Zimbabwe National Water Authority Electronic Record Support System

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BY

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ABSTRACT

The need to develop the **Zimbabwe National Water Authority Electronic Record Support System** was necessitated by the lack of a fast and efficient way to search and record file entries in the records department. Various data gathering methodologies were exercised to render this research such a resounding success. These include interviews and observations to mention but a few. Various alternatives to produce the System Software were considered but fortunately at the end an in-house system software development was approved. The instruments/tools used to produce the Laptop Security System included the *Barillo Barcode Software*, *Adobe Photoshop*, *MySQL, Adobe InDesign, Adobe* and lastly *VB.NET* programming Language.

DECLARATION

I, **Tapfuma Golden Chimusinde**, hereby declare that I am the sole author of this thesis. I authorize **Midlands State University** 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 Electronic Support System**" by **Tapfuma G. Chimusinde** meets the regulations governing the award of the degree of **HINFO-BSC INFORMATION SYSTEMS HONOURS** of the **Midlands State University**, and is approved for its contribution to knowledge and literal presentation.

Supervisor …………………………………………………………………….

Date…………………………………………………………………………

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

This chapter introduces the beginning phase of a support system research and it will outline the background of the organization that the student has derived the roots of his research from and will also give in supportive details the Problem Definition, Aim of the research and also the Objectives pertaining to the Electronic Record Support system (ZINWAER).

1.2 BACKGROUND OF THE STUDY

From the time ZINWA came into existence till now the initial manual system its record's department had is still the one that is in play today. Many changes have been made in almost all the departments but the records department seem to have been neglected or left out in some way. As a result of the constant and successive growth of the authority the initial manual system that was once efficient when the authority was first formed is now failing to properly make ends meet as expected.

To completely digitize this department is not an option at the moment since most of the data that the authority processes through the records department is totally analogue/manual. Since the records department deals with all the departments of the authority to totally digitize this department would result in totally digitizing most of the processes which is not feasible considering the authority's current revenues and budgets. Therefore, an idea was birthed, to develop a system not to completely digitize the department but emanate a partially digitized system that will address the flaws of the current manual system on a most affordable budget

1.2.1 Background of the Organization

On a historical note, the Zimbabwe National Water Authority was set up to profit water assets for the benefit of Zimbabweans and to create a situation where water assets are used effectively for the general advantage of the authority. An amalgamation of the Water Development and Regional Water Authority with the Department of Water Development in the year 2000 brought the Zimbabwe National Water Authority (ZINWA) into existence. The amalgamation move instituted by an act of parliament in the year 2000 on January the first. ZINWA falls under the power of the legislature in the Ministry of Water Resources Development and Management. The ZINWA Act of the year 2000 and Chapter 20:24 of the 1998 Water Act are viewed as the guiding legislature. The Acts created seven Catchment Councils in the country namely

Mzingwane, Runde, Save, Mazowe, Manyame, Sanyati and *Gwayi* which covered the whole country, consider fig 1.1 below.
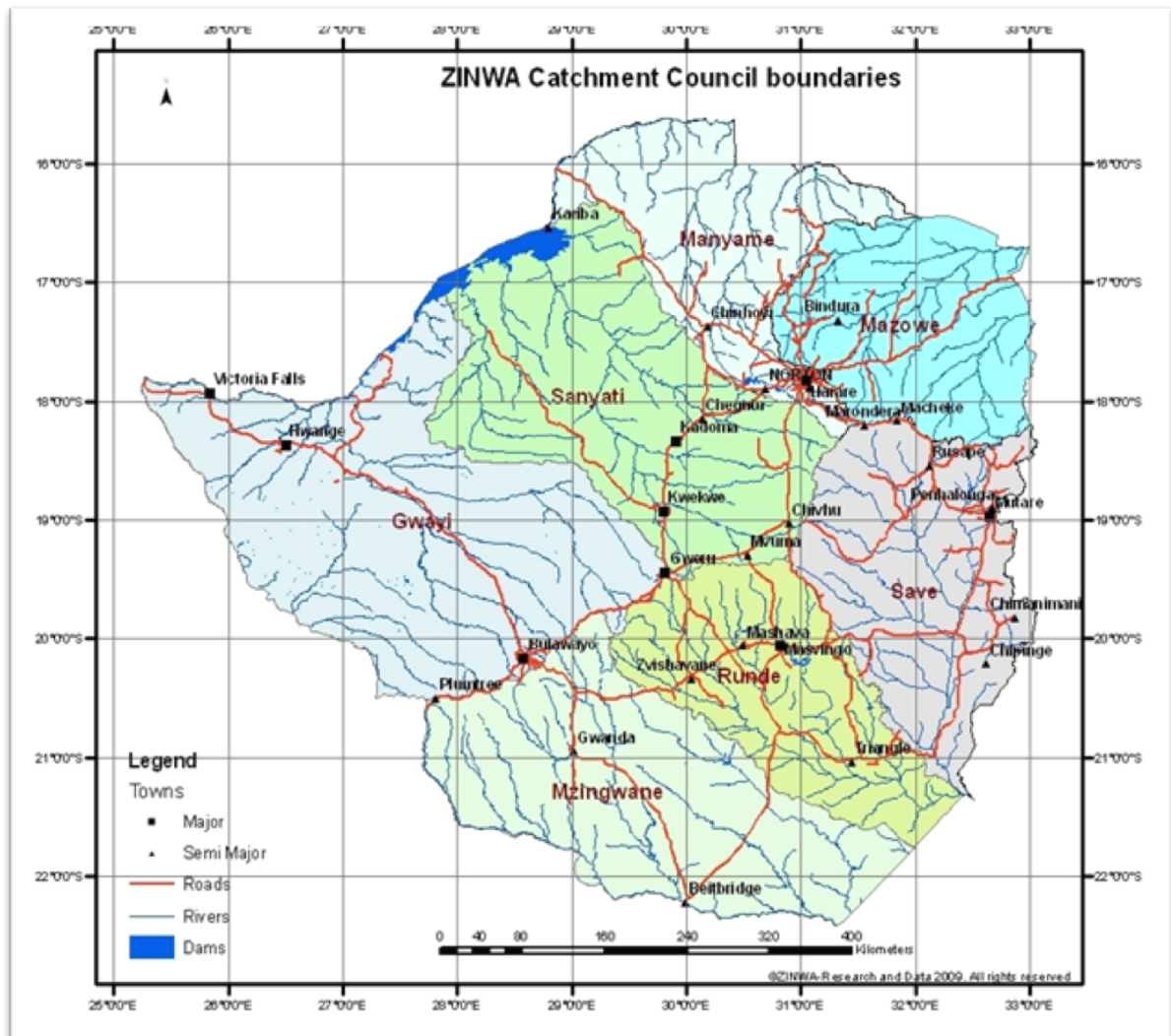
Fig 1.1 *ZINWA Catchments*

