$$

$$NPV = \text{Total PV}$$

r = Discount rate

t = time

df = discount factor

pv = present value

npv = net present value

DF = 10%:

### Net present value

Year	Cash inflow (USD)	Discount Factor (10%)	Present Value (USD)
0	(2050)	1	(2050)
1	1450	0,9091	1318.195
2	4860	0,8264	4016.304
3	6740	0,7513	5063.762
<b>NPV</b>			<b>8348.26</b>

**Table 2.10 Net present value**

### Comment on net present value

The Net present value is positive and it indicates that the project is feasible.

### 2.4.3 Social Feasibility

It focuses on the acceptability of the proposed system by the stake holders. Stakeholders are going to benefit socially by:

- Empower family time for workers. As manager's workloads for effective decision making are removed, they will have the capacity to improve their social lives and build connection with others.
- Reduce paper usage which reduces deforestation.
- It may motivate other pioneers of using the system.
- There might be staff downsizing but however the retrenched will be given good packages.
- Databases will minimize paperwork thereby minimizing garbage pollution in the environment.

### 2.4.4 Operational Feasibility

It focuses on determining whether the system will be fully utilised by the stakeholders after being implemented

- The management system will allow the organization to increase employee morale by keeping ahead with the latest technology.
- The management system will aid in quality decisions being made by top management.
- Management system will be based on the window platform which the users are familiar with hence ease of use.
- There will be 24/7 service provision for employees
- Improved storage capabilities.
- Improved access to records on requests made by clients on any queries forwarded.

#### **2.4.4.1 Risk Analysis**

Risk analysis is used to provide probabilities for the payoff associated with a decision alternative Williams (2003).

#### **Time Frame**

The undertaking being referred to should devise a deliverable item in of three months. This is a brief time considering the complexity of project.

#### **Solution**

- Close checking to guarantee that the undertaking advances according to plan.
- Questions and answer programs to assist users.
- Regular budget reviews.

#### **End User Reluctance**

Despite the fact that users are now and again eager about helping and being an integral part of each advancement on the undertaking, if the program takes a lot of their time they will become reluctant.

#### **Solution**

- Each user will be given time to assist with the progress
- Management should by all methods conceivable instruct the clients on the significance of their involvement in the development.
- Workers should be urged to give their legit conclusion amid the investigation arrange so that the deliverable item will meet their requirements.

## 2.5 Work Plan

This stage recognizes the tasks and their normal durations. Below is the Gantt chart indicating time distribution.

### Project Schedule

Stage	Start	End	Time (weeks)
Proposal	17/08/2015	21/08/2015	1
Planning	24/08/2015	28/08/2015	1
Analysis	31/08/2015	12/09/2015	2
Design	14/09/2015	26/09/2015	2
Implementation	29/09/2015	10/10/2015	2
Maintenance	12/10/2015#	17/10/2015	On going

**Table2.11 Project Schedule**

### Gantt chart

ACTION	Week one	Week two	Week three	Week Four	Week five	Week Six	Week seven	Week eight	Week Nine
Proposal									
Planning									
Analysis									
Design									
Implementation									
Maintenance									
Documentation									

**Fig 2.1: Gantt chart**

**Key**

= 1 Week

**2.6 Conclusion**

Planning clearly pointed out the reason for building the workshop management system. The business values were identified. The stage highlighted different studies carried out to support the decision of proceeding with the proposed system including social, economic, technical and operational. A work plan showing the start dates and end dates have been drafted. The analysis phase is next, which focuses on the breaking down the system into parts with the aim of revising how those parts can work together to achieve their mission.



## CHAPTER3: ANALYSIS PHASE

### 3.1 Introduction

The phase examines all the data about the current system that is collected by information gathering methodologies. An evaluation of the existing system to be developed is done through analysis of existing system, process analysis and data analysis. Weaknesses of the current system will be looked at and evaluation of alternatives will be considered to solve the problems of the current system. The phase covers all the requirements that the system face through functional and non-functional requirements.

### 3.2 Information Gathering Methodologies

Various methodologies were used to gather information about the current system; the methodologies include interviews, observation, questionnaires and document inspection.

#### 3.2.1 Observation

The analyst went to the main headquarters of ZINWA in Harare to observe processes. This methodology was carried out during the operation of the system. The process involved an assessment of how the existing system operates. The analyst noted occurrences, focusing on how IT personnel process repairs and information in the workshop.

#### Advantages of observation.

- It was less expensive.
- It provided mostly reliable information
- It presented a clear picture of how the system operates.
- There was less bias on the employees' part because most of the employees that came into the workshop did not know that they were being watched.

#### Disadvantages of observation

- It was time consuming because repairs did not come to the workshop frequently.
- IT technicians tended to be more careful having the feeling that they were being watched.
- Some of the technicians were actually resisting participating when the analyst was there because of fear of the unknown.

### 3.2.2 Interviews

The analyst made interviews at ZINWA Harare old mutual Branch. Interview questions were drafted for the management in advance and all the interviews were done at lunch time so as to not interrupt daily business. The analyst was given 10 minutes slot for each interview. The analyst easily clarified questions to the participants. The interviewed questions comprised of mostly open ended questions that allowed the analyst to get more information from the interviewee. The questions that were asked to the interviewees will be included in the appendix section. The table below shows the participants on the research.

Source of data	Number of respondents
IT department	5
Administration Staff	2
Employees	8

**Table 3.1 Tabulation of sample size**

#### Advantages of Interviews

- The response rate was immediate
- The privacy caused participants to answer freely.
- Some of the answers enlightened key areas
- There was no bias

#### Disadvantages of Interviews

- Reluctance to answer some of the question thinking that the information can be mishandled.
- It took a lot of effort to convince participants to come to the interview room since it was lunch hour
- Some of the participants demanded some bribe to answer the questions.

### **3.2.3 Questionnaires**

Questionnaires were distributed at ZINWA headquarters. Questions were drafted a week before for the management to approve. The participants were given questionnaires in the morning and data was collected at day end so as to allow participants to respond at their own free time. A draft of the questionnaire will be included in the appendix section.

#### **Advantages of Questionnaires**

- Large amounts of information were gathered because there were more participants.
- It was free from bias.
- The participants had enough time to consider their responses.
- Privacy of answers was assured and participants were free to answer.

#### **Disadvantages of Questionnaires**

- It was costly since it involved more printing and travelling expenses.
- Very few people had the patience to answer all the questions and some of the questionnaires were not returned.
- The questionnaire limited questions to those specifically on questionnaire only

### **3.2.4 Document Inspection**

The analyst went to ZINWA's ICT department to view the documents being used in the current system. The analyst booked for a meeting with the IT manager to view there documents and discuss issues concerning the workshop repairs.

#### **Advantages of Document Inspection**

- It was not time consuming.
- It provided stable and reliable information
- There was accuracy in extracting information from written documents.
- Analysts needed no further analysis since the information was clear.

#### **Disadvantages of Document Inspection**

- Some of the documents were misleading because contained lot of blank spaces
- The documents had wrongly captured information.

### **3.3 Analysis of the Existing System**

After carrying out information gathering an evaluation of the concept behind the current system was made. The current system suffers from delays when requesting a query. The system is not flexible even for internal employees since it requires their presence to check for progress. If a technician is not notified the machines will pile up in the workshop, it cannot be traced to find who was supposed to do the job formally.

#### **3.3.1 Description of Current System**

An employee comes with a repair in the workshop and they will be given a sticker to put their details and the nature of problem and it will be placed on the repair. The technician will be notified by a phone call or orally by the help desk. The technician will then troubleshoot the problem if not successful or the machine is obsolete, the technician will condemn and write a requisition to the procurement department ordering a new machine. In the event that they have finished repairing, the employee will be notified to come and collect the machine.

##### **3.3.1.1 Inputs**

It represents what is inserted into the system

- All the details for employees and repair.

##### **3.3.1.2 Processes**

Process is the action that is made on data. The processes are:

- Log in of machine details.
- Notifications to the employee.
- Assigning IT technician.

##### **3.3.1.3 Outputs**

Output is whatever a system returns to its environment in order to fulfil its purpose (Hofter 2002). Currently the outputs of the current system are:

- Repair details.

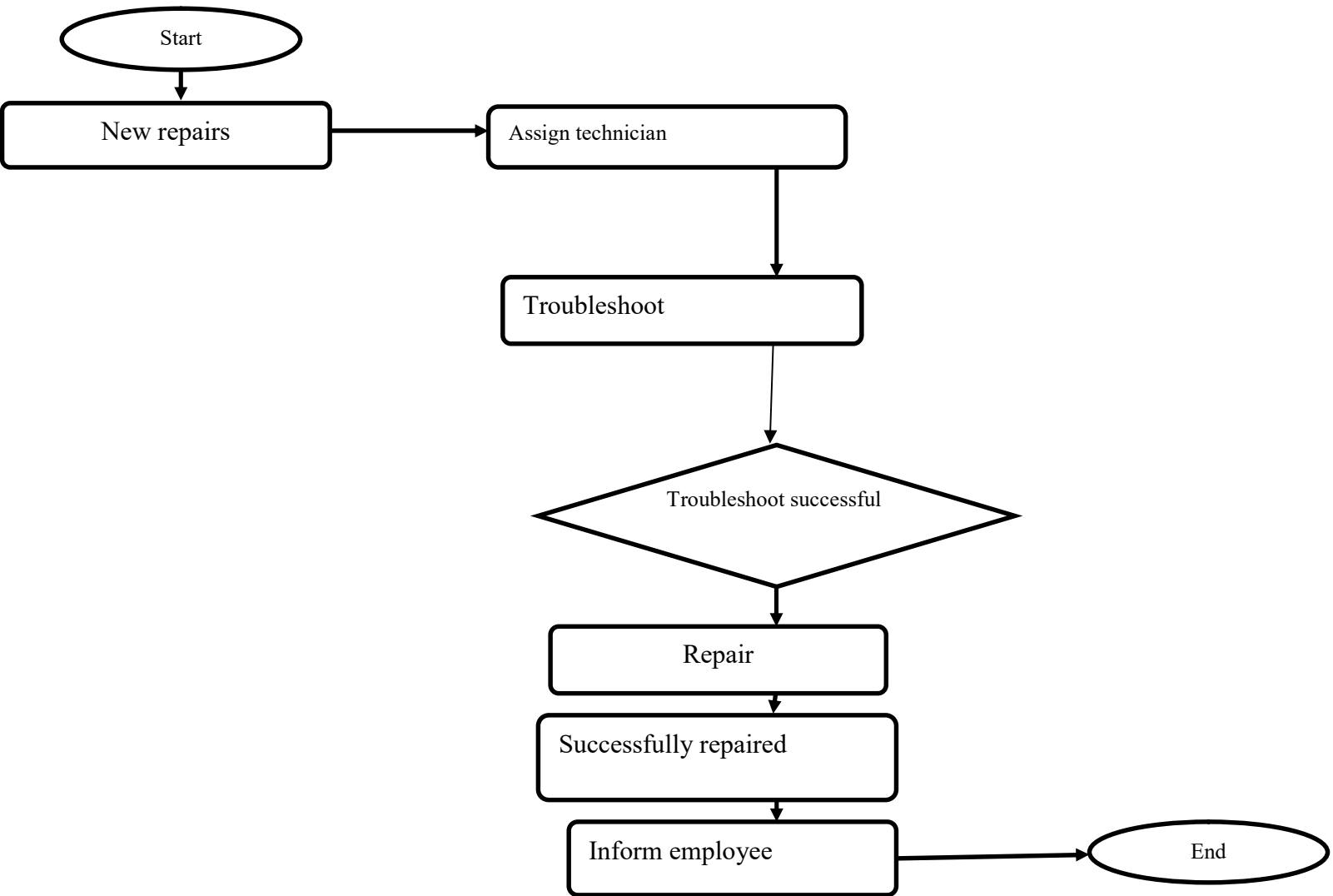
### 3.4 Process analysis

It is the evaluation of different system processes of inter connected tasks in a life cycle from the start to the finish

#### 3.4.1 Activity diagram.

It illustrates how data moves within the system, thus, processes and activities that are performed.

Below is the activity diagram of the current system



**Figure 3.1: Activity diagram for the current system**

### 3.5 Data Analysis

It gives a clear picture of what is happening in the system. Data analysis consist of two diagrams which are context diagram and Dataflow diagram

#### 3.5.1 Context Diagram

It is a process model used to document the scope for the system. Below is the context diagram.

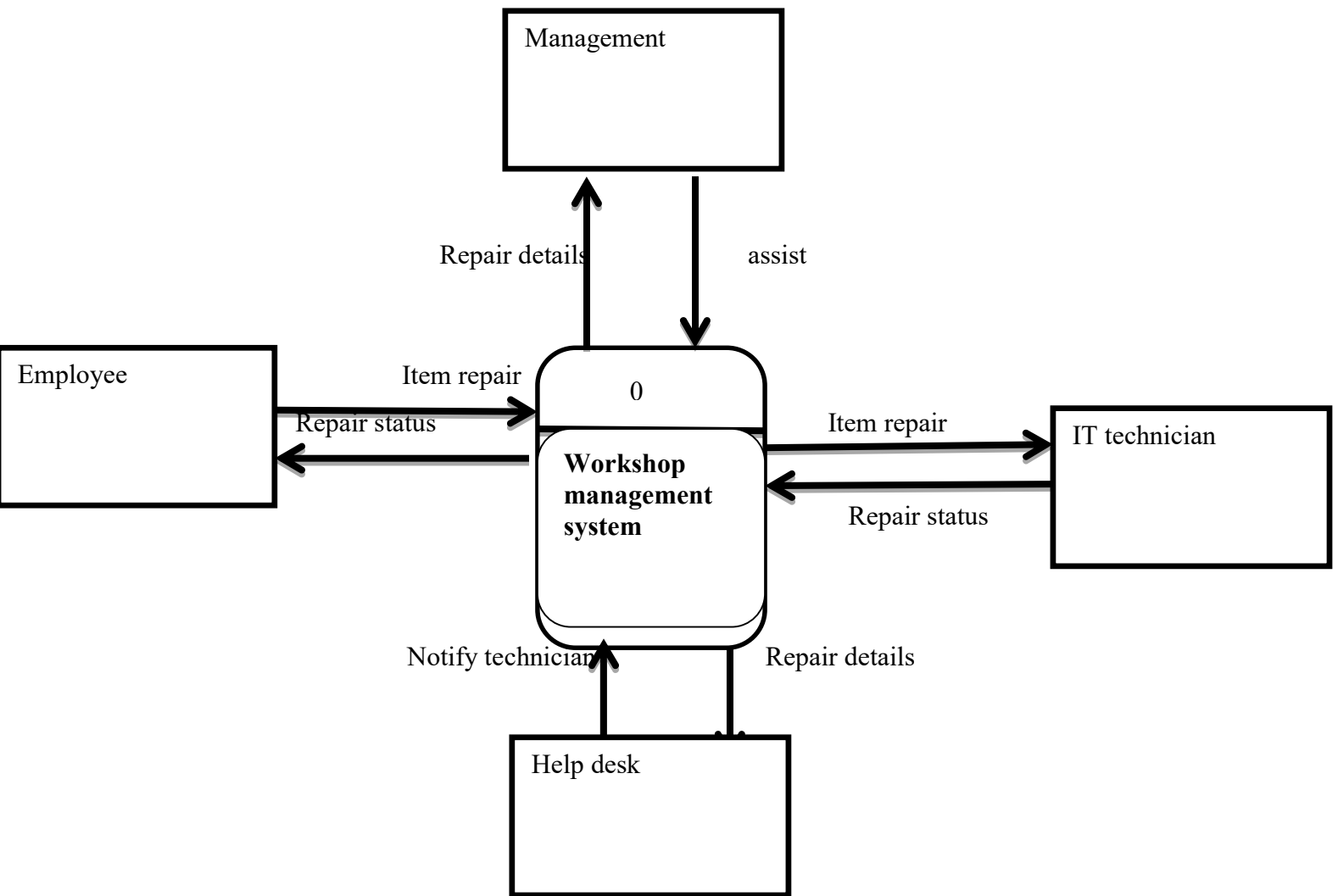
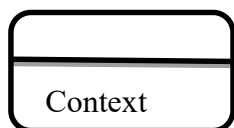


Fig 3.2 Context diagram of the current system

KEY



Data  
Flow



### 3.5.2 Data Flow Diagram (DFD) of the Existing System

It shows the flow of data in the system. Below is the DFD of the current system

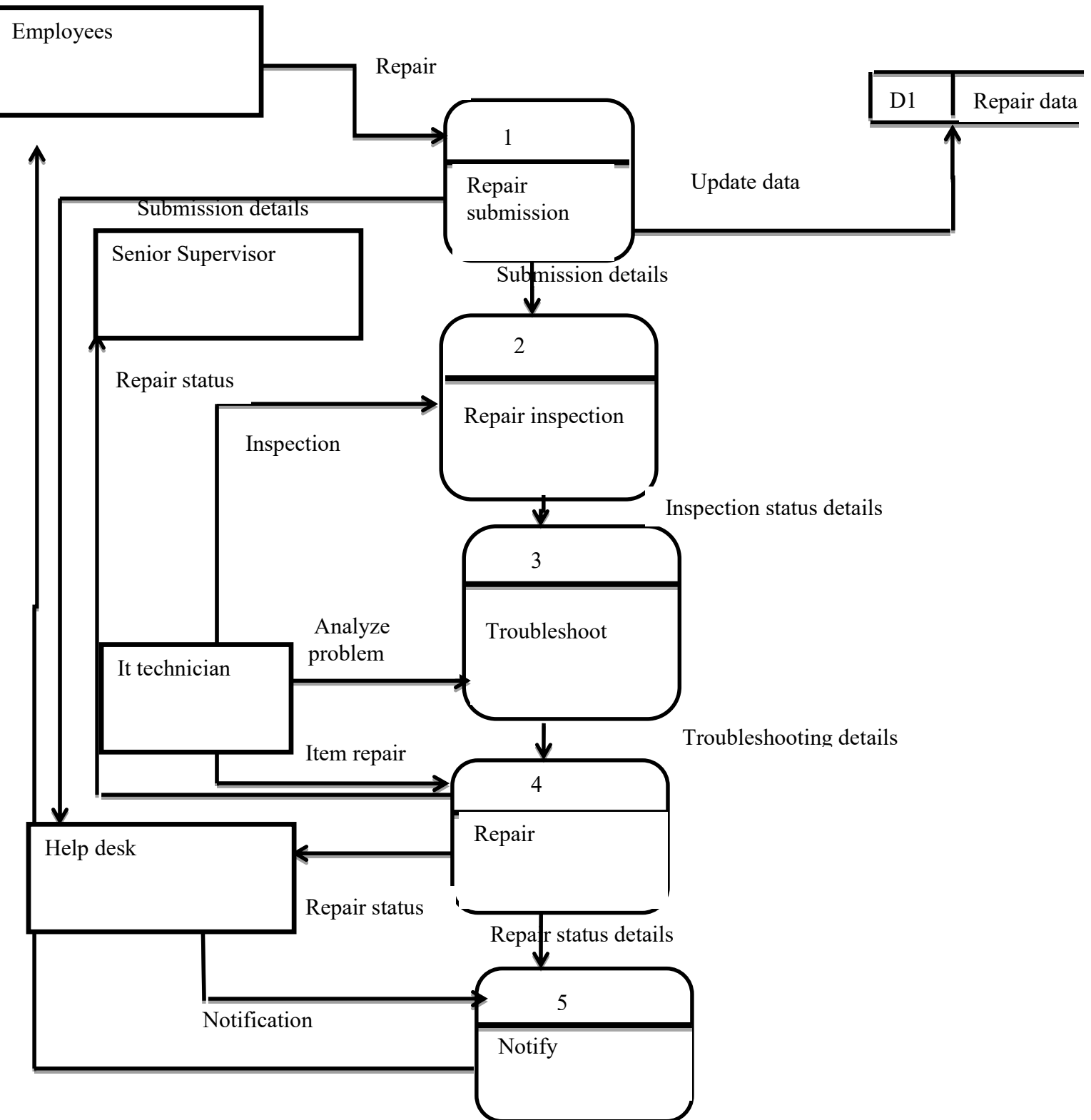
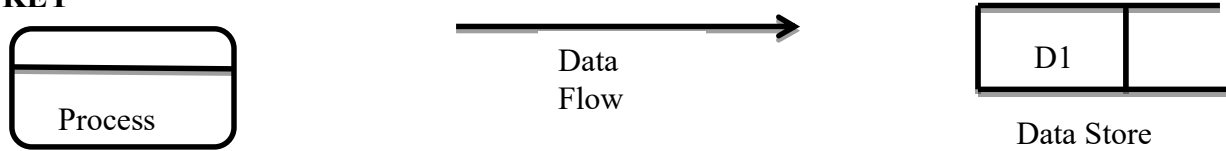


Fig 3.2 Dataflow diagram of the current system

## KEY



### 3.6 Weaknesses of the Current System

The current system has the following weaknesses

- Computers can pile up in the workshop if the employees are not being monitored.
- Performance of the employees is difficult to measure.
- There are no backup storages and the data is being messed around with since some of the information is not found in the documents.
- Information is not always up-to-date as the document contains a lot of blank spaces.
- Expenses continue to increase because buying of stationery
- Retrieving data is very difficult
- It is hard for employees to keep track of their repairs
- The system does not assist technicians with ideas in the invent that they are facing challenges with repairing.

### 3.7 Evaluation of Alternatives

With the user requirements that were produced it is crystal clear that the a new workshop management system needs to be developed. To develop the system the analyst need to select from 3 options that is:

#### 3.7.1 Outsourcing

It is the practice of turning over responsibility of a firm's IT application, operation to a contractor firm at a specified cost and a specified level of service

#### Benefits of Outsourcing

- It reduces risk associated with failure to produce a product that will meet the user requirements because it can be custom made to meet the user requirements.



- Quality is guaranteed.
- It reduces employees work
- It is more accurate and secure.
- Development time is reduced since the contractor will have full knowledge about developing the project

### **Disadvantages**

- The software packages are generally expensive.
- The software packages do not cater for employees that are not computer literate such that at times the softwares could be user unfriendly.
- Customizing the software and meeting the specific user requirements of customers can be a challenge.
- There is less flexibility – the system is difficult to change to meet the ever changing needs of employees.

### **3.7.2 Improving the current system**

It is a process of upgrading the current system to meet the new requirements.

- The system will be easy to use easy.
- It is cost effective.
- Morale will increase as employees know that their jobs are safe
- There will be no training cost

### **Disadvantages**

- Retrieval of data and information is time consuming.
- There is no security as far as handling of information is concerned.
- There will be more stationery expenses.