The billing system integrates and links all these seven catchments in the country, it provides management with the ideal global water supply management guides and allows direct coordination from the ZINWA head office, using internet as a back bone.

In the year 2000, The ZINWA authority just supplied crude water to local city and town councils. However, with development occurring in the organization, ZINWA has expanded its operation to going in *Borehole Drilling*, *Supply of Bottled Mineral Water*, through its other arm "*Kumakomo Spring Waters*". The authority has also now ventured into the *supply of treated water in all the Zimbabwe Military Stations, Mines and Mining Towns, Boarding Schools, Hospitals and all the Growth Points in the country*.

In the year 2005, the Zimbabwe National Water Authority assumed control water supply stations in Harare, the takeover suggested that ZINWA had complete control over all the water activities in Harare City Council.

Then in the year 2007, the authority was permitted the rights to manage all the water activities around the entire nation of Zimbabwe apart from the city of Bulawayo and Masvingo. During the economic meltdown in 2008, ZINWA faced a huge employee turnover, this negatively affected the operations of the Authority and this saw ZINWA losing the power to supply treated water to these towns in 2009. ZINWA being the owner of the major dams in the country still had control and influence in the provision of water resources, this time its influence was indirect as it now supplies the city and town councils with crude water.

1.2.2 Organizational Structure
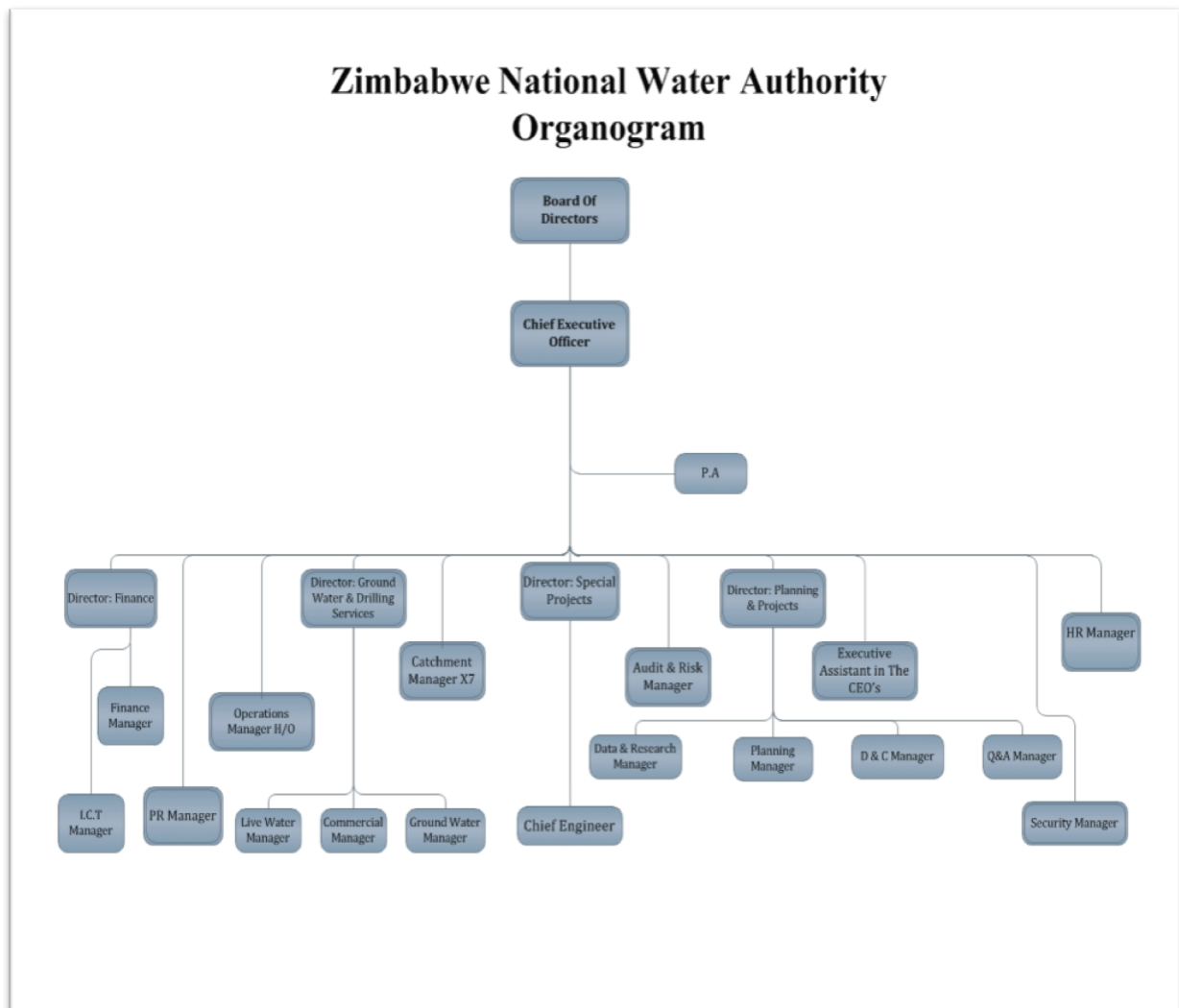
Fig 1.2 Organogram of the Organization

1.2.3 Vision

To be a world class stock-exchange listed provider of water-based lifestyles

1.2.4 Mission Statement

To competitively provide water related products and services to our customers on a sustainable basis.

1.3 PROBLEM DEFINITION

The current system being used by ZINWA to manage their records is manual. It has the following limitations:

- ➢ It is failing to keep up with the constant growth and demands of the authority. It is no longer providing a quick and efficient way on searching the files upon requests from the users of the system;
- ➢ There is little or no security towards protecting the records of the authority, since the physical files are lying on the shelves and there are no measures to guard these search index files which are literally the keys to the records department as a whole. That is, anyone can access them so long they can access the repository;
- ➢ M*ark-Out* cards are literally erased by an eraser for them to be reused to capture details of the next person or department or an organization that is to have access to the same file in the future. This is another setback of the current manual system as there is no efficient way to keep records of the whereabouts of the files that are being trafficked from the records department. For instance if a document was to be edited by a prior user who requested and accessed the document there is no way to back track the document to the malicious user;
- ➢ Due to the lack of the daily file activities logs generated by the department it is difficult for the management and the board of directors to ascertain which files are more active and which ones aren't. The current assumption in place is that file activity is directly related to the time the file was created. Therefore when phasing out files or deciding to delete the files usually the older ones are considered safe (But that is not always reliable considering that some old files are still active);
- ➢ Due to an on-going opening of new water resources and water based companies (for instance the borehole drilling and water bottling companies) more additional files are being opened continuously throughout the year, meaning the setback of bulkiness to the search index files is bound to increase more and more with time;

- It is a difficult to amend files (correcting errors, add a new file entry etc.) in the search indexes when updating the file names and or details as these files are entered in the system manually and with ink which cannot be easily edited by the records clerk. This becomes a challenge as the records clerks are changed due to retirement or retrenchment since they can be the only ones to understand the scribbled edited section of the search index files hence more errors are incurred and the current system become less efficient;
- There are no backups of the file search index, therefore if these files are to be destroyed (by fire or by water), maliciously edited or sabotaged (when workers are having demonstrations or strike) then the entire authority will be crippled with no way to know and access their files from their repository;
- There are no notifications when the file is expected to return or any way to alert the individual or organization which requested the file when it is now available in the repository;

1.4 AIM

The major aim of this research is to address the weaknesses in the manual system currently implemented on the Zimbabwe National Water Authority (ZINWA) with respect *to User Friendly, Secure, Fast Search, Secure Backups, Data profiling and Retrieving* of all the documents and or files in the Records Department keeping a proper profile of the activity to the last file.