### **3.7.3 Developing the system in-house**

It is the process of looking for the staff who can develop the system in the organisation.

### Advantages

- It is cheaper to because internal staff will be developing and organizational resources will be used.
- Maintaining the software package can be very easy.
- User satisfaction will be guaranteed since the system will be developed specifically to meet those requirements.
- Easier system support since most of the stake holders will be part of the development.
- It increases morale for the internal IT staff.
- It can be easily changed to meet the continuous changes of employees.

### Disadvantages

- The system may be faced with resistance with the employees who may panic losing their jobs.
- It takes a lot of time to develop the system.
- Training the staff can be expensive and can take a lot of time.
- Poor software can be produced.

Comparison of the various costs incurred in implementing the above mentioned alternatives.

### Costs

Method	Cost \$
Outsourcing	3200
Improvement	3000
Development	2950

**Table3.5 Computation of total costs of implementing the above mentioned alternatives**

### Comment on the alternatives

As a result of the above computations of total costs of acquiring software, In-house development is more favourable with the total cost of \$2950.

### 3.8 Requirements Analysis

It looks at what the system should deliver for its users. There are two types of requirements which include:

#### 3.8.1 Functional Requirements

It is the abilities that the workshop management system must perform successfully

- The workshop management system will deliver an interface that is easy to use.
- The workshop management system should have integrity on its data.
- The workshop management system should be flexible that is easy to install, change when the user needs change and easier to maintain.
- Workshop management system should allow for data recovery.

##### 3.8.1.1 Use case diagram

It is used to recognize and divide the system functions. In the project they are four actors, which are the employee, help desk, senior supervisor and IT technicians. Below is the use case diagram.

##### Use case diagram of the current system

##### Help desk

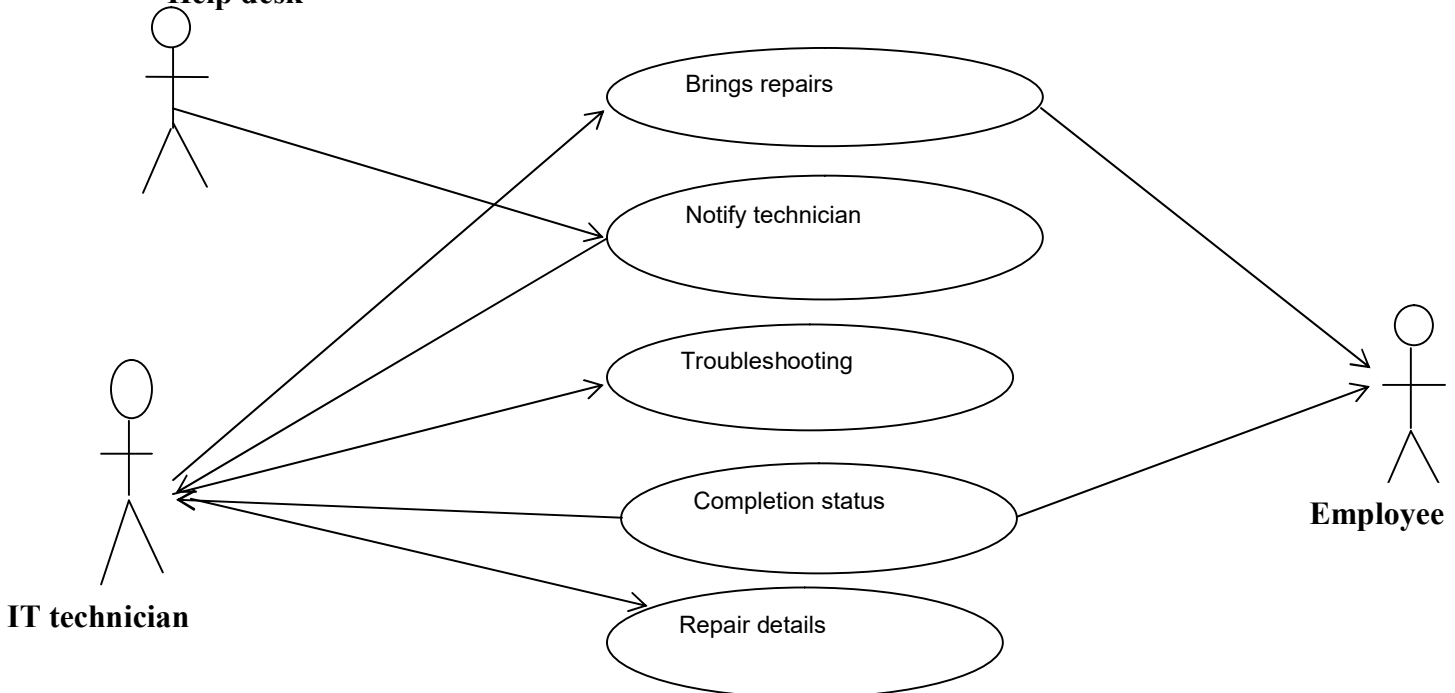

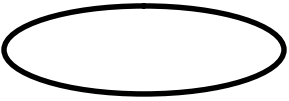


Fig 3.3 Use case diagram of the current system

## KEY FOR USE CASE DIAGRAM

Symbol	Description
	Actor
	Use case

### 3.8.2 Non-functional requirements

It refers to the requirements that a system can function without meeting. Below are the non-functional requirements of the Workshop management system:

#### **Response time**

This is the elapsed time between submitting a transaction for execution and receiving a response.

#### **Transaction throughput**

The average numbers of transactions that can be processed per minute, which must be measured under pick times.

#### **Space utilization**

The amount of storage space used by the database files and their access path structures.

#### **Reliability**

The ability to handle expected and unexpected failures.

#### **Operability**

The ability to co-exist and cooperate with other systems.

### 3.9 Conclusion

The current system was evaluated through the data collected by analyst on information gathering; methodologies like interviews, questionnaires and observation were used. The analysis phase showed how the system works by describing the current system operations. Data analysis showed the data flow in the current system through dataflow diagrams and context diagram. The weaknesses were identified and alternatives which included outsourcing, developing and improving were evaluated and it has been considered to develop a computerised

workshop management system as it is the most ideal solution for the problem. Functional and non-functional requirements have been identified. Design stage of the proposed system follows and it outlines how the proposed system is going to be developed.

## CHAPTER 4: DESIGN PHASE

### 4.1 Introduction

Systems design phase focuses on how the system will work in actual environment. Architectural design and physical design will clearly lay out how software and hardware interact. Database design will show all the entity relationships whilst program design will point out the package and sequence diagrams. Interface design will clearly show the sketches of graphic user interfaces of the system.

### 4.2 System Design

The phase produces features which should be present in the proposed system and these include

#### **Effectiveness and Efficiency**

The workshop management system should be easy to work with for all the users. The management system is supposed to work proficiently with less errors so as to reduce the interruption of operations within ZINWA

#### **Reliability**

The workshop management system should be to produce the needed results so as to facilitate better decision to be made. The information that will be produced should also be accurate.

#### **Maintainability**

In the event that the system needs to be upgraded that is new features need to be added on or some features need to be developed the system should be flexible. The developers should easily do that without facing any challenges.

#### **User Friendliness**

The workshop management system should be used easily. Users of the workshop management system must not encounter any challenges on working with the system.

#### **Security**

The workshop management system should be secure enough so as to maintain the confidentiality of the data in the system. Access levels should be used to restrict unauthorized access.

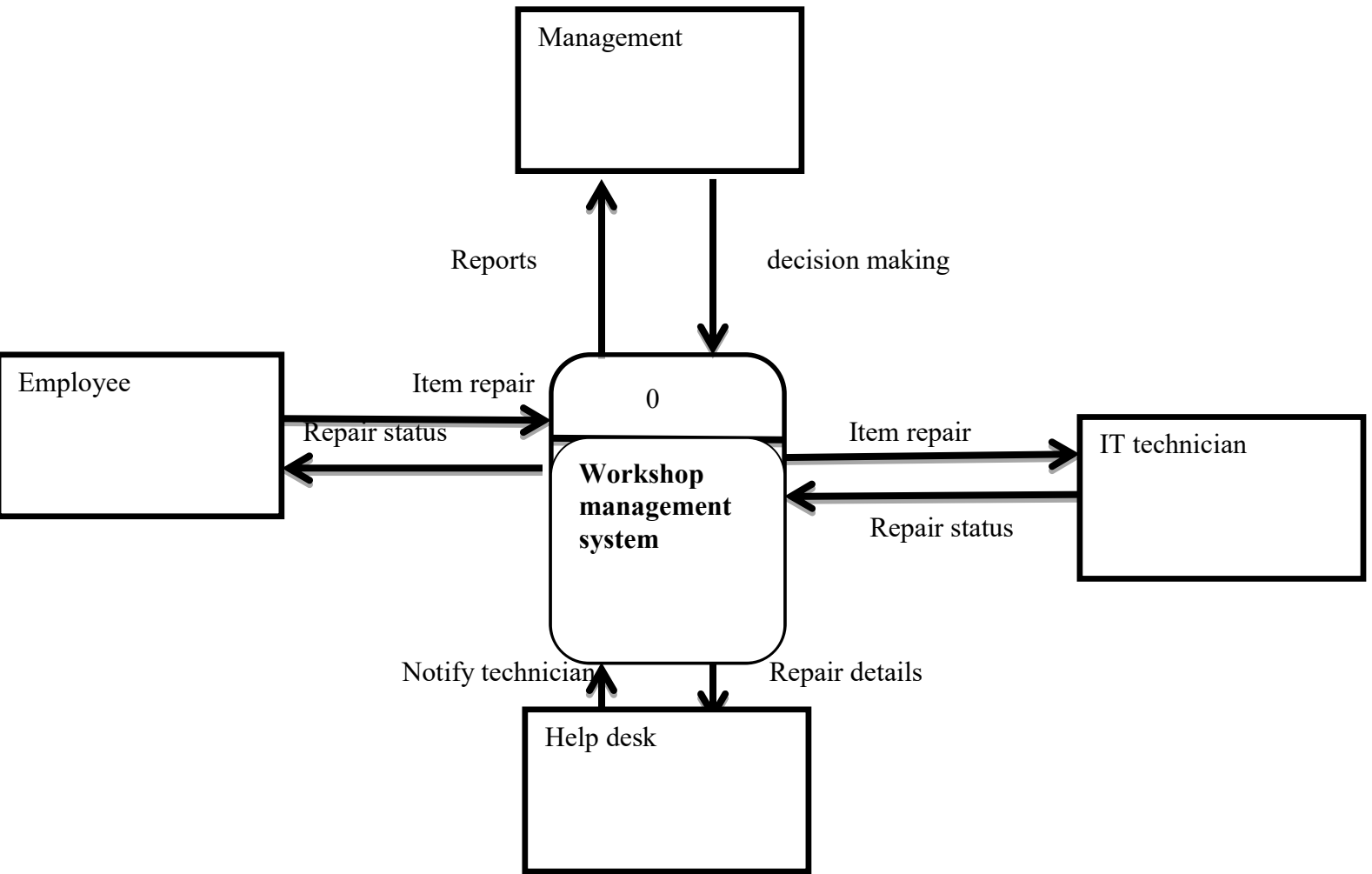
### 4.2.1 Description of the Proposed System

The repairs come into the work shop and it will be logged in into the system by the help desk and the IT technician will be notified. The technician will inspect and troubleshoot the repair updating the status online for the employees to track their repairs. When the repair is successful repaired, the employee will be notified through sms platform to come and collect the repair. In the event that there

are repair overdue in the workshop the manager and senior supervisor will be notified. The system will generate reports for all the repairs that come into the workshop for the management and senior supervisor.

### 4.2.2 Context Diagram

It is a sketch of the system margins. The diagram below shows the context diagram for the proposed system



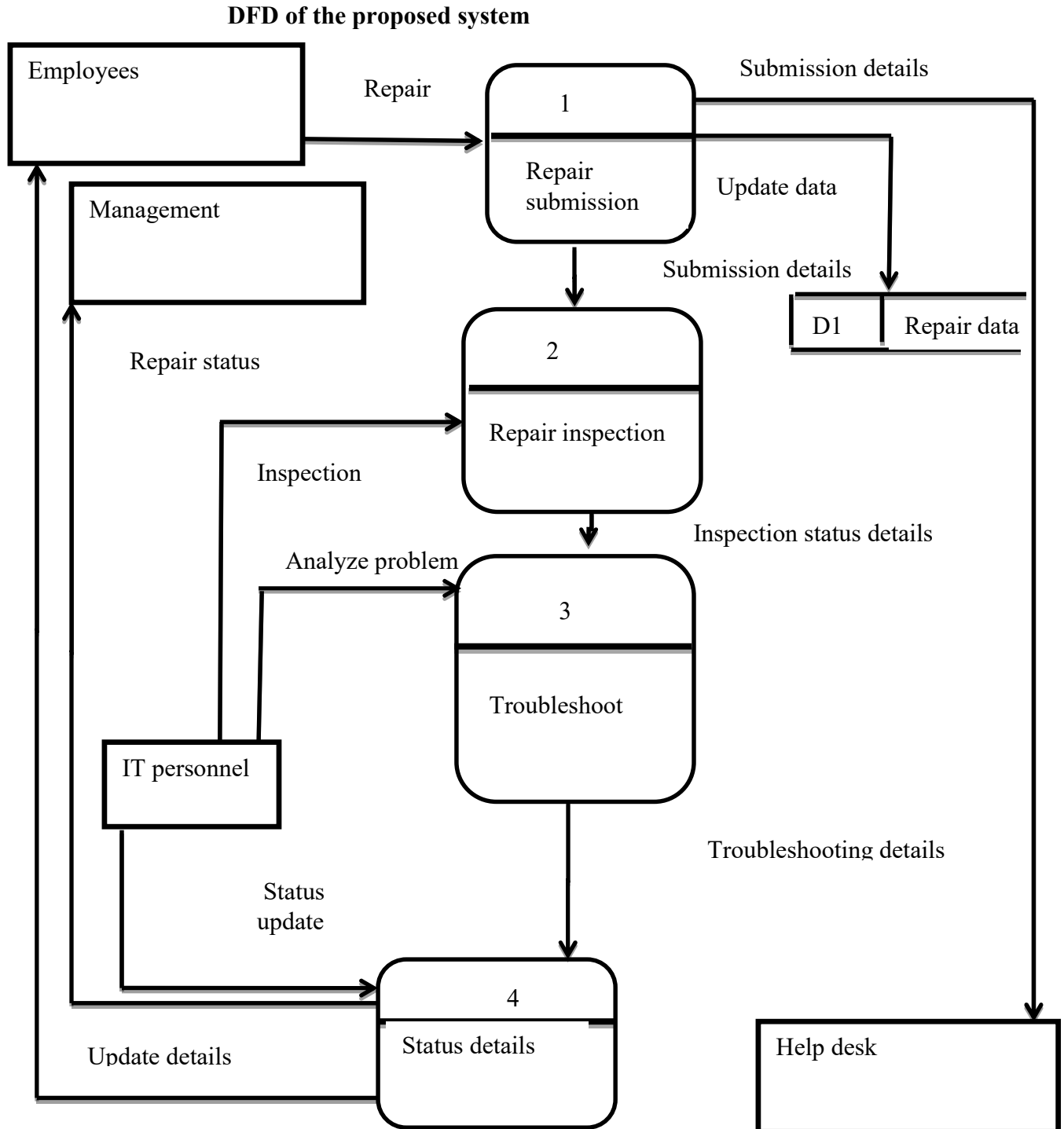
**Fig 4.1 Context diagram of the current system**

**KEY**



### 4.2.2 Dataflow Diagram of the Proposed System

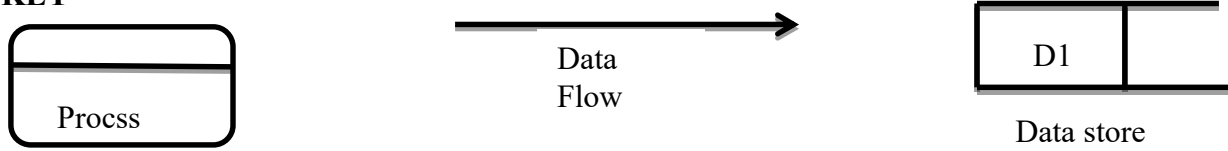
Data flow diagram shows the flow of data and the processes involved.. Below is the data flow diagram of the current system.



Notification  
**Fig 4.2 dataflow diagram.**

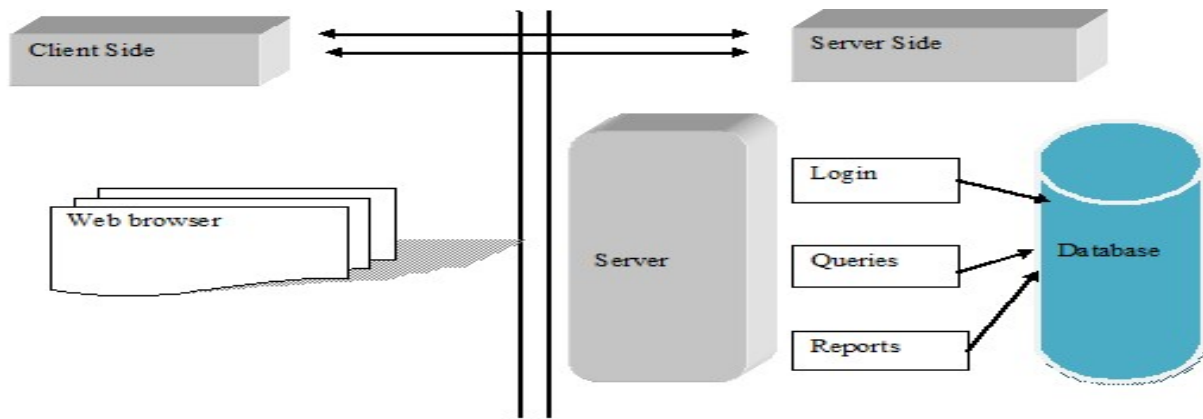


**KEY**



**4.3 Architectural Design**

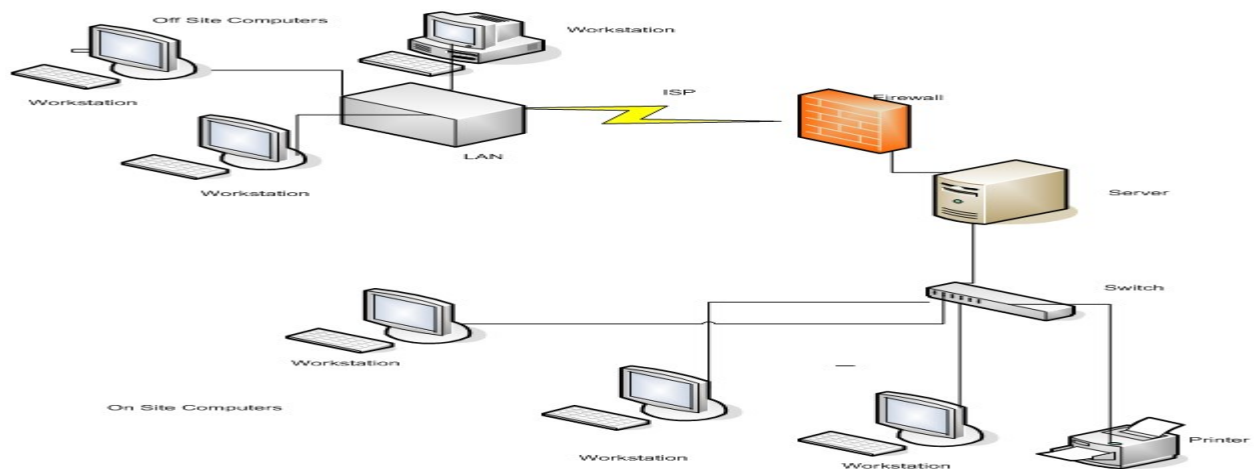
It ascertains whether the specifications for the hardware and the quantities that will be required by the proposed system and also at the network requirements. It is shown on the diagram below.



**Fig 4.3 Architectural Design**

**4.4 Physical Design**

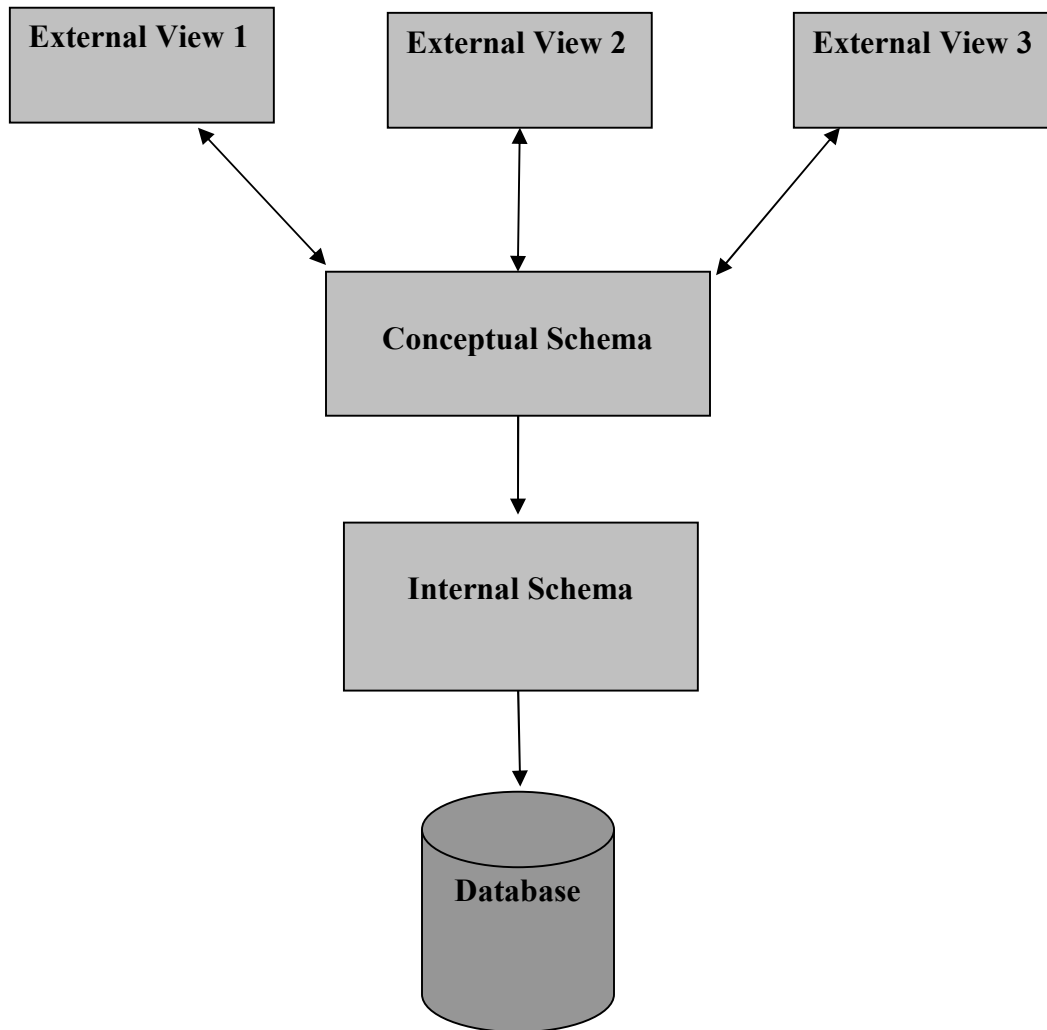
It also concerned about how the hardware parts are inter related that is the organization of work stations, servers and printers.



**Fig 4.4 Physical Design of Proposed System**

## 4.5 Database Design

It refers to the organization of data in a database in schemas. The schemas represents data that is present at the physical level. The table below shows the database design.



**Figure 4.5 Database architecture**

### Physical Level

It is the layer that is found at the bottom level of the design and it outlines how data is kept in the database.

### Conceptual Level

It is the second layer and it focuses on the relationship among data itself and this is where the actual data is stored. Relational tables are used to store the data.

## View Level

It is the abstraction level where users communicate or manipulate data in the system. This is where the graphic user interface is found

### 4.5.1 Entity relationship diagram

It shows the relationship between the objects in the proposed system. Below is the entity relationship diagram

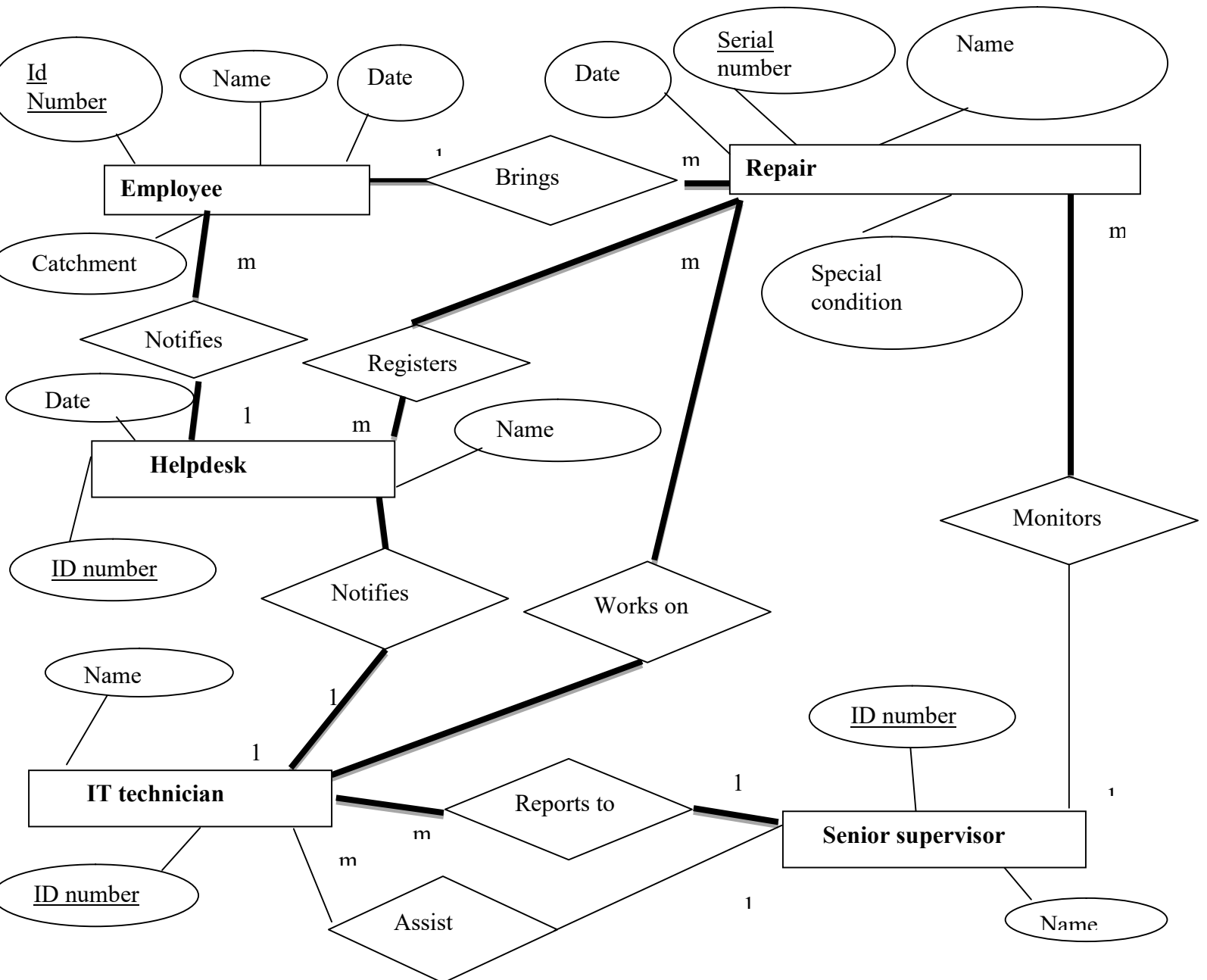
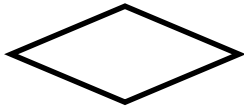


Fig 4.6 Entity Relationship Diagram for the proposed system

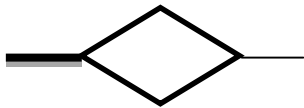
**KEY:**



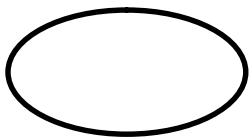
Entity



Relationship



Partial Relationship



Attribute



Total relationship

**4.5.2 Enhanced Entity Relationship Diagram**

It is a specialized diagram that shows the entities and their relationship. Below is the EERD for workshop management system

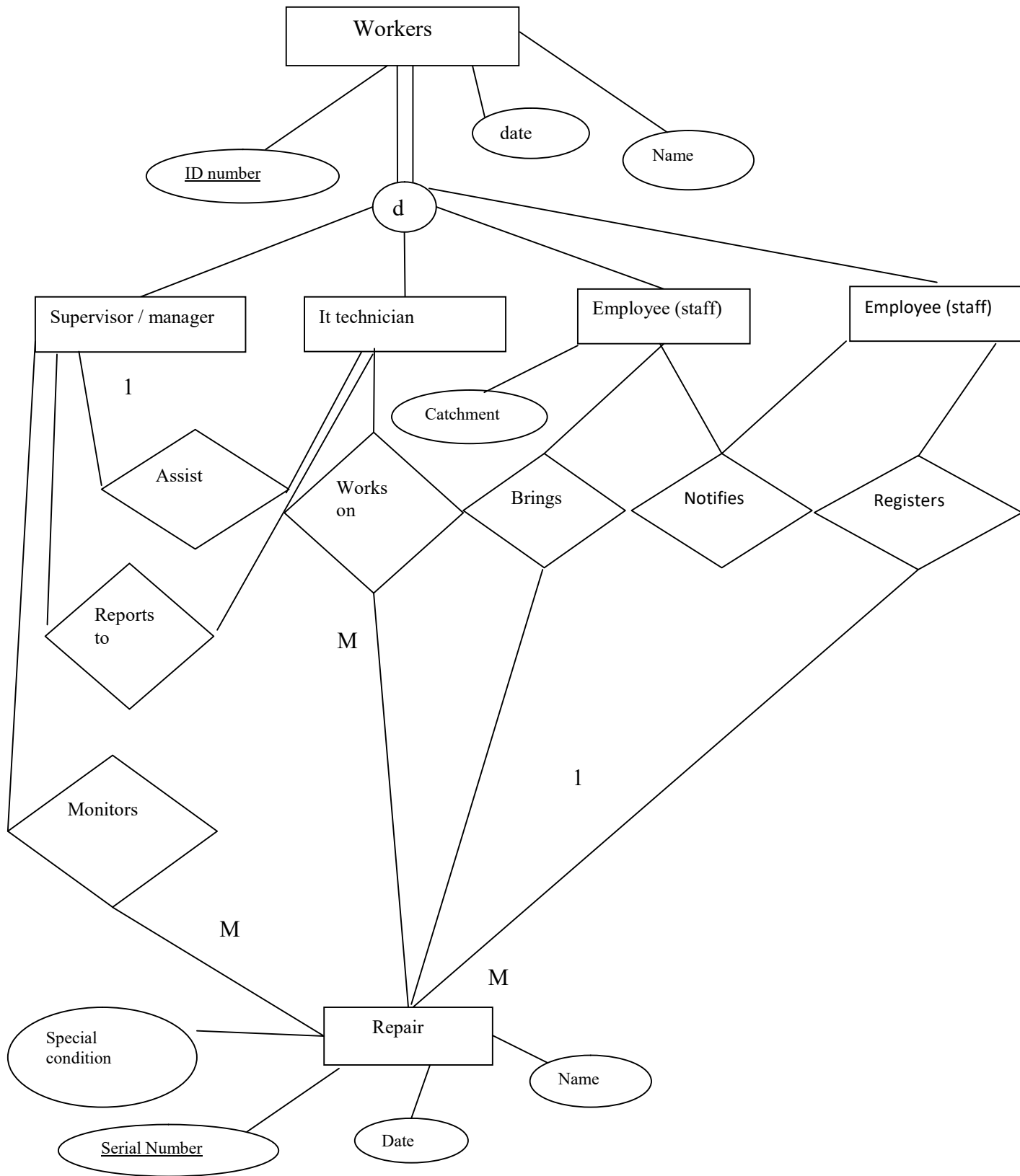
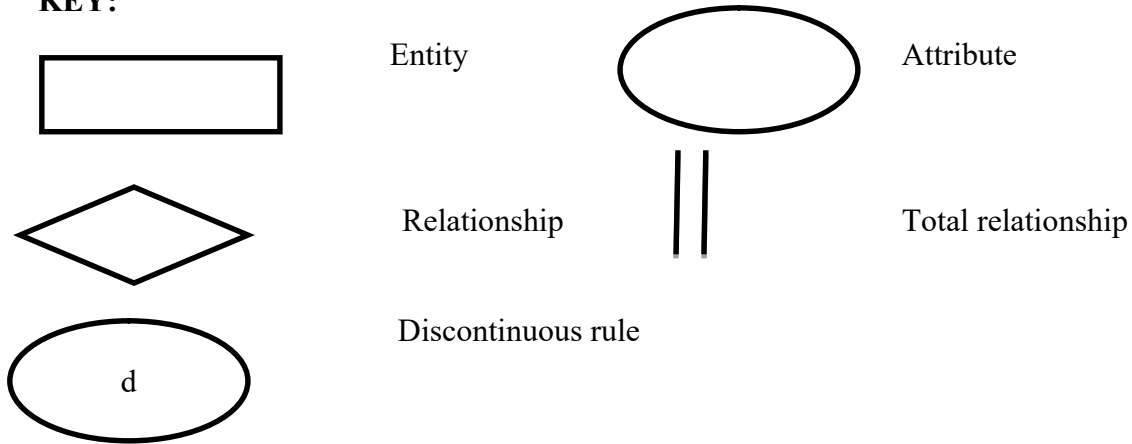


Fig 4.7 Enhanced Entity Relationship Diagram

**KEY:**



**4.5.3 Database Tables**

The tables below show the details of users in normalized form

**Login Table**

Field Name	Data Type	Description
Id	Int	user ID
User_Name	Varchar (20)	Username
Password	Text	Password
Hint_Question	Text(10)	To remember forgotten password
Hint_Answer	Text(10)	Answer for the hint question

**Table 4.1 Login Table**

**Employee Details Table**

Field Name	Data Type	Description
Name	Text	Employees`s name
ID	Varchar	National id number
Date	Varchar	Date of the day
Catchment	Text	Name of catchment
Telephone	int	Contact number
Gender	text	Se of user
Age	Int	Age of the employee

**Table4.2 Employee Details Table**

### Repair Table

Field Name	Data Type	Description
ID	Varchar	Serial number
Name	Text	Name of repair
Date	Vachar	Date of day
Special condition	Text	Condition of repair

**Table 4.3 repair table**

### User registration table

Field Name	Data Type	Description
Name	Text	Employees`s name
ID	Varchar	National id number
Date	Varchar	Date of the day
Department	Text	Name of department
Telephone	int	Contact number
Gender	text	Male or female
Age	Int	Age of the employee
Physical address	varchar	Address of employee

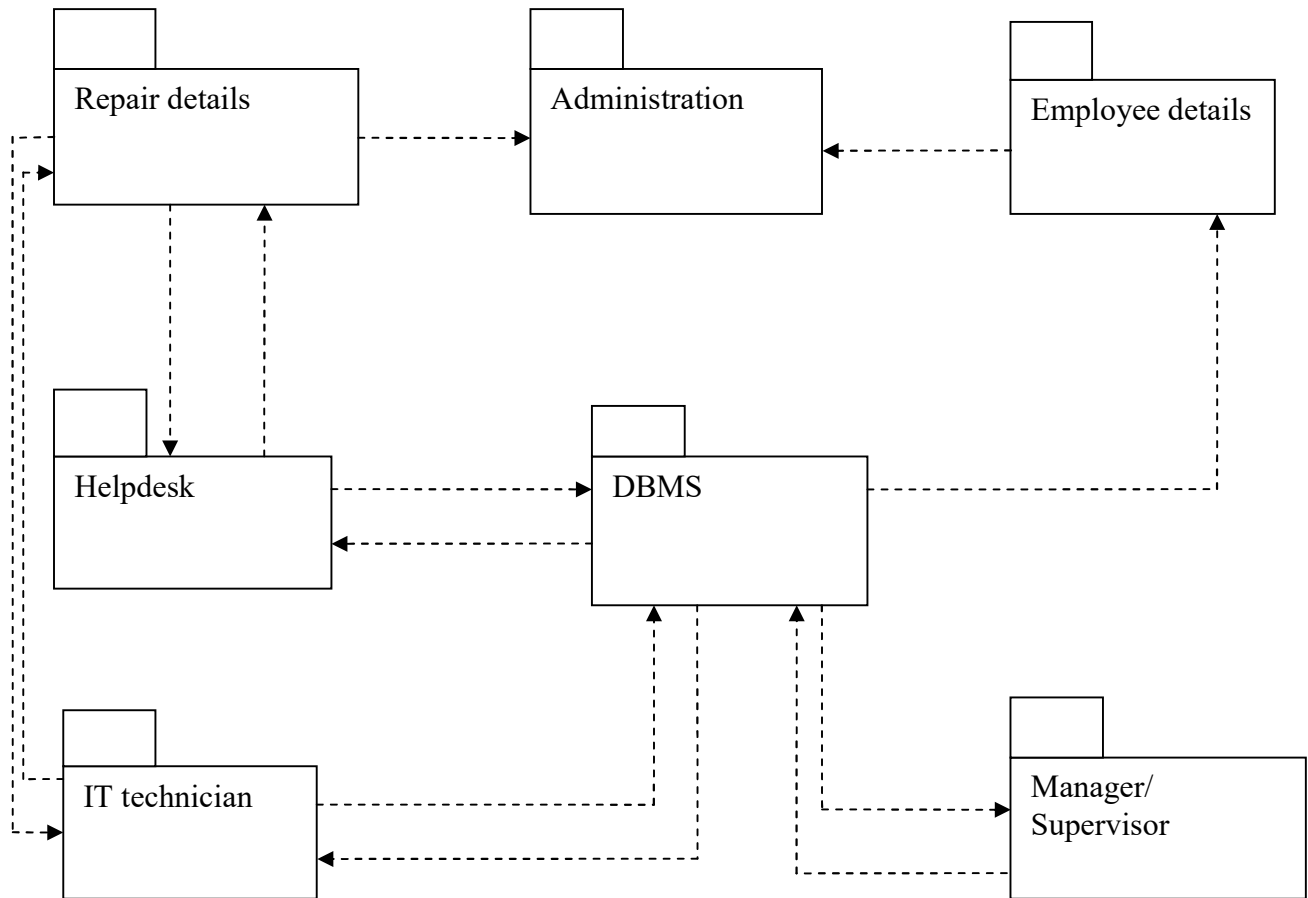
**Table 4.4 user registration table**

## 4.5 Program Design

It is a technique for designing and documenting methods and procedures in software

### 4.6.1 Package Diagram

It shows components that rely on each other of the system for satisfaction of system objectives. It reduces complications such that they will be better understanding of the system. Below is the package diagram.

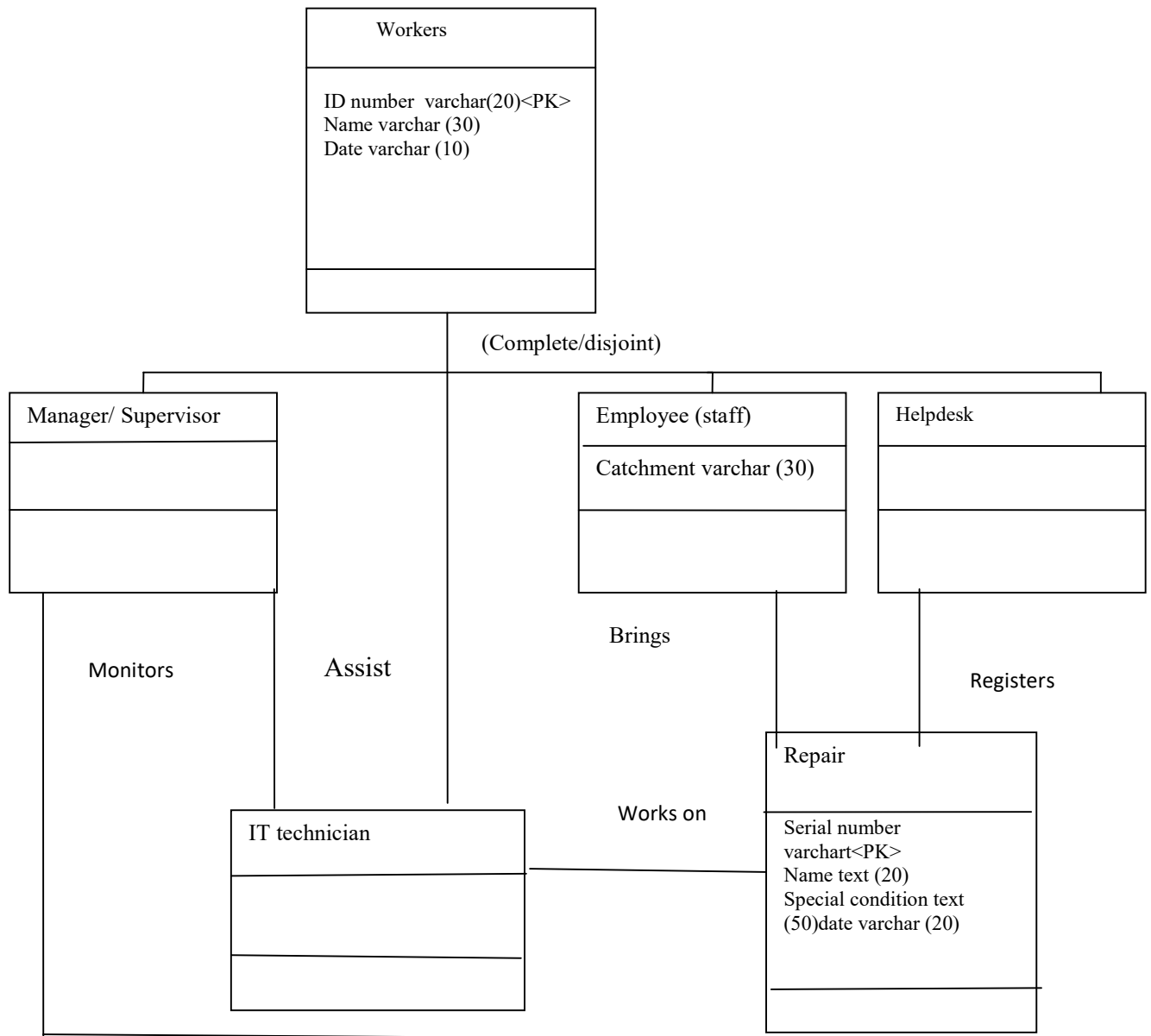


**Fig 4.8 package diagram**

### 4.6.2 Class Diagram

It describes the objects that are found in a system and their relationships and it also gives the connections between many entities in the system. Below is the class diagram.