1.5 OBJECTIVES

By the end of the project, the proposed system should be able to:
- Generate and print Zebra Bar-code for each and every file in the repository;
- Make file request, booking, reservation and notification of the changes in status of the file to the respected user directly online from the ZINWA website;
- Provide with details of the file use and activities which will then assist the management in issuing out the requests to dispose files and or archive them for future use;
- Provide a live chat room for the records clerks to share information seamlessly across all ZINWA catchments;
- Provide integration of stationary use in the records department to the procurement department;

1.6 INSTRUMENTS USED

i. Visual Studio 2010 (VB.Net) and Adobe Dreamweaver CS6 (PHP and JavaScript);

ii. Adobe Master Collection CS6 (Graphic Designing Software);

iii. MySQL and MYSQL Connector (Database Management Software);

iv. Wamp Server;

1.7 JUSTIFICATION AND RATIONALE

The proposed solution/system points not to totally digitizing the whole records department but rather to just give them fundamental tools to improve their work processes and permit proficiency in the department's daily activities.

1.8 CONCLUSION

The idea of the development of an Electronic Record Support System was not to completely get rid of the manual system (paperwork), as this is very expensive and or almost an impossible goal to achieve currently at the Zimbabwe National Water Authority, on the account of the type of technology in currently in play generally in the organization as a whole. Some data literally comes to the authority as analog/manual hence the need to develop a system to support the manual system and not a system to completely remove the manual system altogether is a feasible idea.

Zimbabwe National Water Authority Electronic Record Support (ZINWAER) system serves to make the daily file activity of the authority more secure, efficient and reliable by providing the current system with support tools that will make it at least relevant in this digital age and yet doing all that on a very affordable budget.

On the following Chapter we will be looking into the planning phase, whereby we will do a thorough risk analysis, business value of the system and lastly develop a work plan on how to develop the proposed system.

CHAPTER TWO: PLANNING PHASE

2.1 INTRODUCTION

This chapter reveals in great detail the development of the ZINWAER, topics like the feasibility study, risk analysis and the development of a work plan will be discussed in the following sections.

2.2 BUSINESS VALUE

Becker (2000) postulated that, the business value of IT investments could take many forms, such as productivity, process improvement and profitability. As the proposed system is developed and implemented ZINWA as an organization will derive various benefits from ZINWAER. These benefits also include those that will contribute positively to the business value of the authority, these benefits include:

Productivity

Moral: Mazin (2010) states that, organizations with higher morale have more staff who arrive to work on time, communicate better, waste less time on gossip, have higher rates of recruitment and retention, and are more creative. Since there were no computers in the records department this was depriving the Records Personnel's moral in that they were not enjoying free internet and were left out to access the memos sent through the company's email. When the records personnel needs to access email they were having to borrow computers from other offices at the mercy of those employees. Therefore this proposed system will also in a way address this flaw on a great scale as we will be able to have more than a social reason to computerize this department.

Process Improvement

Operations: The proposed system will revolutionize the way files are searched, booked, profiled and also generate operational reports as per requested by the management. It will also pave way into a paperless environment in the records department.

Security: The issue of password and usernames in accessing the newly erected electronic database now will result in more security protocols being put in place by the proposed system. We will also be able to tie the changes of the file's condition and alteration to the respectable user who was granted access to that file.

Powerful Searches: By providing an electronic database for all the files in the repository, this will allow for powerful, efficient and reliable searches as per client request. It adds value to the authority in that urgent file request are not in any way hindered now that there is reliable way to search the files, this will result in more time being saved as the requests and.

Profitability

Synergy: Digitizing the records department is keeping up the appearances of the Department and lifting the banner of the Authority as a whole, this will also increase a Synergy amongst the once parallel departments, that is, Information Communications (ICT) department and The Records department. This synergy will ensure that some tension and neglect that was putting these departments apart will be erased

Competitive Advantage: ZINWA will be one of the first Parastatals amongst its competitors to have digitized its records department. It pauses a competitive advantage in that now its clients will not have to wait long queues and travel long distances for nothing as they can now do all this online in the comfort of their own offices and be notified when the authority is now able to address their request. Unlike many other ministries and Parastatal organization this system will make the authority's clients enjoy short time in conducting service from the authority, thereby adding more value to the authority.

2.3 ANALYZE FEASIBILITY

Feasibility analysis is defined as a study that determines if the proposed information system/solution makes sense for the organization from an economic and operational standpoint. This will challenge on how practical the proposed system is and provide an overview of the primary issues related to the proposed system. The purpose here is to clearly state and identify the issues that would make the proposed system a success. It is in this section where the management will ascertain whether or not the authority will be able to develop the proposed system.

2.3.1 Technical Feasibility

This focuses on the technical components of the system and analysis of the currently available resources and how this will affect the development of the proposed system. For the proposed system, ZINWAER to be implemented at full potential the following specifications are required:

Hardware Requirements

The current hardware that is present at the ZINWA Head Office is able to support the proposed system with a few minor additional requisitions. The table below will breakdown the hardware requirements of the proposed system highlighting the equipment currently in place and the ones that the authority need to purchase.

ITEM DESCRIPTION	QTY AVAILABLE	QTY REQUIRED
Database Server (*IBM Power 720 Express Server/better*)	**X 1**	----
Patch Panels (*24-port Cat 6*)	----	**X 2**
Krone Boxes *(Face Plate Single Sided and Back Box Cat 6*)	**X 2**	**X 12**
D-Link Networking Cable (*Cat 6*)	----	**X 1**
Rj45 Boots-Connectors (*Cat 6*)	----	**X 50**
Rj45 Rubber Boots	----	**X 50**
Patch Cables (*Cat 6*)	**X 7**	**X 7**
Hubs *(TP-Link Hub 1 Hole in 7 Ports)*	**X 8**	----
Wireless Routers	**X 2**	----
Running Desktop PC (*2GB RAM,40GB HDD, Dual Core CPU, Wireless Network Card*)	**X 3**	**X 11**
USB Barcode Scanner (*ZEBEX SCANNER*) x 3	----	**X 9**
Label Printer (*ZEBRA RR GK420*)	----	**X 2**
Barcode Sticker Paper (*Computer Label-C*)	----	**X 10**

Table 2.1 *Hardware Requirements of the proposed system*

Software

The following is a list for the software requirements for the proposed system:

ITEM DESCRIPTION	QTY AVAILABLE	QTY REQUIRED
Microsoft Visual Studio 2010 (or better)	Yes	----
Microsoft .Net Framework 3.5.1	Yes	----
Crystal Reports For Visual Studio 2010	Yes	----
Wamp Server (Apache 2.4.9/ better, MySQL 5.6.17/ better, PHP 5.5.12/ better)	Yes	----
Adobe Dreamweaver CS6	Yes	----
Adobe Photoshop CS6	Yes	----
Adobe Illustrator CS6	Yes	----
Adobe InDesign CS6	Yes	----

Table 2.2 *Software Requirements of the proposed system*

Technical expertise is a process that serves to identify the key players with significant expertise and technical skills to the successful development of the proposed system. The main aim for this process is to establish these unique individuals before the system development commences. ZINWA has a competent ICT department and they are to technically support the development of the proposed system in many disciplines.

To sum up, all the required components to build the proposed system have been identified and this information will be used to calculate development costs of the proposed system to conduct a cost benefit analysis of the proposed system and to carefully allocate special system development processes to the people with the right knowledge and experience.

2.3.2 Economic Feasibility

Economic feasibility outlines the resource allocation based on a comparison of the expected benefits from attaining goals and expected costs, Horngren et al. (2013). Benefits are grouped into two distinct categories, tangible and intangible benefits.

2.3.2.1 Tangible Benefits

Tangible benefits are benefits which can be quantified. The following are a list of tangible benefits of the proposed system:

- Stationary cost savings;
- Telephone bill cost savings;
- Salaries and wages cost savings (reduced overtime, no need for extra stuff), to assist in inefficiency of the manual system;

2.3.2.2 Intangible Benefits

Intangible benefits are benefits which cannot be seen or tasted or measured. The following are a list of intangible benefits of the proposed system:

- Boost in moral, due to improved user experiences brought by the proposed system;
- Accurate and faster access to data for timely decisions;
- Improved relations amongst the ICT and the Records Department;
- More reliable searches, and digital backup of the search indexes;

2.3.2.3 Development Costs

Development costs are one-time costs that occur before the system is released to the user, William and David (1943). Adage, these are the costs ZINWA will incur for the development of the proposed system. Consider Table 2.3 below for further details of ZINWAER development costs.

2.3.2.4 Operational Costs

Operational costs are those tangible costs that are required to operate the system throughout the system's life time. Simply put, these are costs that ZINWA will incur and will continue to incur even after the implementation of the ZINWAER. Consider Table 2.3 below for operational cost details of the proposed system.

2.3.2.5 Cost Benefit Analysis

Cost benefit analysis may be used as a before project analysis, after project analysis and or in progress analysis investment evaluation.