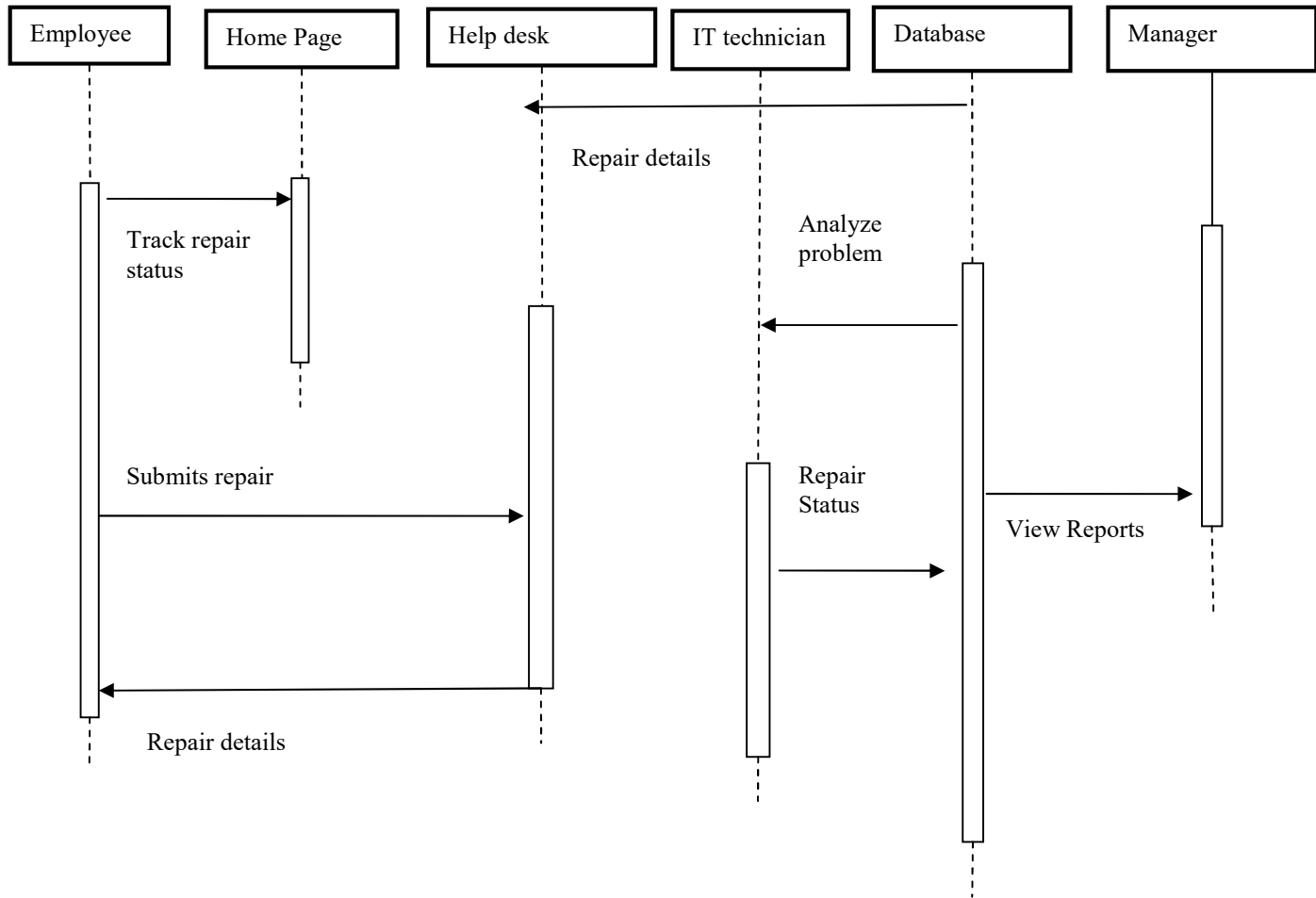




**Fig 4.8 Class Diagram**

### 4.6.3 Sequence Diagram

It shows the objects relations arranged in time sequence. Below is the sequence diagram



**Fig 4.9 Sequence Diagram**

#### 4.7 Interface Design

It is the workshop management system’s graphic user interfaces were users interact with the system. It can be in the form of menus. It gives skeleton of the arrangement of the input and output of the workshop management system. The new system will have a main menu which will control the processes of the system.

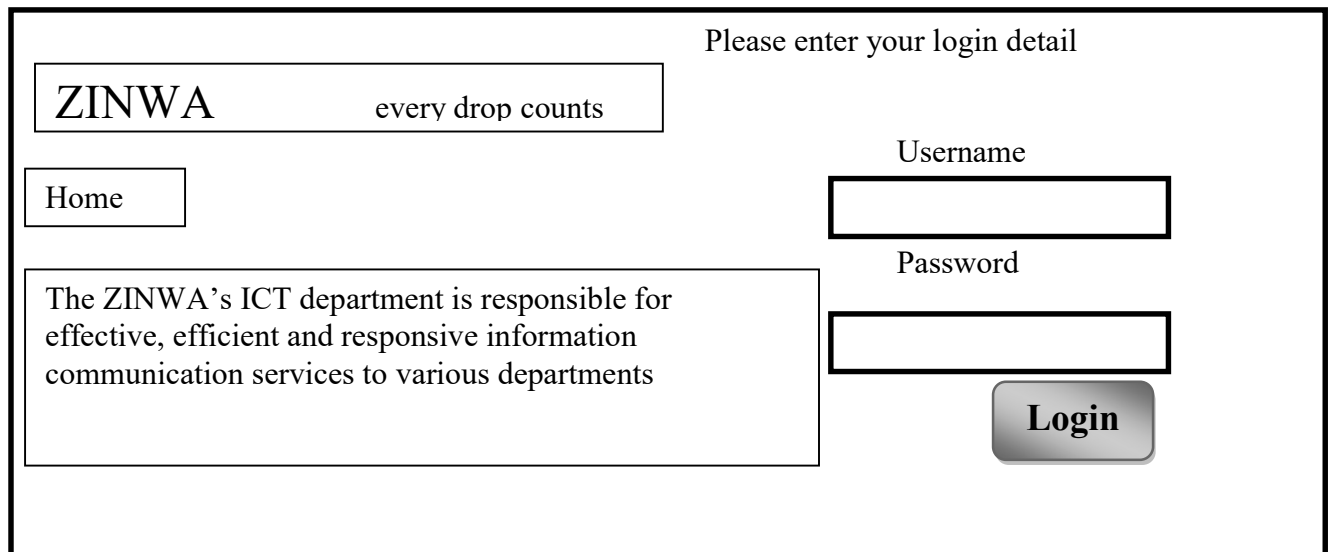
##### 4.7.1 Input Design

It shows the input form in the management system that is easier for the users to understand it focuses on the user friendliness of the system so as to allow users to input data easily so as to improve the quality of data produced.

## Login form

The diagram shows the log in form for the users at ZINWA it will be used as a measure to accept only authorised users into the system. Correct username and password are used to login the system.

### User Login Form

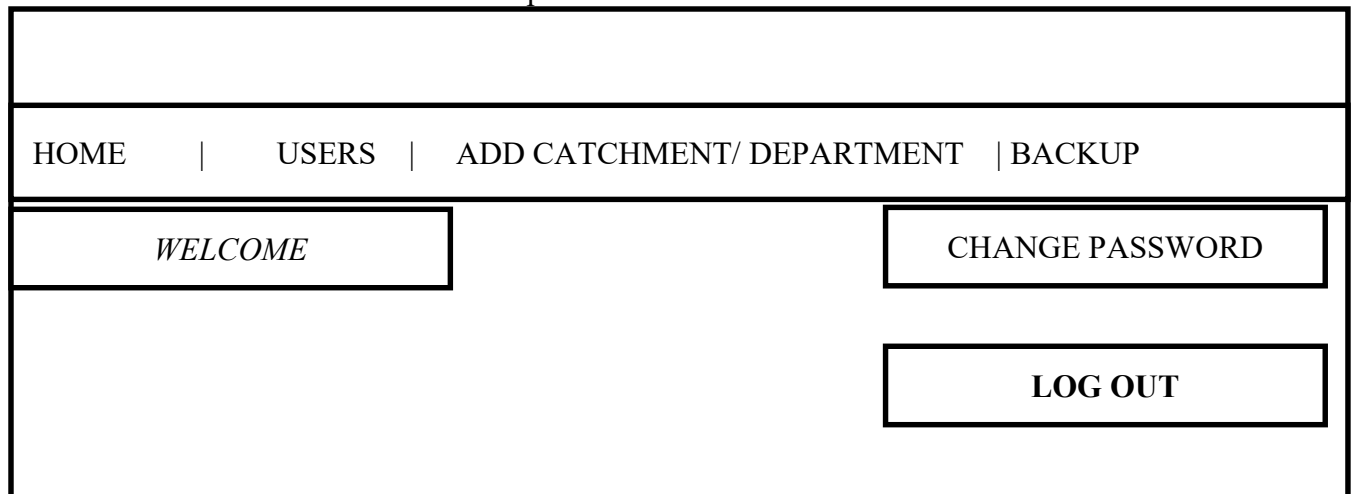


The diagram shows a user login form for ZINWA. At the top right, it says "Please enter your login detail". On the left, there is a logo for ZINWA with the tagline "every drop counts" and a "Home" button. Below the logo is a text box stating: "The ZINWA's ICT department is responsible for effective, efficient and responsive information communication services to various departments". On the right side, there are two input fields labeled "Username" and "Password", and a "Login" button.

Fig 4.10 User Login form

### Main Menu for the Administrator

On the admin main menu the administrator will be able to create, edit and suspend a user or catchment and also the admin can backup data

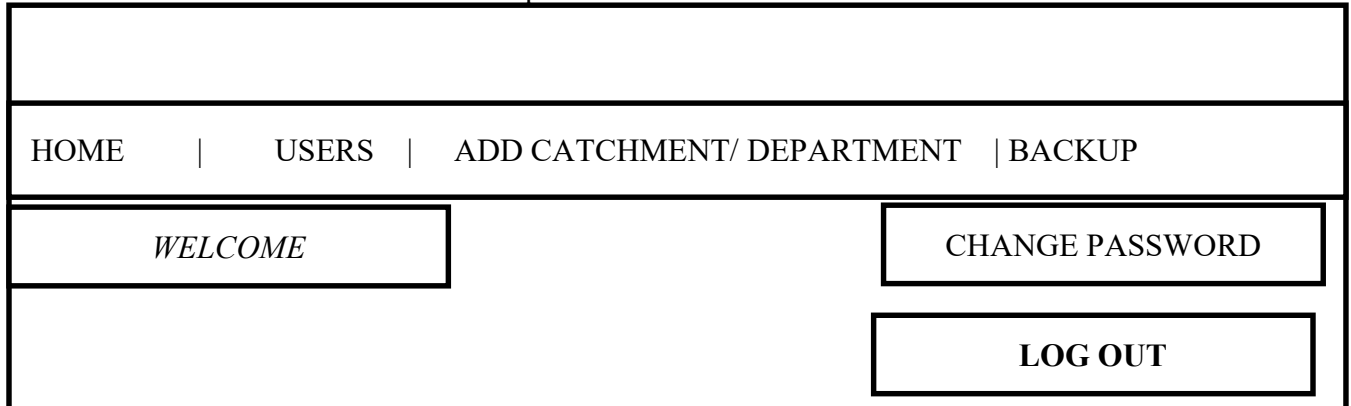


The diagram shows the main menu for an administrator. At the top, there is a navigation bar with the following items: HOME | USERS | ADD CATCHMENT/ DEPARTMENT | BACKUP. Below this, there are three buttons: "WELCOME" on the left, "CHANGE PASSWORD" on the right, and "LOG OUT" on the right.

Fig 4.11 admin main menu

### Main Menu for the Administrator

On the admin main menu the administrator will be able to create, edit and suspend a user or catchment and also the admin can backup data

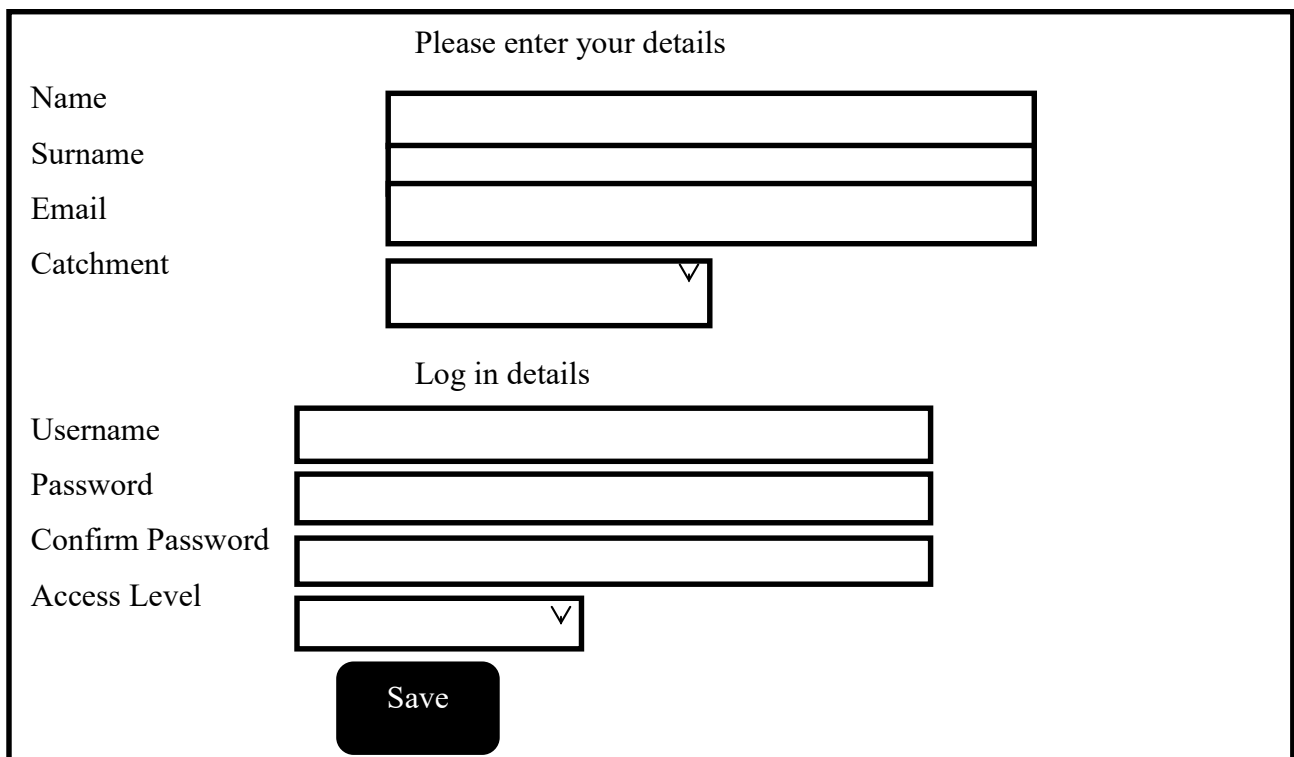


The image shows a screenshot of an administrator's main menu. At the top, there is a navigation bar with four items: 'HOME', 'USERS', 'ADD CATCHMENT/ DEPARTMENT', and 'BACKUP', separated by vertical bars. Below this, there are three buttons: 'WELCOME' on the left, 'CHANGE PASSWORD' on the right, and 'LOG OUT' centered at the bottom right.

Fig 4.11 admin main menu

### Users Registration Form

The form is designed to capture the details of the users.

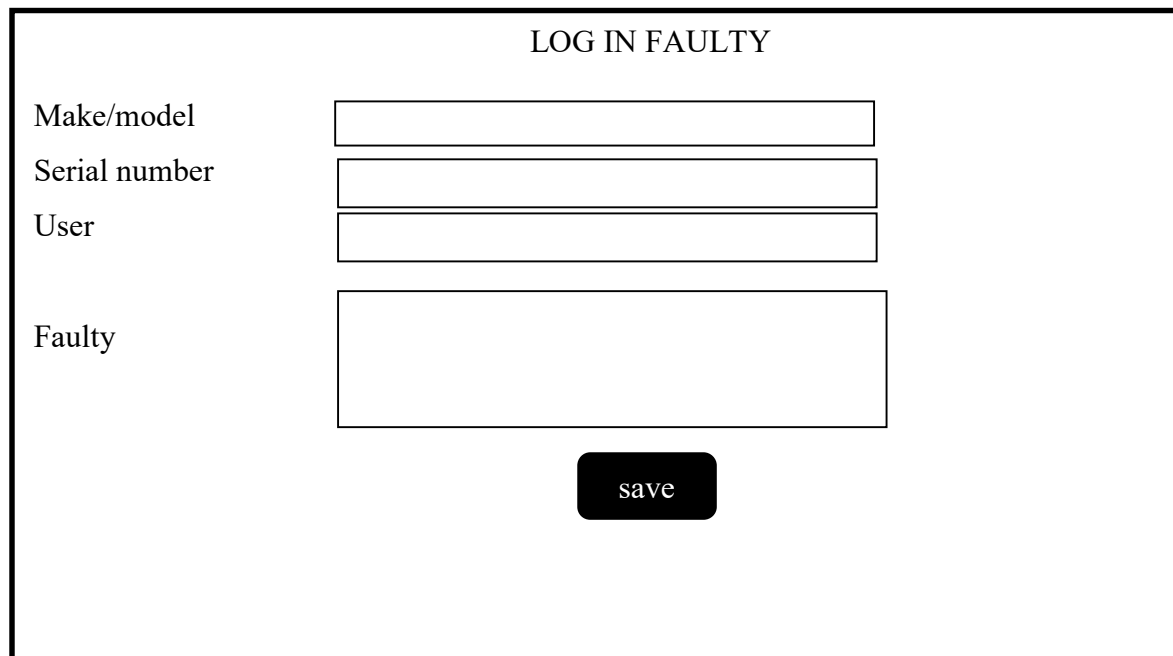


The image shows a user registration form titled 'Please enter your details'. It is divided into two sections: 'Please enter your details' and 'Log in details'. The first section includes fields for Name, Surname, Email, and Catchment (a dropdown menu). The second section includes fields for Username, Password, Confirm Password, and Access Level (a dropdown menu). A 'Save' button is located at the bottom center of the form.

Fig 4.12 User registration form

### Faulty log in form

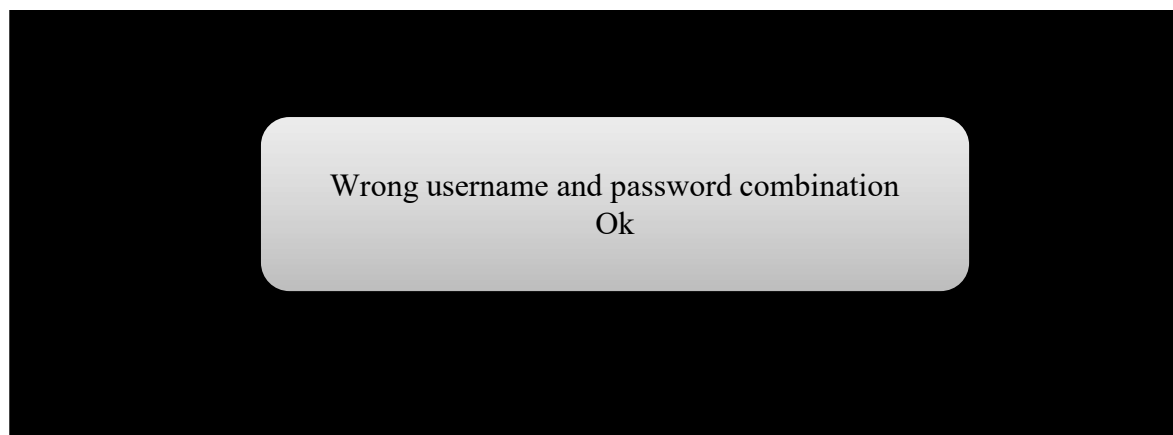
The repairs will be locked into the system by the help desk



The image shows a form titled "LOG IN FAULTY". It contains four input fields: "Make/model", "Serial number", "User", and "Faulty". Below the "Faulty" field is a "save" button.

### 4.7.2 Output Design

It shows how data in the database can be viewed. Below is the result when the user enters a wrong username or password



**Fig 4.14 wrong credentials combination**

### Repair reports

The reports shows all the activities that have been happening in the workshop, it shows the management all senior supervisor all the finished and work in progress tasks.

FAULTY REPORT			
Start Date	22/09/2015	End date	27/09/2015
			Finished ▼
<input type="button" value="Search"/>			
User	Problem	Solution	Date
B Sibanda	Not receiving mails	configured network	23/09/2015
Q Shinda	OS corrupted	Changed OS	26/09/2015

**Fig 4.15 repair reports**

**Chat box form**

The chat room is meant to increase communication between the technicians.

Home   Resolve faulty	Change password
<p><b>Tarisai:</b> Guys from the workshop are coming to collect the condemned machine for auctioning, can we move the machines downstairs by 10 o'clock</p> <p><b>Tentone:</b> Noted</p> <p><b>Camacho :</b> By 9 will be going to Manyame for quarterly services</p> <p><b>Tarisai :</b> so we do it before 9</p>	<input type="button" value="Log out"/>

**Fig 4.16 chat box**

**Notification to users**

The user will notified when the repair was successful or condemned.

Serial number

Status	date in	machine serial number	Fault	Catchment
Finished	09/04/2015	4566345673j767	corrupted files	Manyame

**Fig 4.17 user notification**

#### **4.8 Conclusion**

The design phase outlined how the proposed system will work. The system design clearly showed the data flow in the proposed system through dataflow diagram, context diagram sequence diagram. Physical design showed the hardware and software specifications of the proposed system. Program design showed the package diagram and class diagrams. Graphic user interface of the proposed system were sketched on interface design. The next phase is implementation it focuses on where the proposed system will be put into use.

## CHAPTER 5: IMPLEMENTATION PHASE

### 5.1 Introduction

The phase focuses on the delivery of the workshop management system into the real environment. The codes that will be used to produce the system will be clearly shown under coding. Testing is also done in the stage to observe if system specifications meet user requirements. Installation of the system will be conducted and the best installation technique will be chosen. Maintenance of the system will be done to ascertain quality of information.

### 5.2 Coding

It resembles the codes that are not real but are similar to the actual codes which are implemented by a certain programming language. Below is the pseudo code representing the processes and functions found in the modules.

#### 5.2.1 Pseudo Code

##### Login

Enter login details

```
If (login) {  
    Direct user to their specific home pages  
} else {  
    Check the login details  
}
```

##### Log out

```
If (logout) {  
    Direct user to login page  
} else {  
    Failed to logout  
}
```

##### Add Staff

Please fill in all details

```
IF (register) {  
    User account created  
} ELSE {  
    Failed to create account}
```



## View user

IF (view) {

    List of users and delete user

} ELSE IF (delete) {

    Delete user details

}

} ELSE {

    MYSQL error

}

## 5.3 Testing

It involves examining software with data to check the information to be produced. Several methods of testing to observe if the system user requirements have been met were used which includes module testing, subsystem testing, system testing and acceptance testing

### 5.3.1 Module Testing

In this case each module was developed individually basing on the relationship and tested one by one. The test also encompassed execution paths, error handling paths to understand all the validation needed per module. A set of actions and functions were tested together. It was also done using the set objectives to measure the reliability and functionality and to see if it is working properly. Backup file was tested as a module. Below is the form.

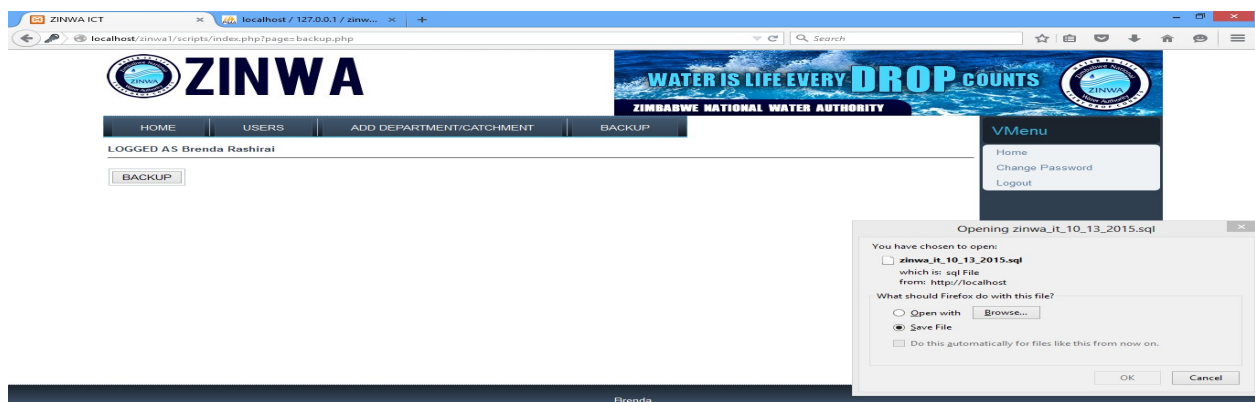


Fig 5.1 module testing form

### 5.3.2 Subsystem Testing

The system modules that were related were joined together to produce a sub system. The database was also tested as a subsystem. With this type of testing there was recognition of interface mismatch.

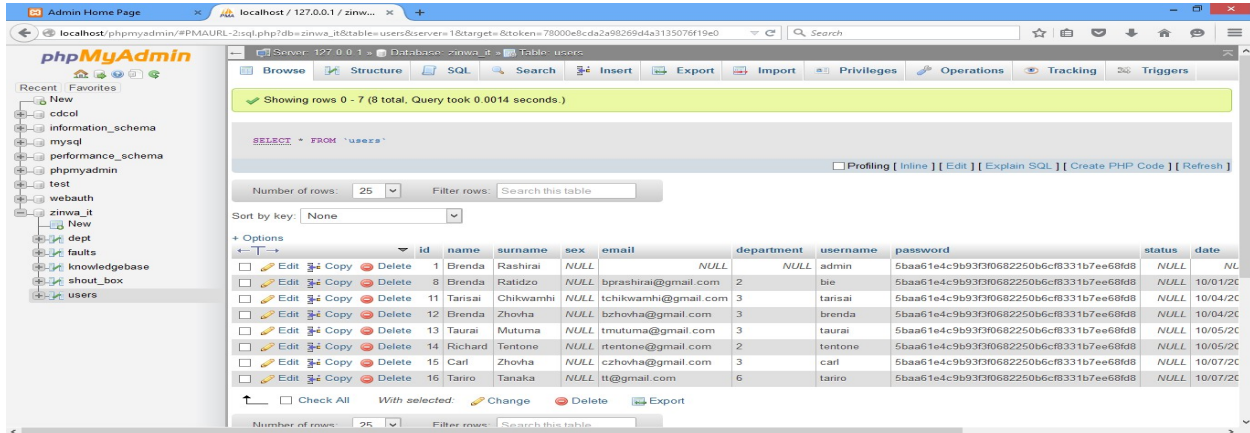


Fig 5.2 subsystem testing form

### 5.3.3 System Testing

In this case the sub systems were joined together to form the whole system. It involved testing the whole system to see if it meets the user specifications. This was done also to see if there are any errors that can affect the performance of the system. Real data was inserted into the system to see if the required output is being produced by the system. They are two types of system testing that were used:

#### 5.3.3.1 Black box testing

With this type of testing the system was tested without making reference to the code. The workshop management system was tested by inserting applicable data to test the accuracy of the data that was inserted, and also to check the accuracy of the results so as to allow the results to be compared with expected results.

#### Advantages

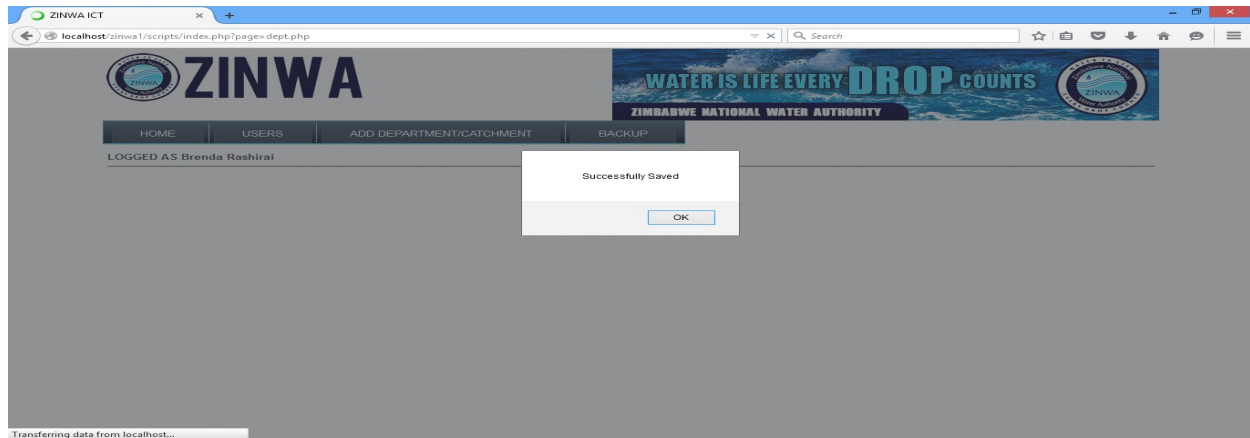
- Simplicity that is the users easily tested.
- Errors were quickly identified.
- The outputs were of great value to compare with the user expectations.

#### Disadvantages

- Output can be overrated since some errors were found after white box testing

- Without referencing to the code the workshop management system users might not have full understanding of the code

Below is the form for black box testing.



**Fig 5.3 black box testing form**

### 5.3.3.2 White box testing

With this type of testing reference to coding was done. Step by step running of system was conducted with report and output at each step of the execution and validation and verification was done at each significant code segment.

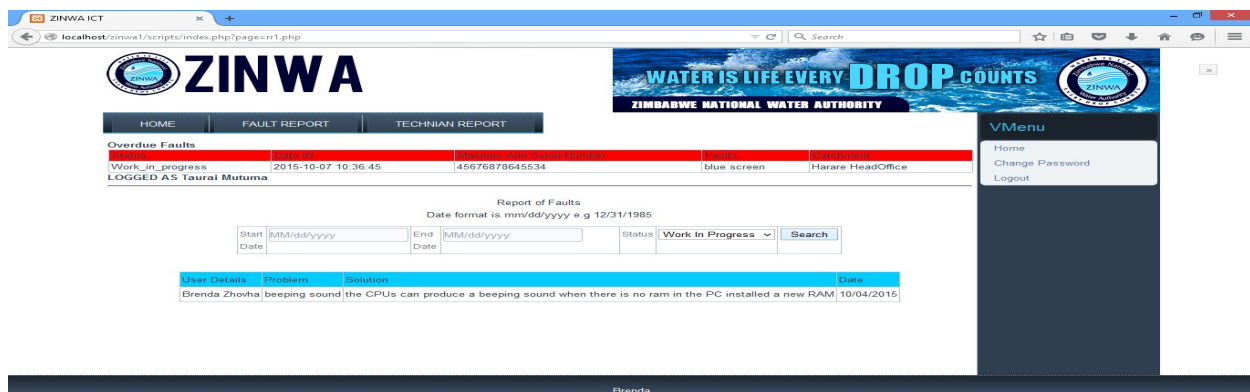
#### Advantages

- Bugs were removed quickly
- Better comprehensive test

#### Disadvantages

- It required someone who is skilled to test
- It took a lot of time to test

Below is the form for white box testing



**Fig 5.4 white box testing form.**

## 5.2.5 Acceptance Testing

This is the final testing for management system so that it will be accepted by ZINWA for use. The testing was done by intended users of the workshop management to see if the system meets there specifications and to note some errors so they can be repaired before implementation in the organization. This was done so that the system users can feel the type of a system that they are going to use before it is implemented and it was measured against the objectives that the users gave that included:

1 To enable clients to track their computer status on repairs.



Fig 5.5 status report

2 To notify technician on a new jobs.

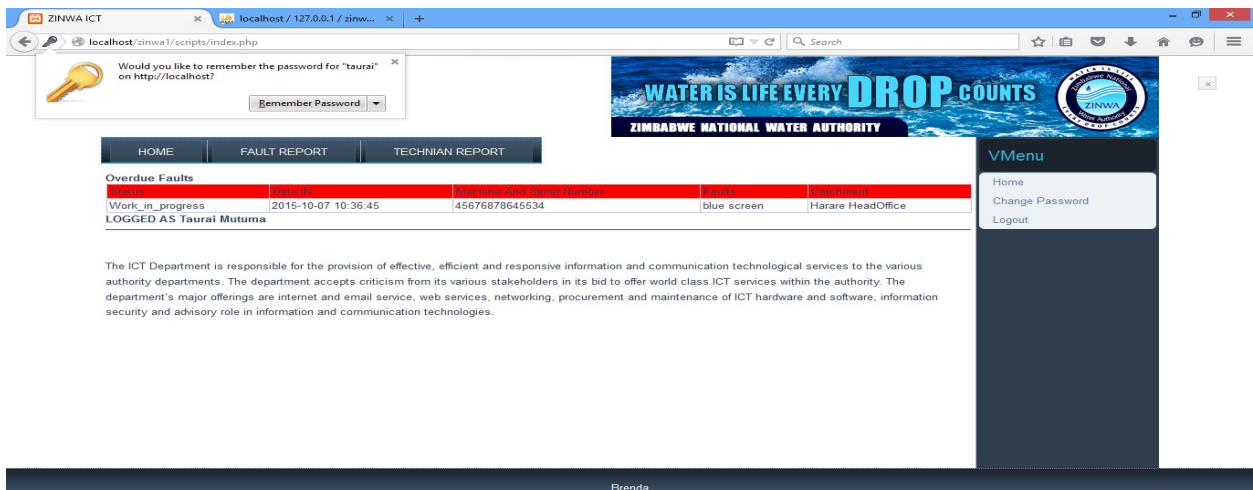


Fig 5.6 technician notification

3 To alert the management on jobs overdue.

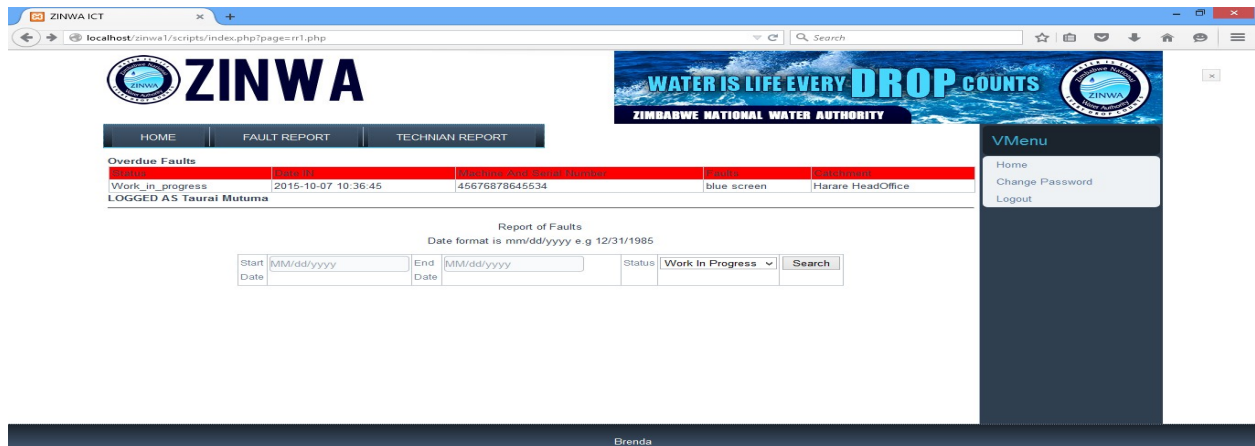


Fig 5.7 overdue notification

4 To enhance communication through chat box.

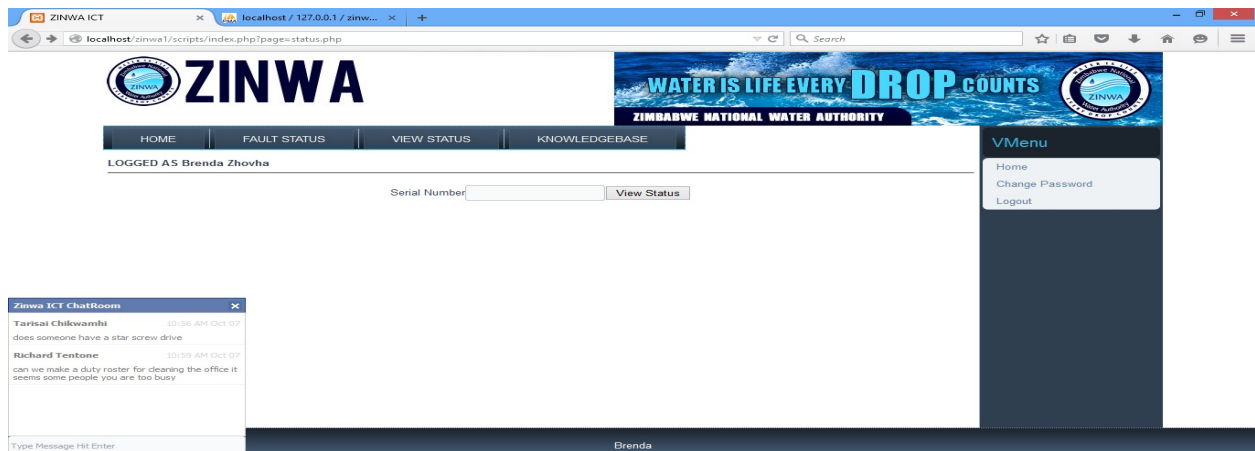


Fig 5.8 chat box

5 To have a knowledge base with solutions to some questions.

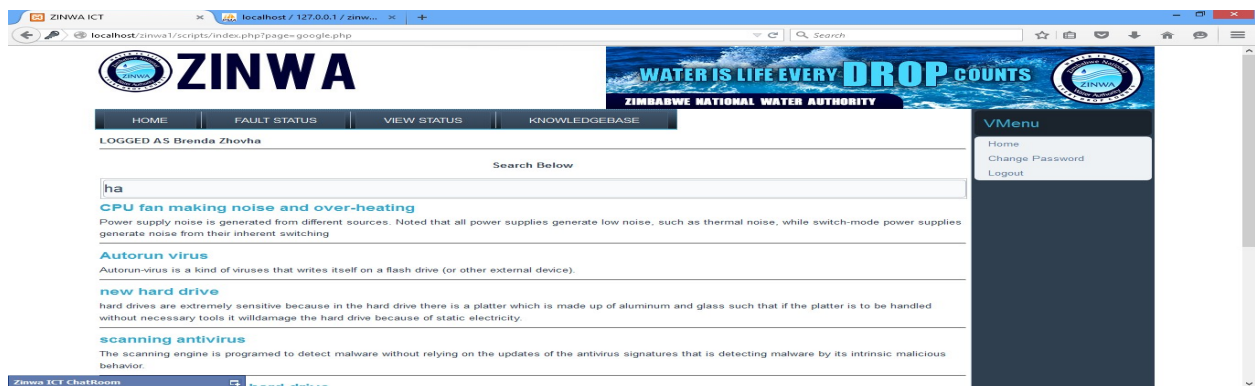
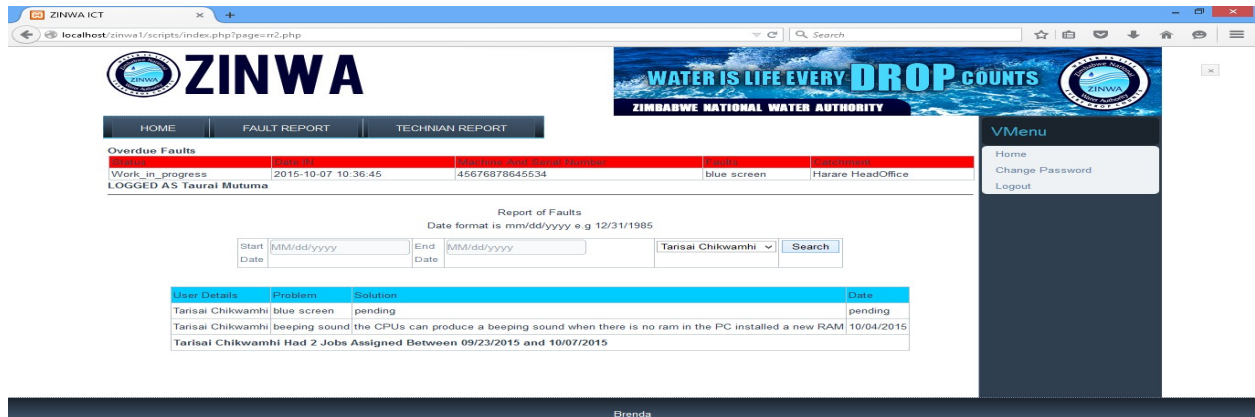


Fig 5.9 knowledge base

## 6 To allow managers to assess the performance of IT technicians



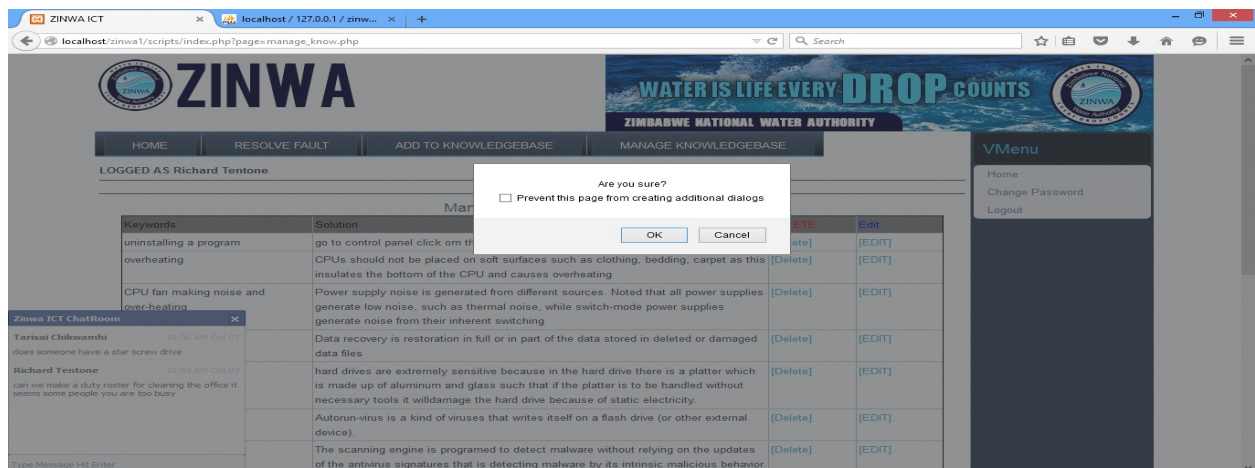
**Fig 5.10 performance assessment**

### Verification

It is done to measure the functionality against user requirements. Errors will be reduced by assisting the user with some information before making a decision and rejecting wrong data into the system.

### Record update Verification

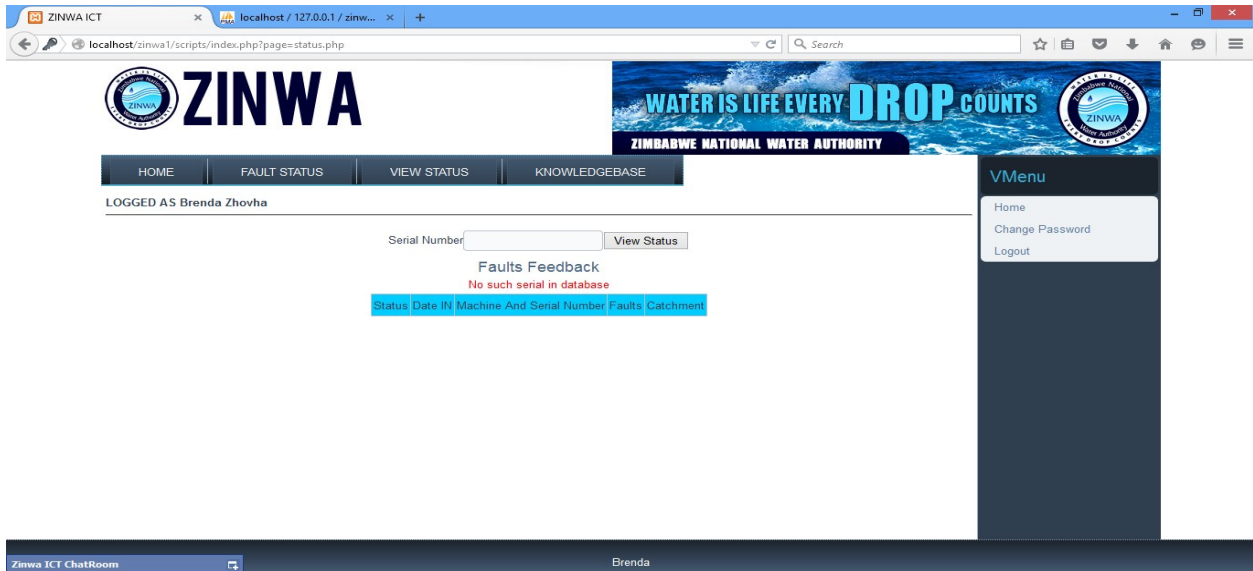
With this type of testing the IT technician were allowed to edit the data in the database and a message box popped up to verify the decision



### 5.11 record update verification

#### Serial input verification

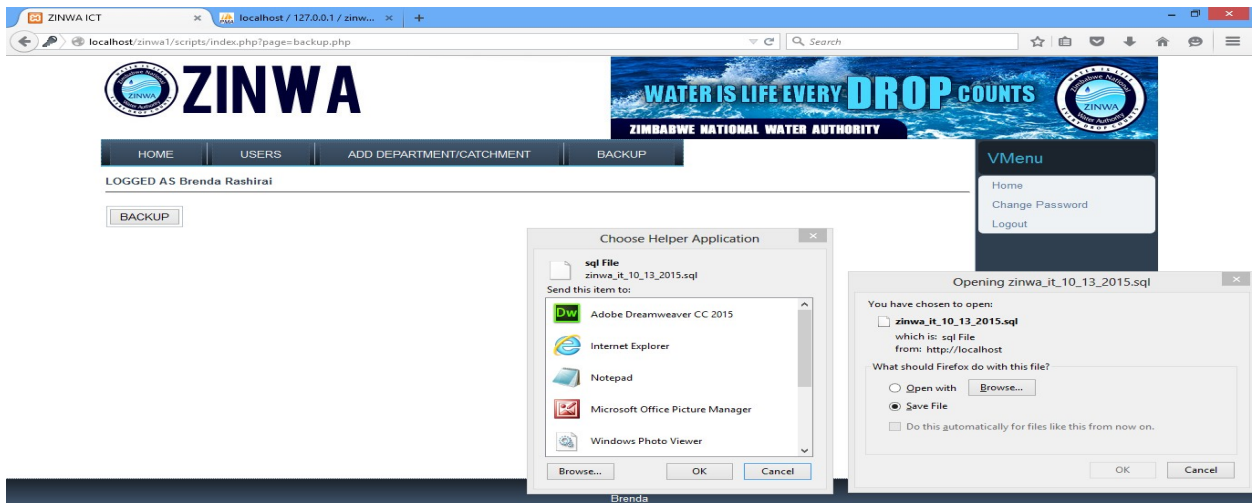
The ZINWA staffs were allowed to input wrong serial numbers when searching for the status to check if the system is working properly.