Cost Benefit Analysis Table

	2016	2017	2018	2019
Currency	**USD $**	**USD $**	**USD $**	**USD $**
BENEFITS				
Stationary Cost Savings	655.30	540.15	425.15	320.00
Telephone Bill Cost Savings	1 652.10	1 566.20	1 465.25	1 400.30
Salaries/Wages Cost Savings (per year)	3 600.40	3 600.00	3 600.00	3 600.00
Reduced Logistics Costs	100.20	100.00	100.80	100.60
Total Benefits	**6 008.00**	**5 806.15**	**5 591.20**	**5 420.90**
DEVELOPMENTAL COSTS				
USB Barcode Scanner *(ZEBEX SCANNER)*	850.00	0.00	0.00	0.00
Label Printer *(ZEBRA RR GK420)*	900.00	0.00	0.00	0.00
Barcode Sticker Paper *(Computer Label-C)*	130.00	0.00	0.00	0.00
Patch Panels *(24-port Cat 6)*	76.00	0.00	0.00	0.00
Patch Cables *(Cat 6)*	10.50	0.00	0.00	0.00
Desktop PC	3 960.00	0.00	0.00	0.00
Krone Boxes	42.00	0.00	0.00	0.00
D-Link Networking Cable	210.00	0.00	0.00	0.00
Rj45 Boots-Connectors	4.00	0.00	0.00	0.00
Rj45 Rubber Boots (Cat6)	5.00	0.00	0.00	0.00
Training Stuff	300.00	0.00	0.00	0.00
Total Development Cost	**6 487.50**	**0.00**	**0.00**	**0.00**
OPERATIONAL COSTS				
Software Maintance and Updates	337.00	337.00	337.00	337.00
Computer Label-C	13.00	0.00	13.00	0.00
Total Operational Costs	**350.00**	**337.00**	**350.00**	**337.00**
Total cost	**6 837.50**	**337.00**	**350.00**	**337.00**
Profits/Losses	**(829.50)**	**5 469.15**	**5 241.2**	**5 083.90**

Table 2.3 Cost Benefit Analysis of the Proposed System

Considering the calculations derived from the *Table 2.3* above it is economically feasible to develop the proposed support system in that the benefits outweigh the costs.

Alternatively, it is not wise to base our economic feasibility on just one theory, therefore to further analyze the cost benefit analysis of the proposed system we will use three more different approaches, which are:

2.3.2.6 Return on Investment (ROI)

This is a proportion of the difference between total profits less expenses all over its total expenses and it is expressed as a percentage. Consider the calculations and formulas below for the calculation of the return of investment:

$$\textit{Return on Investment}$$

$$= \left(\frac{\textit{Total Profits} - \textit{Total Expenses}}{\textit{Total Expenses}}\right) \textbf{X 100\%}$$

$$= \left(\frac{14\,964 - 7\,861.5}{7\,861.5}\right) \textbf{X 100\%} = \left(\frac{4\,735}{5\,241}\right) \textbf{X 100\%} = \textbf{90.35\%}$$

Therefore, according to the Return on Investment calculations above a 90.35% will move the management into supporting the development of the proposed system.

2.3.2.7 Payback Period

Payback period is defined as the number of years it takes a firm to recover its original investment in the project from net cash flows. This method is simple to calculate consider Table 2.4 Below.

Year	Description of Cash Inflow/Outflow	Balance
0	Total Costs for the First Year (6 837.50)	(6 837.50)
1	The Total Benefits Costs for First Year 6 008.00	(829.50)
2	The Total Benefits Costs for Second Year 5 806.15	

Table 2.4 Payback Period of the Proposed System

Payback Calculations:

$$\left(\frac{829.50}{5\,806.15}\right) \textbf{X 12} \textit{months} = \textbf{1.7}$$

Therefore, the initial money invested by ZINWA in the proposed system will break even in a period of 1 year 2 months.

2.3.2.8 Present Value Analysis

The NPV in present day terms of the various cash inflows and outflows expected to arise at different periods in the future. This project valuation technic takes into account the time value of money, it recognizes that $1 received now is worth more than $1 received in one year's time.

$$Discount\ Factor = \frac{1}{(1+r)^i}$$

$$NPV = \sum \frac{C_i}{(1+r)^i}$$

Where:

- ➢ **c** is the value of money in the year **i**;

- ➢ **r** is the Discount Rate;

- ➢ **i** is the year number;

Given That**: Discount Rate** = 10%

YEAR	DISCOUNT FACTOR	CASH FLOW	PRESENT VALUE
0	1.00000000	- 6 837.50	- 6 837.50000
1	0.90909091	6 008.00	5 461.81818
2	0.82644628	5 806.15	4 798.47107
3	0.75131480	5 591.20	4 200.75132
4	0.68301346	5 420.90	3 702.54764
Net Present Value (NPV)			**11 326.08821**

c

A negative NPV depicts negative cash flows and a positive NPV means that profits exceed costs thus from the calculations on Table 2.5 above an NPV of **US$11 326.08821** suggests that the proposed system should be accepted.

To sum up, cost benefit analysis, return on investment, payback period and the present value analysis collectively support the economic feasibility and therefore support the development of the proposed system.

2.3.3 Social Feasibility

This is where we analyze the changes in the way that the employees of the authority interact, and or improved by the implementation of the proposed system considering that the proposed system also aim to bridge the gap between the ICT department and the records department.

> **Employees:** Considering that the first computer is to be placed in the records department after the implementation of the proposed system. With this advancement, the Records Personnel can now be placed onto the company's social platforms (memos, company emails, and chat rooms). This will also break barriers making the Records Department form a common ground with ICT Department and also improving the relations of the two departments.