**Fig 5.12 serial input verification**

**Record selecting verification**

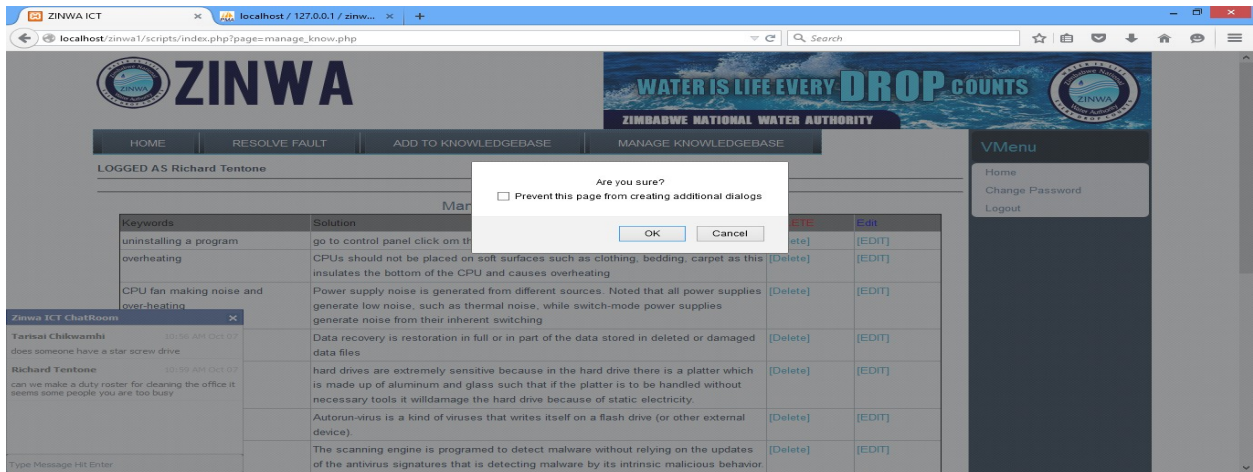
Backing up of data was used to test. The users were given the option to go ahead with the idea or to cancel as a way of verifying their ideas



**Fig 5.13 record selecting verification**

**Record Deleting Verification**

On deleting certain stuff from the system the system will ask the user if they are certain through a message box in the event that they might want to delete the information by mistake.



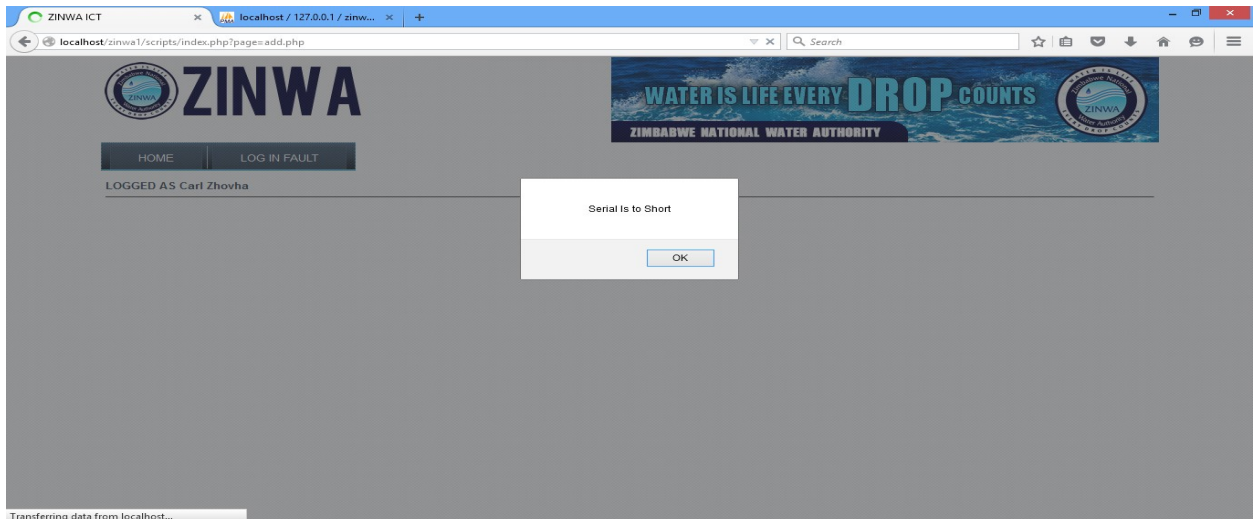
**Fig 5.14 record deleting verification**

### Validation

It focuses on how the system responds to valid and invalid data input. For the system to reduce errors and data inconsistency the workshop management system needs to be validated

### Short serial number validation

The users were allowed to input short serial numbers into the system to check if the system accepts the data.

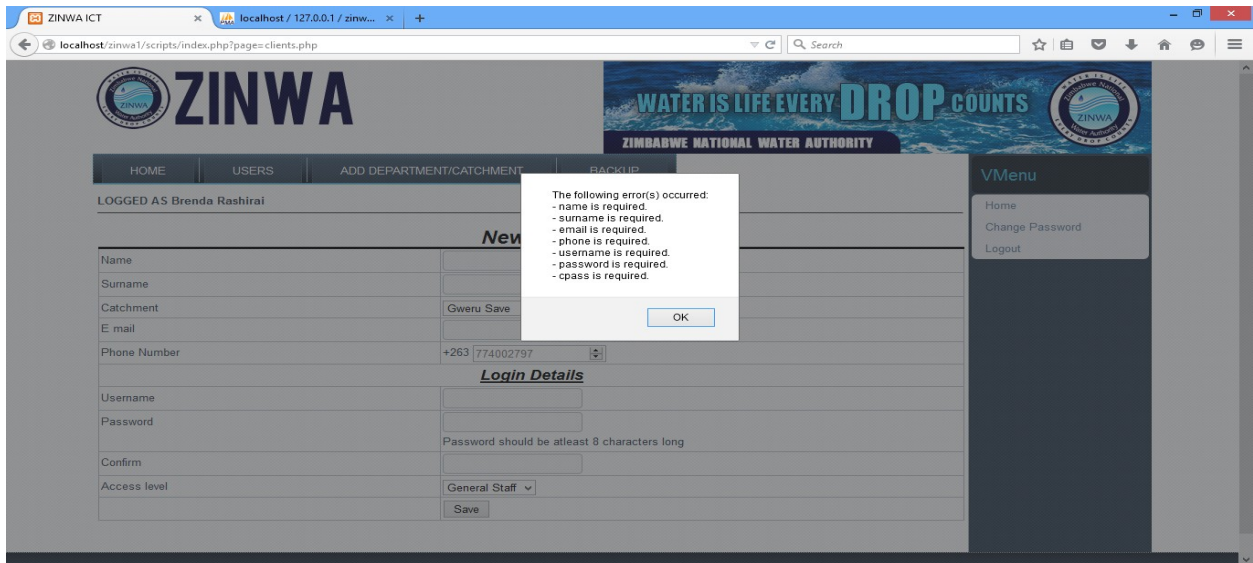


**Fig 5.15 short serial number validation**

### Null Fields Validation

With this type of testing the users did not put any data in the fields so as to check if the system accepts null fields. Below is the form that shows errors that occur when no data is inputted.

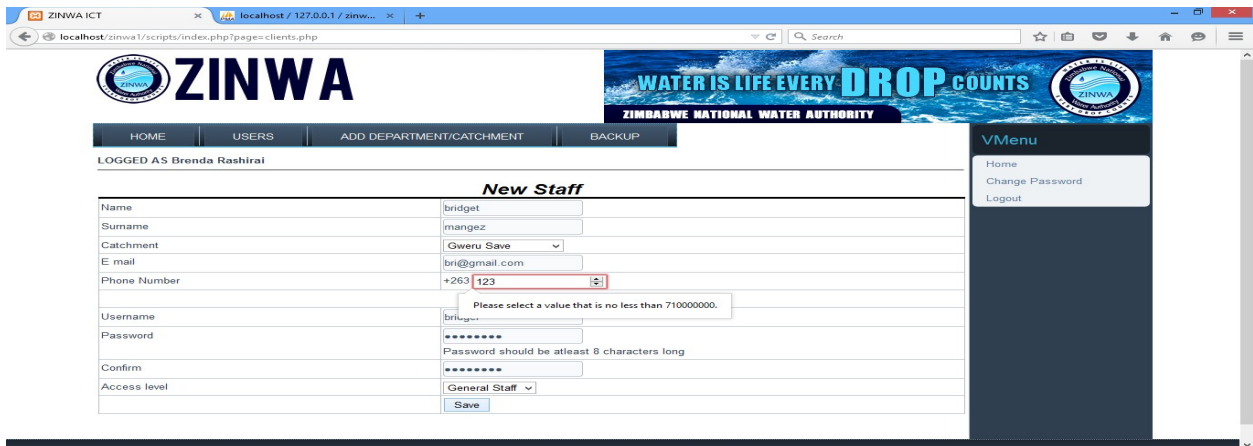




**Fig 5.16 null fields validation**

**Few numbers input validation**

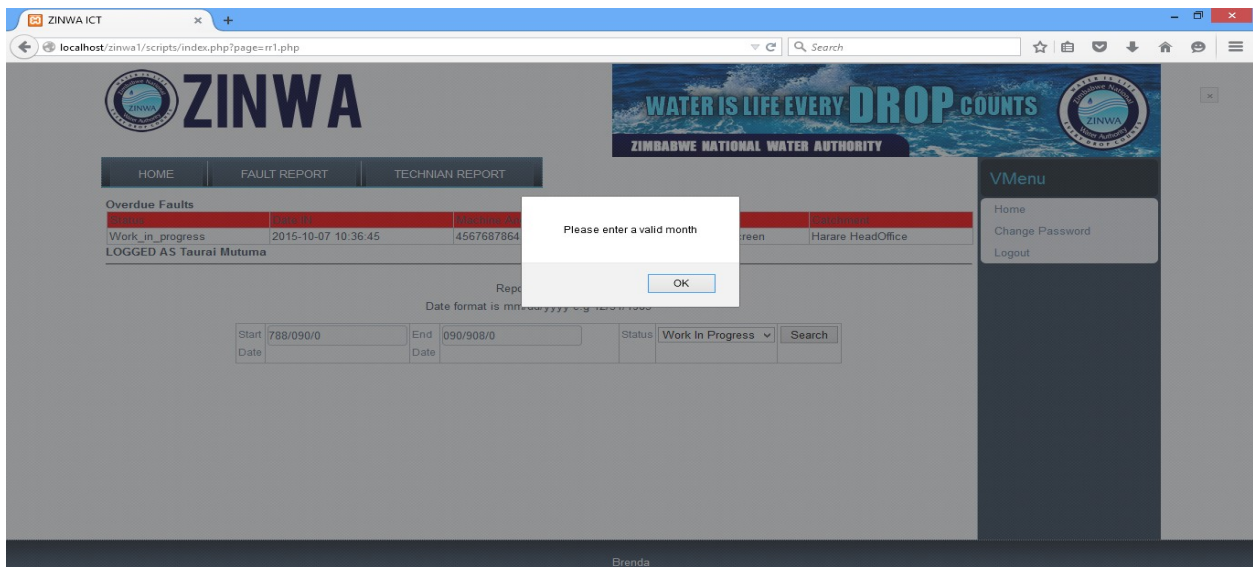
The users of the system were allowed to input few digits on the phone numbers section to check if the system accepts.



**Fig 5.17 few numbers input validation**

### Data searching validation

The managers were allowed to input wrong dates when searching for a report. Below is the result



**Fig 5.18 data searching validation**

## 5.4 Installation

It focuses on training, file conversion and system conversion methodologies..

### 5.4.1 User Training

It was done for the users to familiarize with the system and to know all the operations that will be done by the system. A plan for training the users was developed and it was given to the management for approval. The training was done for 3 days and all the different type of users were given different time slots so that they will clearly understand what they were being taught without mixing the information. The users were allowed to ask questions on the issues that were

not as clear to them as a way of broadening their understanding the system. After the training the users were given questionnaires so as to asses the impact of the training to the users.

### **5.4.2 Operational Environment**

It focuses on objects that hinders system functionality such as

- Hardware
- Software configuration
- Operating system programs
- Utilities
- Network resources

### **5.4.3 File Conversion**

It focuses on the transfer of the workshop management system after the system has been verified. Programs were designed to do the conversion process. By the time that the users will be using the system the files will be in use and the conversion will be done during the weekend and also after the working hours.

#### **5.4.3.1 System Conversion**

This is the process of replacing the old system with the new system. To changeover they are several methods that can be used

##### **5.4.3.1.1 Direct Changeover**

This occurs when implementing the new system; the old system will be completely overridden by the new system.

#### **Advantages**

- It avoids duplication of work in both systems.
- Reduces the cost of keeping both systems in operation.
- Users are more likely to quickly learn than when all the systems are in operation.

### **Disadvantages**

- Very high risk of affecting operations when the system does not perform up to standard.
- It is difficult to repair some errors that will be noticed after implementation whilst it is the main system in operation.
- It requires cautious preparation and concentration to operations.

#### **5.4.3.1.2 Parallel Running**

With this type of a conversion the old and new system will run in operation for some time and then the old system will stop operation after sometime.

### **Advantages**

- Low risk because all the systems will be in operation.
- It can give the users enough time to choose the best system they are comfortable.
- The workshop management system user may refer to the older system on some gray areas.
- If the workshop management system fails the older system can easily take control

### **Disadvantages**

- It is expensive because all the systems will be functioning at the same time
- Progress on adaptation to the new system can be slow.

#### **5.4.3.1.3 Pilot Operation**

This type of conversion focuses on implementing the new system to the area or department that it really needed. The other part of the organization will continue to use the older system until it is proven to be cost effective.

### **Advantages**

- Low risk of losing important information for the organization due to system failure because the old system will take over.

- Successfulness of the system will determine if the system can be launched in the whole organization.
- Cheaper to implement because it will be implemented on a small scale.

### **Disadvantages**

- High cost because both systems will be operating
- It can take time until the system is implemented on a larger scale
- By the time that the system will be implemented on a larger scale some of the features will be obsolete and will need to be changed hence it will be more difficult for the other users that will be starting to use the system on that time.

#### **5.4.3.1.4 Phased Changeover**

This occurs when the new system is implemented in the form of modules into the organization.

### **Advantages**

- Less risk in the event that the system fails
- Low cost of implementation

### **Disadvantages**

- It can be time consuming to implement the whole system.
- Costly to maintain both systems.

### **Conclusion on system conversion.**

To install the system parallel conversion was used because of low risk involvement in the event that user expectations are not met

## **5.5 Maintenance**

It is a process that is done at a regular basis to address the changes that come up in the organization. It can be done through periodic review. There are few types of maintenance which are:

### **5.5.1 Corrective Maintenance**

It is done to repair or fix software faults. Errors in the code are cheap to do hence design errors are expensive because they require rewriting of most program components. Most of the corrections will be documented.

### **5.5.2 Adaptive Maintenance**

It is a process of adopting software package to different operating environment. Adaptive maintenance is mostly done on areas such as hardware, operating system. The workshop management system should be flexible and should always be modified to adapt to the perpetual changes.

### **5.5.3 Perfective Maintenance**

This focuses more on putting missing functionalities in the implemented workshop management system. The ultimate objective is to maintain a better version of the system and to keep abreast with the latest technology.

### **Conclusion on Maintenance**

Adaptive method will be used for the maintenance process. The analyst came up with the following recommendations

- There should be effective training so as to reduce unnecessary errors and workshop management system users should fully utilize the user manual.
- There should be constant security checks to avoid security breaches such as viruses.
- The workshop management system should be open enough to tell where changes are needed such that they remain being satisfied by the system.
- The knowledge base should constantly be updated so as to allow users to have the latest information.

### **5.6 Conclusion**

In the phase the pseudo codes that the system was using were shown. Testing of the system was carried out which included module testing, sub system testing, system testing and acceptance testing. Installation was conducted and parallel conversion was chosen on which older system and new system were working together to reduce the risk of loss of information. Maintenance of the workshop management system will be done continuously as a way to improve system performance and also in the near future it is the aspiration of the researcher to add an auctioning module for unwanted machinery.

## BIBLIOGRAPHY

- 1) Bahrami, A. (1999) Object oriented system development 2nd Edition, Irwin McGraw-Hill, Singapore
- 2) Bateman T, S and Snell A. (2011) Management 9<sup>th</sup> Edition. McGraw Hill: London
- 3) Boyd, H. Westfall, R and Stasch, S.F. (1999) Marketing Research Text and cases 7<sup>th</sup> Edition. Prentice hall: London
- 4) Brown, C.E. and O’Leary, D.E. (1995). Introduction to Artificial Intelligence and Expert Systems. Prentice-Hall: New York.
- 5) Brinkman R, (2008) Information Systems Analysis (5<sup>th</sup> Edition), Prentice-Hall: London
- 6) Boettcher, J. (Ed.) (1993). Success Stories Of Information Technology In Higher Education: The Joe Wyatt challenge, McGraw-Hill: New York:
- 7) David, R. Anderson, R and Dennis J, S. (2003). An introduction to management science quantitative approaches to decision making 10<sup>th</sup> edition Book Masters Inc: United States of America.
- 8) David, S. (2006). Measuring the Business Value of Information Technology. Intell Press: New York
- 9) Dunn, W. N. (2009). Public Policy Analysis: An Introduction. Longman: New York
- 10) Green, E P. Tull, S D. and Alban G. (2000) Research for marketing decisions 5th Edition Prentice hall : New Delhi
- 11) Haag, S. (2004) Computing Concepts 2nd Edition, Prentice-Hall, London
- 12) Heathcote P, M. (2000) Computing. Letts Educational: London
- 13) Hughes (1999) .An improved Micro level Software Development Resource Estimation 2nd Edition McGraw-Hill: Singapore
- 14) Lynch, R. (2009), Strategic management .5<sup>th</sup> Edition. Library Congress: London
- 15) Lucey T. (1997) Costing 5th Edition Letts Educational Aldine Place : London
- 16) O’Brien J, A. (1997). Introduction to information systems 8th Edition Tata McGraw- hill : New Delhi
- 17) O’Brien J, A. (2006) Introduction to information systems 12th Edition Tata McGraw- hill : New Delhi
- 18) Patton, G. (2002) Systems Analysis and Design, Prentice-Hall: London

- 19) Pressman. (2005). Software Engineering: A Practitioner's Approach 3rd Edition, McGraw-Hill, London
- 20) Schulthess, R. and Sumner, M. (1999) Management information System the manager's view Tata McGraw – hill: New Delhi
- 21) Sommerville, I. (2004). Software Engineering, Dorling Kindersley: South Asia
- 22) Stoner, J, A. Freeman, R, E and Gilbert, D, R. (2005) Management 6th Edition Prentice hall : New Delhi
- 23) Stutely R, (1999). The definite business plan 2<sup>nd</sup> Edition. Prentice hall: London
- 24) Ramakrishnan, R and Gehrke, J. (2003) Database Management System 3<sup>rd</sup>.Edition McGraw-Hill Higher Education: Boston
- 25) Tannenbaum, A. S. (1990) Structured Computer Organisations (3<sup>rd</sup> Edition). Prentice-Hall: London
- 26) Wit C, T. (2009) IT best practices. CRS Press: New York



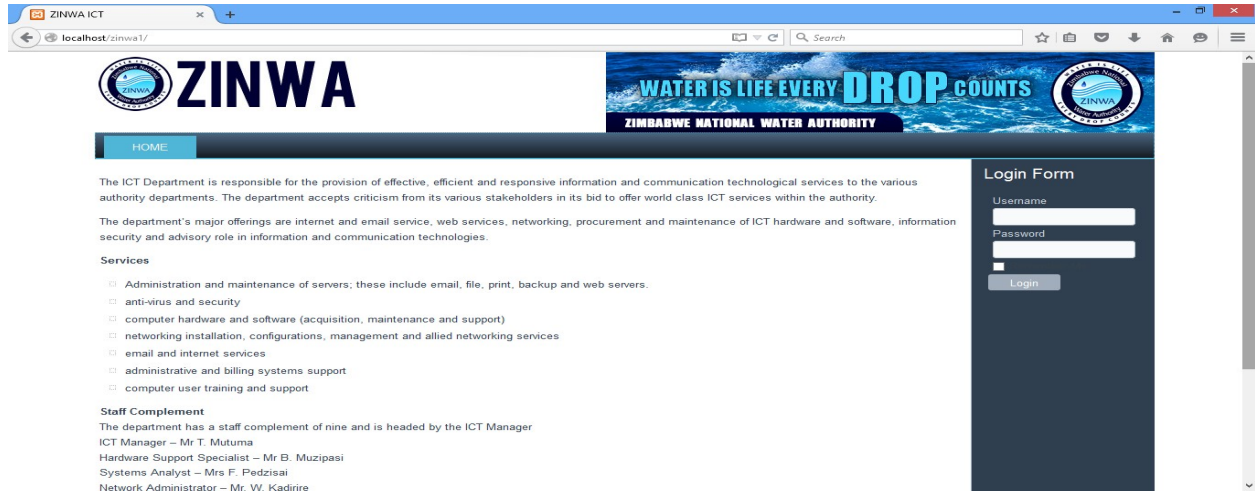
## APPENDIX A

### USER MANUAL

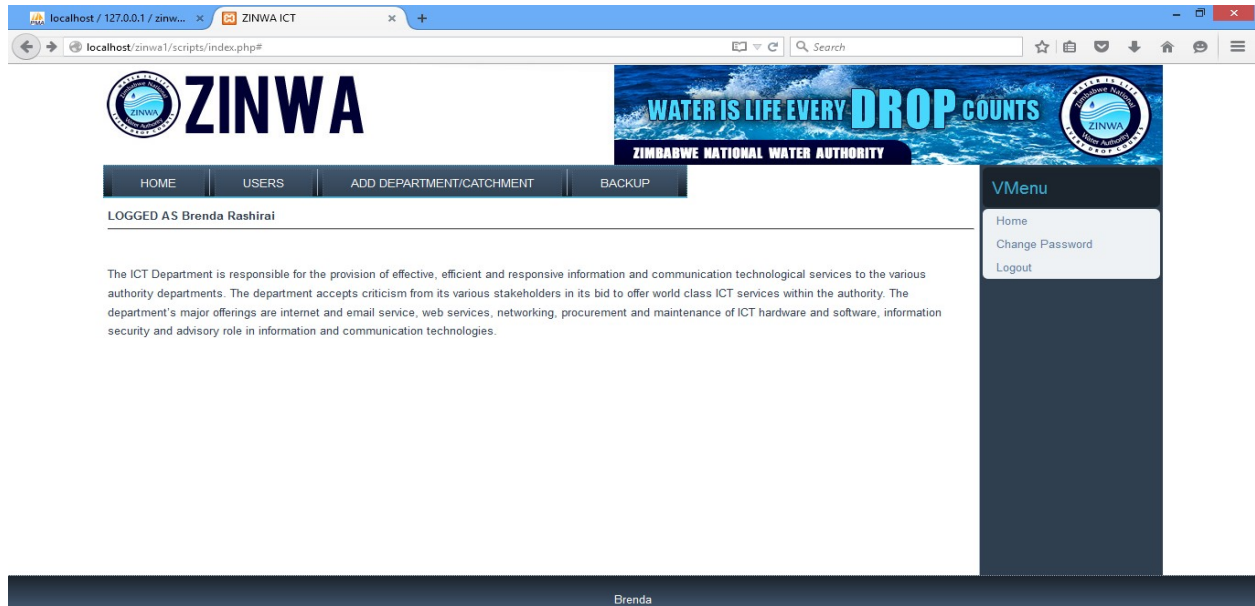
#### admin section

Default credentials Username = admin Password = password.