> **Management:** The management being the arm of the authority, the proposed system will give them a new information pool to assist them with a database that they can use to apply their data mining tools to check the way the records personnel are conducting their daily work and identify whether or not to give them some time off work to resolve some of their personal issues.

> **Other Catchments:** the proposed system will also bridge the gap for records personnel in different catchments of the Authority to interact, share ideas and improve their work processes.

2.3.4 Operational Feasibility

Operational feasibility investigates how well the proposed system is taking care of the issues brought about by the current system and how well it will give advantages when completely executed. The proposed solution/system points the records department to today's technology as it encourages strong, precise and accurate searches, simple approaches to amend/correct errors effortlessly and lastly but not least provide chat rooms for the records department for formal and recreational purposes.

2.4 RISK ANALYSIS

The main goal of Risk Analysis is to distinguish, minimize or keep away from the potential risks that may unfavorably influence the project. Three sections are to be dealt with for the analysis of risk in this project, that is:

> **Risk Identification:** The potential for a threat source to exercise (accidentally trigger or intentionally exploit) a specific vulnerability.

> ➢ **Risk Estimation:** It is the approximate calculation of the identified risk to occur the effect of that risk to the proposed system.

> ➢ **Risk Mitigation:** involves prioritizing, evaluating, and implementing the appropriate risk reducing controls recommended from the risk assessment process (Risk Identification and Risk Estimation).

The risks that are to be expected in the development of ZINWAER are as following:

1. **Records Clerks' resistance to change**

   Solution: Resistance to change was solved in a manner that the records clerks were assured of their job security and a training has been scheduled in advance at the system testing stages. Whereby the clerks will be having a hands on approach to the proposed system.

2. **Personal deficiencies/shortcomings**

   Solution: This type of risk is mitigated in that extra help is to be outsourced from colleagues, web based forums on the web and the help from the project supervisor.

3. **Unrealistic schedules**

   Solution: To combat the issue of unrealistic schedules, the student carefully drafted a flexible work plan that will best suit the proper development of the proposed system and not work under last minute pressures. This will also allow the student to have ample time to develop the ZINWAER even in face of hardware malfunction.

4. **Developing interfaces which are not user friendly**

   Solution: The solution to develop user friendly interfaces is to involve the users of the proposed system in the development processes of the system. Practically it is not possible to reject your own preferences.

5. **Last minute changes to prerequisite system modules**

   Solution: To avoid last minute changes to the systems prerequisite modules, the student plan on developing these modules first before developing some other extra features like colors and transitions of the basic GUI.

6. **Malfunction in external hardware components**

   Solution: Hardware malfunction is most likely to be the most devastating risk of all. Mitigating hardware malfunction was a costly endeavor in that this resulted in the student buying an extra barcode scanner just in case the other scanners malfunctions.

7. **Inability to make the two separate systems work well**

   Solutions: This is to be expected to have a very small effect on the development of the proposed system in that a measure to prevent this type of risk has been put into place already as the student decided to develop the two separate systems simultaneously and using the same database DBMS.

To sum up, Risk in itself is not bad, risk is essential to progress, and failure is often a key part of learning. But we must learn to balance the possible negative consequences of risk against the potential benefits of its associated opportunity.

2.5 STAKEHOLDER ANALYSIS

Stakeholder analysis is a tool for clearly defining key players with great interest for the success of the proposed system. Understanding where stakeholders stand, and developing cooperation between the stakeholders and the proposed system. The stakeholders of the proposed system are as follows:

Records Clerks

These are the chief users of the proposed system as they interact with the system much of the time compared to the rest of the system's stakeholders. Records clerks also interface clients with the new system.

Clients

Clients refers to employees and other respected parties that interact with files of the authority. They interact with the proposed system on two fronts, that is directly when they search for the files online from the authority's website and when they

ICT Personnel

ICT stuff are more or less the administrators of the proposed system. They possess great significant menus and functions onto their side of the interface for the proposed system and they are responsible for adding editing and removing the users of the system. They also print, allocate and manage all the barcodes of the files in the electronic repository database.

Procurement Officers

These users interact with the system when the records clerks issue out or request stationary (flat files, folders, mighty markers etc.)

2.6 WORK PLAN

Work plan is a summary of strategies and deadlines that the student have set to carefully manage the time and resources for the success of the project, consider Table 2.6 and Table 2.7 below.

Project Schedule

Phase	Start	End	Duration
Proposal	16/02/2016	26/02/2015	1 Week
Planning	29/02/2016	03/03/2015	1 Week
Analysis	06/03/2016	20/03/2015	2 Weeks
Design	21/03/2016	03/04/2015	2 Weeks
Implementation	04/04/2016	18/04/2015	2 Week
Maintenance	20/04/2016	28/04/2015	1 Week

Table 2.6 *Time allocation and breakdown of processes for the proposed system development*

Gantt chart: This is a bar chart that illustrates a particular schedule, including the start and finish times of each of the participating processes (Abraham Silberschatz et al 2010)

ACTIVITY	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Project Proposal	■								
Planning		■							
Analysis			■	■					
Design					■	■			
Implementation							■	■	
Maintenance									■
Documentation	■	■	■	■	■	■	■	■	■

Table 2.7 *Gantt Chat for the Proposed System*

2.7 CONCLUSION

In Conclusion, analyze feasibility aspects of the proposed solution were discussed in great detail and the expected risks were also analyzed and brought to light and matching solutions were then drafted and put in place for those expected risks, then a work plan was drawn for the development of the proposed solution to the final stages of the implementation of the system. However, these results found from the feasibility analysis shows that it is feasible for the developer to continue with the project.