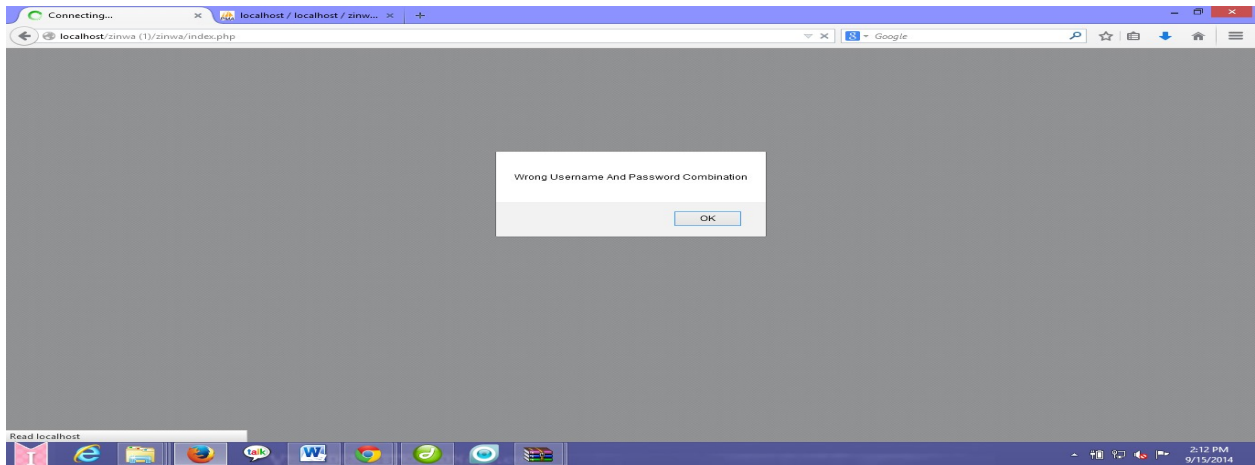
NB: The administrator account make changes that will affect other users.



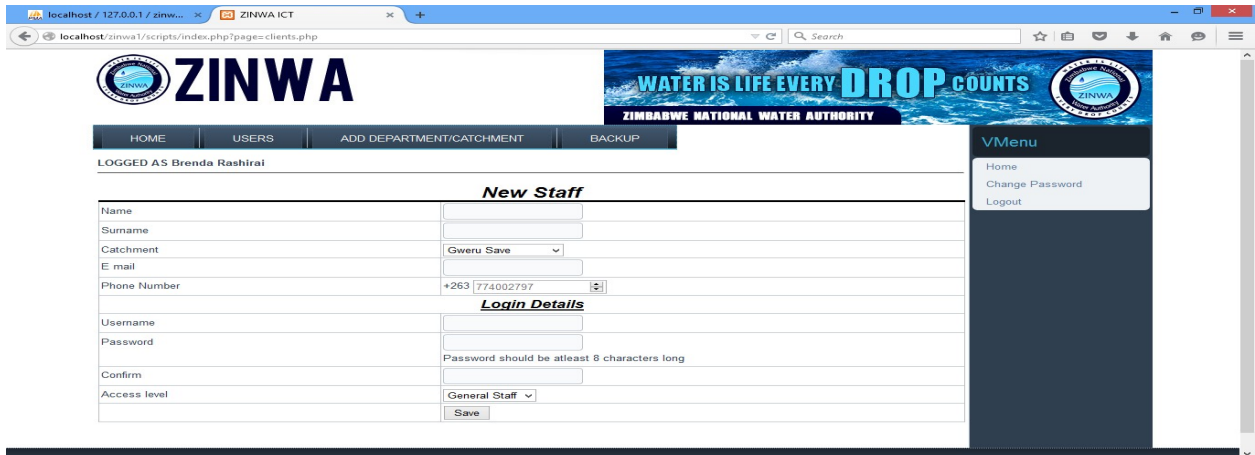
A new page will pop up



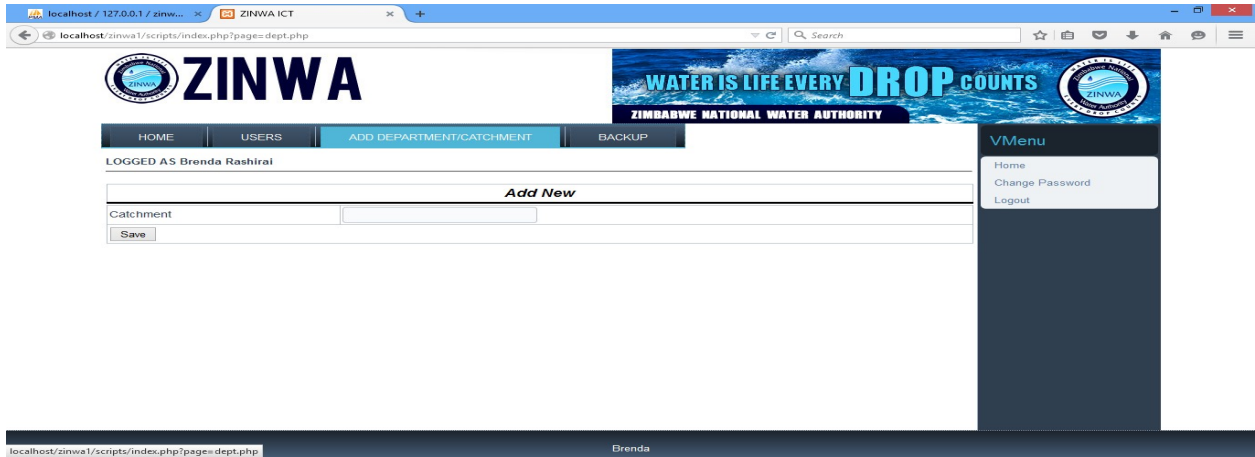
In the event of wrong password combination this page will pop up.



To add user click on the add user button. A form will appear on which details needs to be field and saved to create an account.

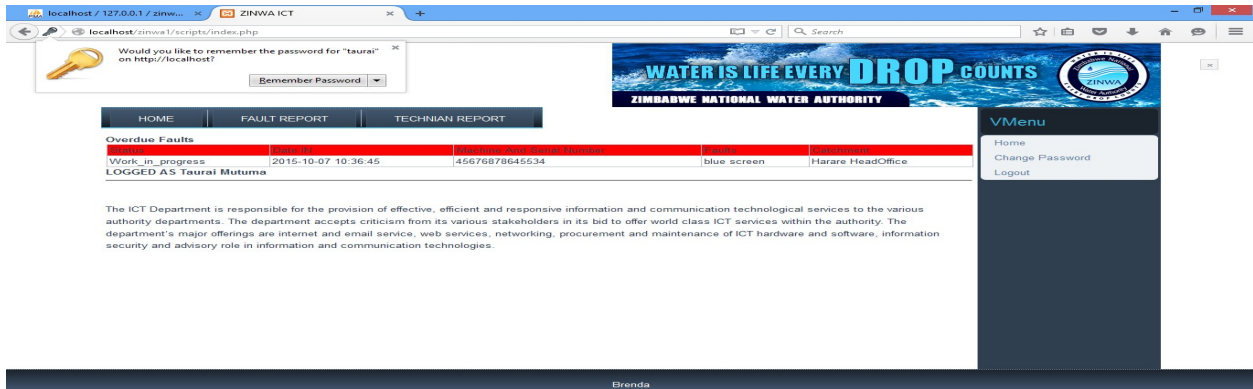


To add catchment click on the add catchment button and click save.



## How to log in the managerial section

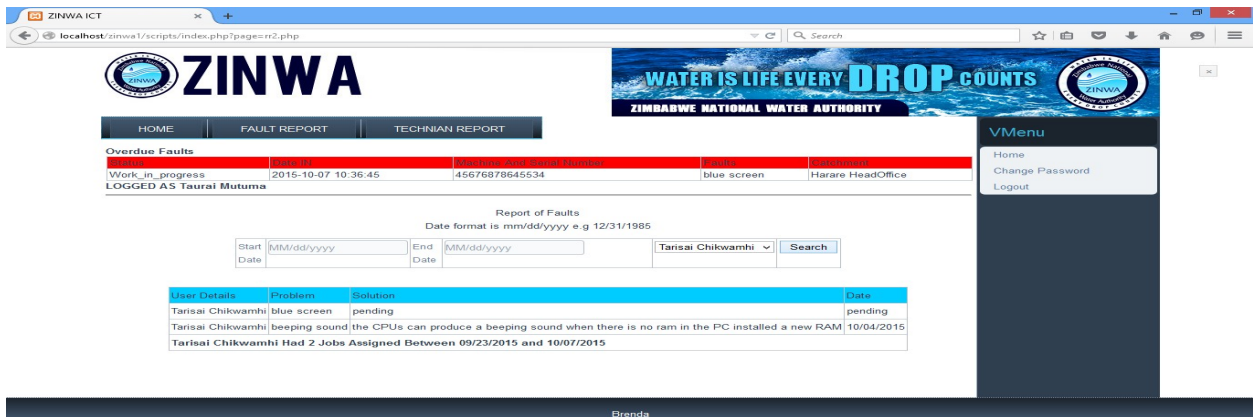
Enter correct details and this page will pop up.



To view faulty reports click on the faulty report button



To view the reports on technicians click on view technicians report



Repair over dues are automatically found on the page

Would you like to remember the password for "taurai" on http://localhost?

Remember Password

HOME FAULT REPORT TECHNIAN REPORT

**Overdue Faults**

Status	Date (H)	Machine And Serial Number	Faults	Catchment
Work_in_progress	2015-10-07 10:36:45	45676878645534	blue screen	Harare HeadOffice

LOGGED AS Taurai Mutuma

The ICT Department is responsible for the provision of effective, efficient and responsive information and communication technological services to the various authority departments. The department accepts criticism from its various stakeholders in its bid to offer world class ICT services within the authority. The department's major offerings are internet and email service, web services, networking, procurement and maintenance of ICT hardware and software, information security and advisory role in information and communication technologies.

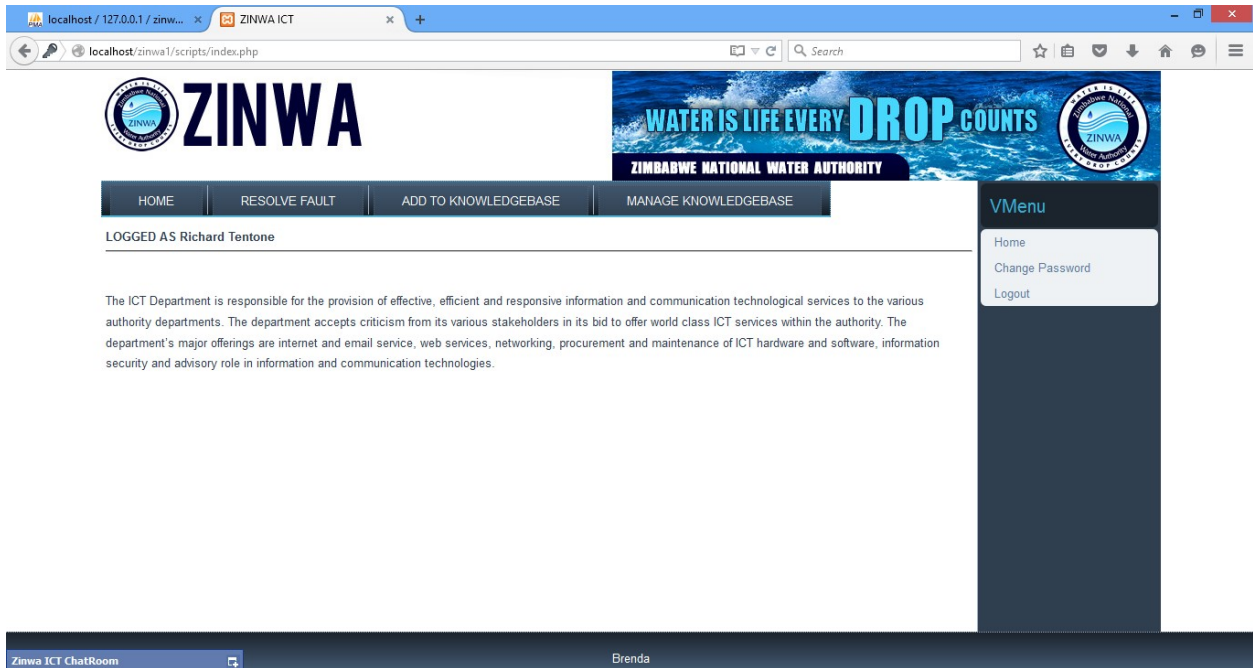
VMenu

- Home
- Change Password
- Logout

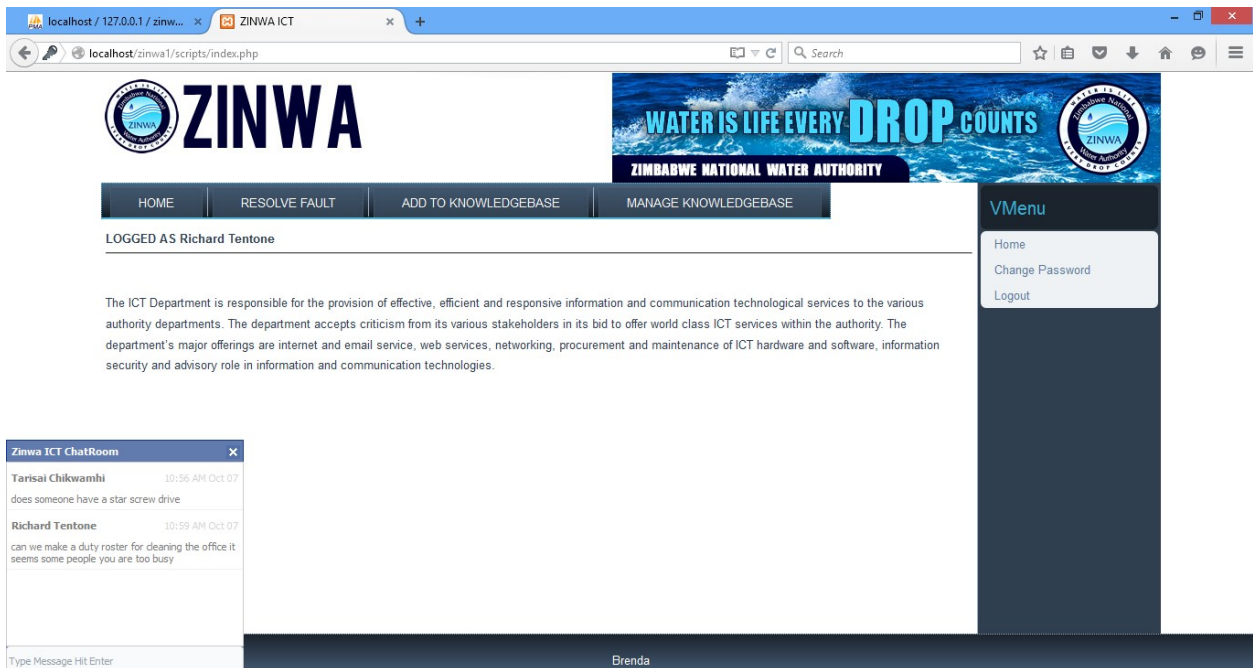
Brenda

## IT technician section

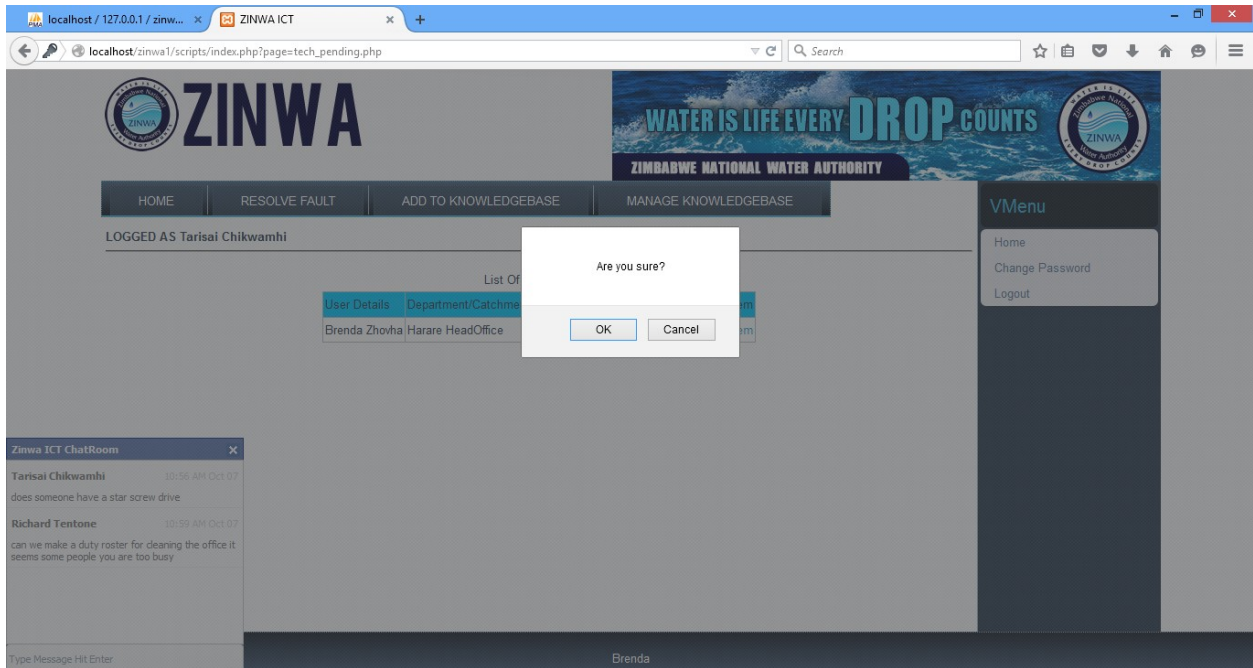
Enter correct credentials and the following page will pop up



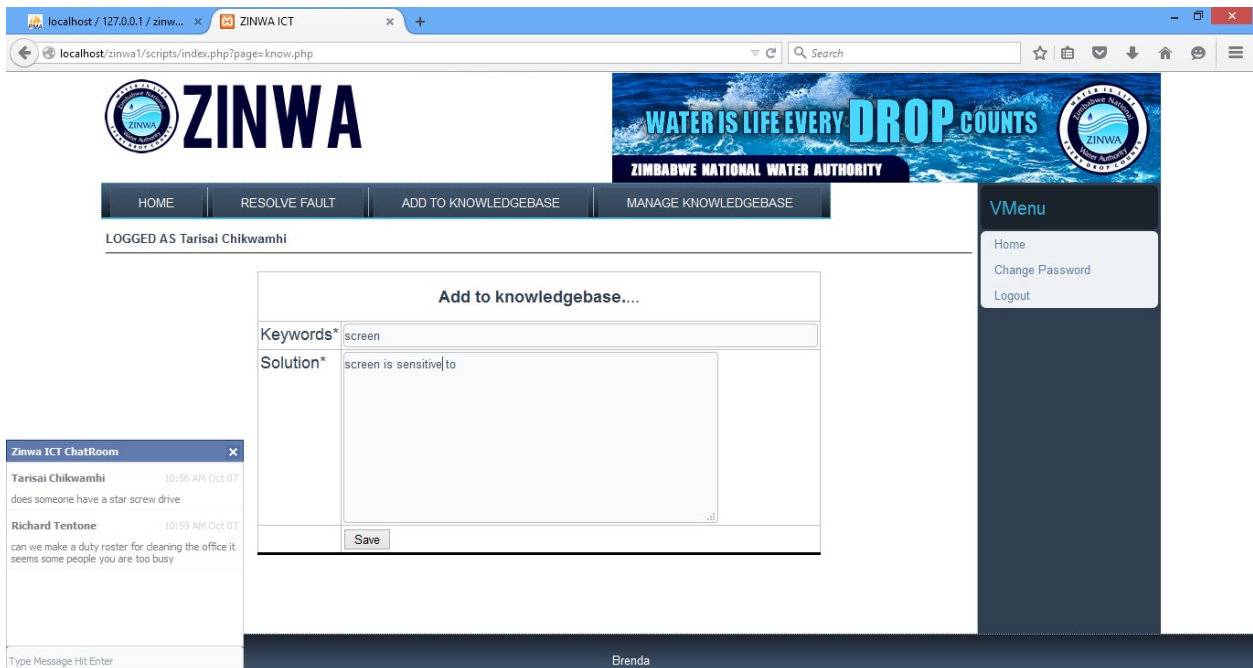
To make use of the chat box write on the chat box and hit enter



To condemn a machine click resolve and condemn



To add data to the knowledge base click on add to knowledge base button and the form below will pop up



To delete or edit data to the knowledge base click on manage to knowledge base button and the form below will pop up

localhost / 127.0.0.1 / zinwa... x ZINWA ICT

localhost/zinwa1/scripts/index.php?page=manage\_know.php

**ZINWA**

WATER IS LIFE EVERY DROP COUNTS

ZIMBABWE NATIONAL WATER AUTHORITY

HOME RESOLVE FAULT ADD TO KNOWLEDGEBASE **MANAGE KNOWLEDGEBASE**

LOGGED AS Tarisai Chikwamhi

Manage knowledgebase

Keywords	Solution	DELETE	Edit
uninstalling a program	go to control panel click on the program and click change or uninstall	[Delete]	[EDIT]
overheating	CPUs should not be placed on soft surfaces such as clothing, bedding, carpet as this insulates the bottom of the CPU and causes overheating	[Delete]	[EDIT]
CPU fan making noise and over-heating	Power supply noise is generated from different sources. Noted that all power supplies generate low noise, such as thermal noise, while switch-mode power supplies generate noise from their inherent switching	[Delete]	[EDIT]
	Data recovery is restoration in full or in part of the data stored in deleted or damaged data files	[Delete]	[EDIT]
	hard drives are extremely sensitive because in the hard drive there is a platter which is made up of aluminum and glass such that if the platter is to be handled without necessary tools it will damage the hard drive because of static electricity.	[Delete]	[EDIT]
	Autorun-virus is a kind of viruses that writes itself on a flash drive (or other external device).	[Delete]	[EDIT]
	The scanning engine is programmed to detect malware without relying on the updates of the antivirus signatures that is detecting malware by its intrinsic malicious behavior.	[Delete]	[EDIT]

Zinwa ICT ChatRoom

Tarisai Chikwamhi 10:56 AM Oct 07  
does someone have a star screw drive

Richard Tentone 10:59 AM Oct 07  
can we make a duty roster for cleaning the office it seems some people you are too busy

localhost/zinwa1/scripts/index.php?page=manage\_know.php

VMenu

- Home
- Change Password
- Logout

## How to log in on the general staff section

Go to the home page enter correct username and password

ZINWA ICT

localhost/zinwa1/

**ZINWA**

WATER IS LIFE EVERY DROP COUNTS

ZIMBABWE NATIONAL WATER AUTHORITY

HOME

The ICT Department is responsible for the provision of effective, efficient and responsive information and communication technological services to the various authority departments. The department accepts criticism from its various stakeholders in its bid to offer world class ICT services within the authority.

The department's major offerings are internet and email service, web services, networking, procurement and maintenance of ICT hardware and software, information security and advisory role in information and communication technologies.

**Services**

- Administration and maintenance of servers; these include email, file, print, backup and web servers.
- anti-virus and security
- computer hardware and software (acquisition, maintenance and support)
- networking installation, configurations, management and allied networking services
- email and internet services
- administrative and billing systems support
- computer user training and support

**Staff Complement**

The department has a staff complement of nine and is headed by the ICT Manager  
 ICT Manager – Mr T. Mutuma  
 Hardware Support Specialist – Mr B. Muzipasi  
 Systems Analyst – Mrs F. Pedzisai  
 Network Administrator – Mr. W. Kadirire

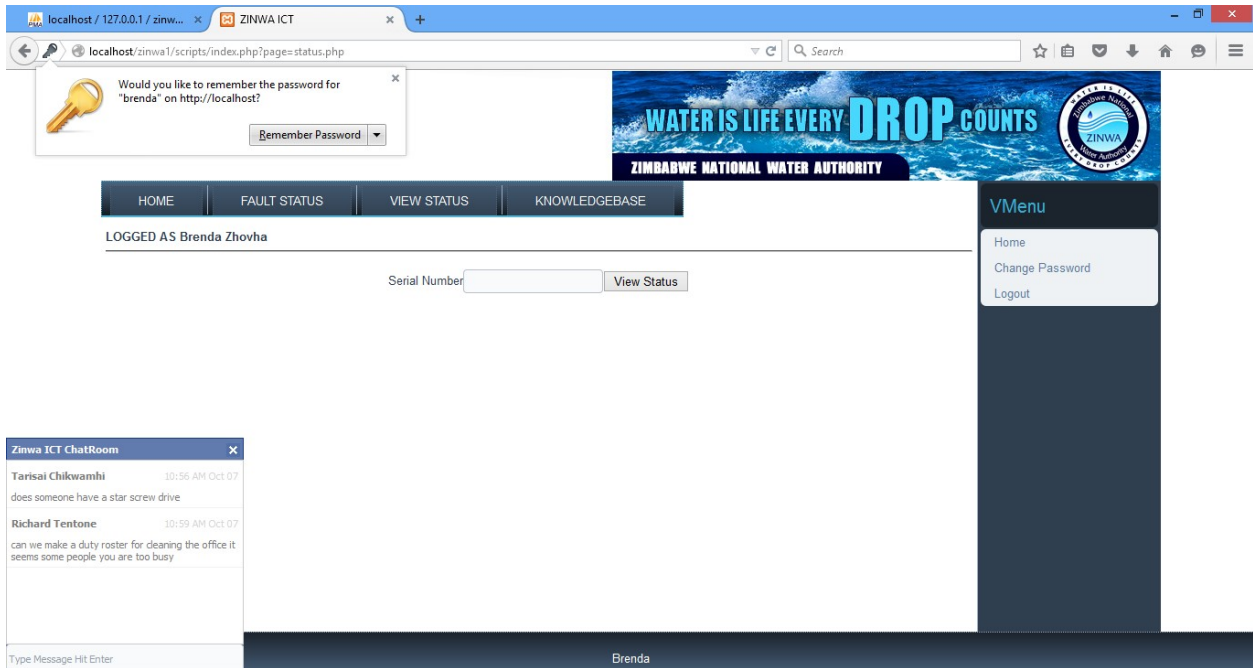
**Login Form**

Username

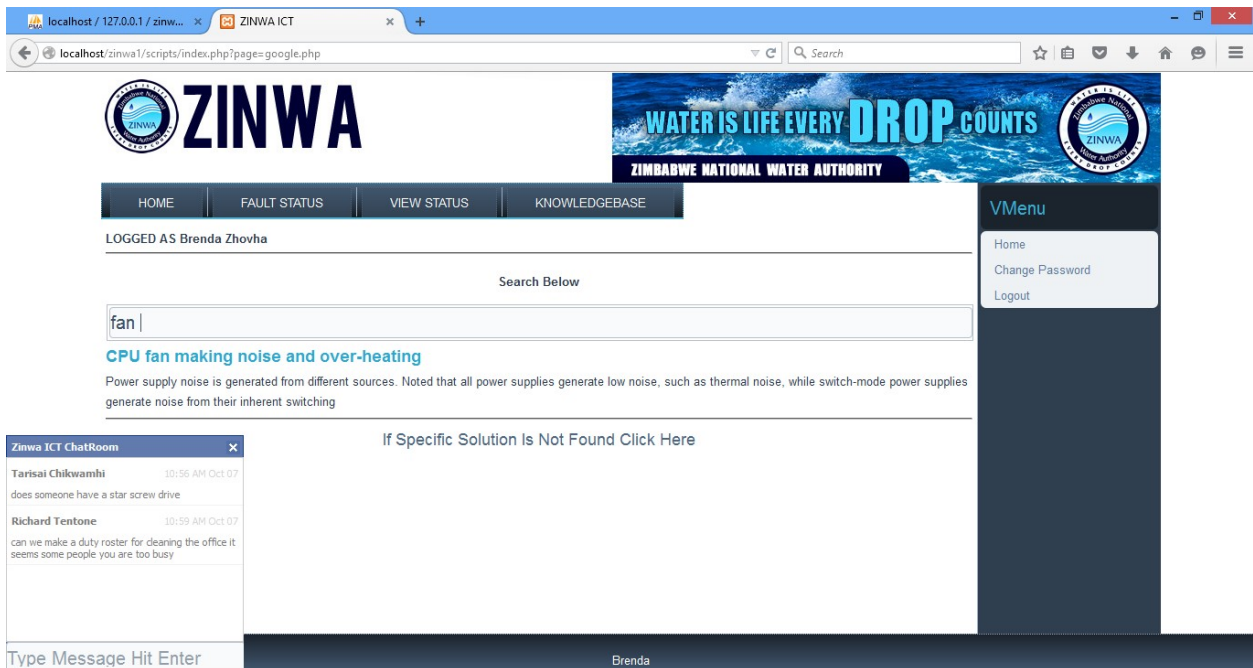
Password

Login

To change password click on the change password button and the following page will pop up the new password should match the confirm password and click save

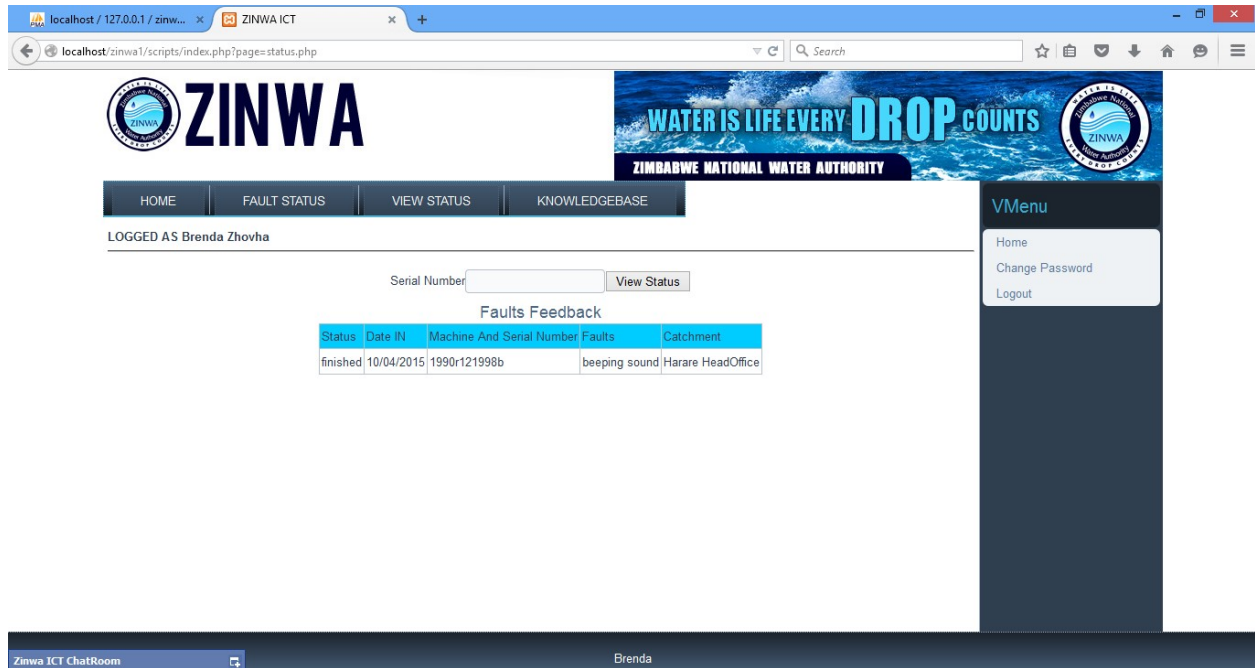


To get quick solution click on the knowledge base button click a hint word on the search area and the following page will pop up



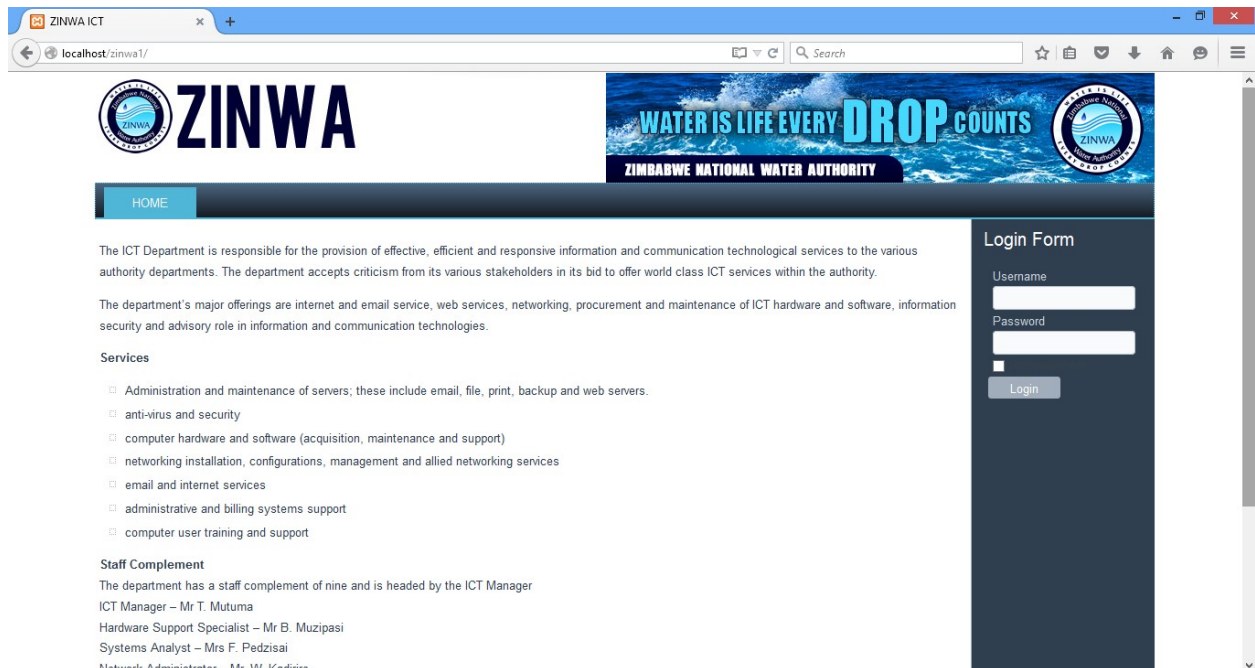


To track the status of the machine click on view status, enter the serial number and click view status



## Help desk section

Enter correct credentials to log in on the home page



To log in faulty click on the log in faulty button. Enter the details and it will automatically notify the technician

The screenshot shows a web browser window with the URL `localhost/127.0.0.1/zinwa1/scripts/index.php?page=add.php`. The page features the ZINWA logo and a banner with the text "WATER IS LIFE EVERY DROP COUNTS" and "ZIMBABWE NATIONAL WATER AUTHORITY". Navigation buttons for "HOME" and "LOG IN FAULT" are visible. The user is logged in as "Carl Zhovha". A form for logging a fault includes fields for "Make/Model", "Serial #", "User Details" (set to "Brenda Ratidzo"), and "Fault", along with a "Save" button. A vertical "VMenu" on the right contains links for "Home", "Change Password", and "Logout". The footer shows the URL `localhost/zinwa1/scripts/index.php?page=add.php` and the name "Brenda".

## APPENDIX B

### INTERVIEW CHECKLIST

#### Interviewee Details

1. Position in the organization \_\_\_\_\_
2. Department \_\_\_\_\_

#### Interview Questions

1. For how long have you worked for ZINWA?  
\_\_\_\_\_

2. How are your views of the current services in the IT department?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Did you face any challenges with the IT service and can you explain the challenge?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. What is the average time they take to notify customers on successful repair?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Do you manage to keep track of your repairs?  
\_\_\_\_\_  
\_\_\_\_\_

---

---

6. What do u suggest should be improved?

---

---

---

---

---

---

7. Do you think computerized system will help and why?

---

---

---

---

---

---

8. Any other additional information?

---

---

---

---

---

---

## APPENDIX C

### Questionnaire Checklist

Answer all questions and give accurate details on all answers. Do not write your name on this document.

- Are you facing any challenges with the current workshop management system?

Yes

No

If yes please give a brief description of the challenge below.

.....

.....

.....

.....

.....

.....

.....

.....

.....

- How do you wish it to be improved?

.....

.....

.....

.....

.....

.....

.....

- What are some of the functions that you expect to be incorporated in the system

.....

.....

.....

.....



## APPENDIX E

### THE CODE SNIPETS

#### CODE FOR THE HOME PAGE

```
<?php
error_reporting(0);
include 'opendb.php';
if(isset($_POST['submit'])){
    function clean($str) {
        $str = @trim($str);
    if (get_magic_quotes_gpc()) {
        $str = stripslashes($str);
        }
    returnmysql_real_escape_string($str);
    }
$username = clean($_POST["username"]);
$password = sha1(clean($_POST["password"]));
//echo $username; exit;
if($username == " OR $password == "){
    echo ("<SCRIPT LANGUAGE='JavaScript'>window.alert('Enter All fields')
    javascript:history.go(-1)
    </SCRIPT>");
    exit;
    $resul = mysql_query("SELECT * from users where username='$username'
AND password = '$password' and suspend='0'");
    $rows = mysql_num_rows($resul);
    if($rows==1)
    {
        echo("<SCRIPT LANGUAGE='JavaScript'>window.alert('You Have Been Suspended
Contact The Administrator')
        javascript:history.go(-1)
        </SCRIPT>");
    }
}
```

```

        exit;
    }
else{
    $result = "";
    $query = "SELECT * from users where username='$username' AND password = '$password' ";
    $result = mysql_query($query);
    $rows=mysql_fetch_array($result);
    $access=$rows['access'];
    $id=$rows['id'];
    $email=$rows['email'];
    $q=$rows['department'];
    $q1=$rows['name'];
    $q2=$rows['surname'];
    $full=$q1." ".$q2;
    session_start();
    $_SESSION['username'] = $username;
    $_SESSION['branch'] = $q;
    $_SESSION['name'] = $full;
    $_SESSION['access'] = $access;
    $_SESSION['id'] = $id;
    if(!$result)
    {
        die( "\n\ncould'nt send the query because".mysql_error());
        exit;
    }
    $row = mysql_num_rows($result);
    if($row==1)
    {
        header("location: scripts/index.php");
        exit;
    }
}

```



```

else
                                                                    {
echo("<SCRIPT LANGUAGE='JavaScript'>window.alert('Wrong Username And Password
Combination')
        javascript:history.go(-1)
                </SCRIPT>");
}
}}
?><!DOCTYPE html>
<html dir="ltr" lang="en-US"><head><!-- Created by Artisteer v4.1.0.59688 -->
<meta charset="utf-8">
<title>ZINWA Information Communication Technology (ICT)</title>
<meta name="viewport" content="initial-scale = 1.0, maximum-scale = 1.0, user-scalable = no,
width = device-width">
<!--[if lt IE 9]><script
src="http://html5shiv.googlecode.com/svn/trunk/html5.js"></script><![endif]-->
<link rel="stylesheet" href="style.css" media="screen">
<!--[if lte IE 7]><link rel="stylesheet" href="style.ie7.css" media="screen" /><![endif]-->
<link rel="stylesheet" href="style.responsive.css" media="all">
<script src="jquery.js"></script>
<script src="script.js"></script>
<scriptsrc="script.responsive.js"></script>
</head>
<body background="images/bg.jpeg">
<div id="art-main">
<div class="art-sheet clearfix">
<header class="art-header clearfix">
<div class="art-shapes">
</div>
</header>
<nav class="art-navclearfix">

```

```

<ul class="art-hmenu"><li><a href="http://www.zinwa.co.zw"
class="active">Home</a></li></ul>
</nav>
<div class="art-layout-wrapper clearfix">
<div class="art-content-layout">
<div class="art-content-layout-row">
<div class="art-layout-cell art-content clearfix"><article class="art-post art-article">
<h2 class="art-postheader"></h2>
<div class="art-postcontent art-postcontent-0 clearfix"><p><p><span style="line-height:
1.5em;">The ICT Department is responsible for the provision of effective, efficient and
responsive information and communication technological services to the various authority
departments. The department accepts criticism from its various stakeholders in its bid to offer
world class ICT services within the authority.</span></p>
<p>The department’s major offerings are internet and email service, web services, networking,
procurement and maintenance of ICT hardware and software, information security and advisory
role in information and communication technologies.</p>
<p><strong>Services</strong></p>
<ul>
<li>Administration and maintenance of servers; these include email, file, print, backup and web
servers.</li>
<li>anti-virus and security</li>
<li>computer hardware and software (acquisition, maintenance and support)</li>
<li>networking installation, configurations, management and allied networking services</li>
<li>email and internet services</li>
<li>administrative and billing systems support</li>
<li>computer user training and support</li>
</ul>
<p><strong>Staff Complement</strong><br />
The department has a staff complement of nine and is headed by the ICT Manager<br />
ICT Manager – Mr T. Mutuma<br />
Hardware Support Specialist – Mr B. Muzipasi<br />

```

Systems Analyst – Mrs F. Pedzisai<br />  
Network Administrator – Mr. W. Kadirire<br />  
System Analyst – Mr J Mangoma<br />  
Hardware Technician – Mr T. Chikamhi<br />  
Hardware Technician – Mr M. Camacho<br />  
Helpdesk Support – Mrs P. Mesa<br />  
Webmaster – Mr R. Tentone</p><br></p></div>

</article></div>

<div class="art-layout-cell art-sidebar1 clearfix"><div class="art-block clearfix">

<div class="art-blockheader">

<h3 class="t">Login Form</h3>

</div>

<div class="art-blockcontent"><form action="" method="post" name="login" id="form-login">

<fieldset class="input" style="border: 0 none;">

<p id="form-login-username">

<label for="modlgn\_username">Username</label>

<br />

<input id="modlgn\_username" type="text" name="username" class="inputbox" alt="username" style="width:100%" />

</p>

<p id="form-login-password">

<label for="modlgn\_passwd">Password</label>

<br />

<input id="modlgn\_passwd" type="password" name="password" class="inputbox" size="18" alt="password" style="width:100%" />

</p>

<p id="form-login-remember">

<label class="art-checkbox">

<input type="checkbox" id="modlgn\_remember" name="remember" value="yes" alt="Remember Me" />Remember Me

</label>

```
</p>
<input type="submit" value="Login" name="submit" class="art-button" />
</fieldset>
<ul>
<!--<li>
<a href="#">Forgot your password?</a>
</li>
-->

</ul>
</form></div>
</div></div>
</div>
</div>
</div>
</div>
<div class="art-footer clearfix">
<div class="art-footer-inner">
<p><br></p>
<p>Brenda</p>
<p class="art-page-footer">
</p>
</div>
</footer>
</div>
</body></html>
```