Moreover, the next chapter will address the designing of the proposed system, data flow and processes of the current system will be taken into account in the form of context diagrams and the data flow and processes of the proposed system will also be analyzed in the form of data flow diagrams.

CHAPTER THREE: ANALYSIS PHASE

3.1. INTRODUCTION

The analysis phase will be focusing on the information gathering methodologies, the analysis of the current manual system in detail in the form of its data flow and context diagrams. Lastly, an evaluation of the alternative will be further analysed as to whether we create the proposed on our own or we will outsource it.

3.2 INFORMATION GATHERING METHODOLOGIES

The main purpose of information gathering is to understand more about the target organisation or authority. To further understand ZINWA as an authority and its needs for the proposed system a couple of information gathering tools were implemented that is, *interviews, questioners and observation.*

3.2.1 Interviews

All things considered, before you interview someone else, you must in effect interview yourself Kendall (2002). This proposed project will utilize a special type of interviews called structured interviews. Structured interviews are defined as the fixed format interview in which all questions are prepared beforehand and are put in the same order to each interviewee.

3.2.1.1 Advantages of Structured Interviews

➢ This was a fast way to gather information from various users of the current system, especially the management which stressed points like they wanted to engage to other commitments in their respected fields;

➢ It was possible to relate to the body language response of the current system users and aid to the way they were answering questions set before them;

➢ It made it possible to gather answers to specific questions and this made it possible to eliminate and avoid unnecessary questions

3.2.1.2 Disadvantages of Structured Interviews

➢ Some interviews were prematurely cancelled due to an urgent response of the interviewee to their daily work commitments;

➢ Some current system users displayed attitude towards the student due to age differences and lack of professionalism;

3.2.1.3 Findings from Interviews

Significantly, the interviews proved useful in providing a clear picture as to what extent the current system users have lost confidence in their manual system. Moreover, it also provided details in how to address the current problems as the interviewees were asked about their expectations and what made them more comfortable as individuals and or department.

3.2.2 Questionnaires

These research instruments are carefully constructed with a specific and direct set of questions that which when asked even in a structured interview the interviewee will tend to pull back and give the expected answer instead of the honest answer to that related question.

3.2.2.1 Advantages of Questionnaires

- ➤ By being anonymous it was possible to tap into the emotional part of the current system users and gather enough data on how well to improve their psychological states and boost moral;
- ➤ It does not require a specific time to schedule a meeting to fit into the current system's busy schedule, which can at times prove to be impossible;
- ➤ Analysis of the data gathered from questionnaires was easier to sort out;
- ➤ They are cheap and they save both time and money as they were sent through carriers and saved time in that as the users were answering them the student was doing other things at the same time;

3.2.2.2 Disadvantages of Questionnaires

- ➤ It was not possible to ask complex questions;
- ➤ It was time consuming since these were sent by carrier services;
- ➤ Not all questionnaires returned from the survey as some of the targeted individuals did not respond to them;

3.2.2.3 Findings from Questionnaires

Basing on the facts of the returned questionnaires, the current system users are demotivated from the neglect that the authority had on not digitizing the records department and immediate action is required to boost morale of the current system users. Likewise, the questionnaires managed to cultivate the fact that the system user's which in a way resisted to the change to a computerised system had little or no computer knowledge and they expressed fears in their job security.

3.2.3 On-Site Observation

Shelly G et al (2008) found in their researches that, Observing people helps understand exactly how they perform a task. The student conducted the onsite observations of the current manual system at the ZINWA head office in Harare. This data gathering methodology made it possible for the student to see how the users of the current system interact and respond to different situations in their operations.

3.2.3.1 Advantages of On-Site Observation

➢ The student had a close up view of the operations of the proposed system;
➢ Provided the student with the actual feel of the current system and the way its users currently perform their daily works and activities.
➢ It provided reference to the data gathered from other data gathering methodologies;
➢ It provides a hands-on approach into understanding the processes and where the problems are arisen from a mere observation on the current system and how the future may look like if the proposed system is to be implemented in the same environment.
➢ This method allows the student to take advantage of the current technologies to take pictures videos of the current system and its components in action so as to help in the development of the proposed system with more detail and reverence of the failing current one.

3.2.3.2 Disadvantages of On-Site Observation

➢ This process was time consuming;
➢ Due to the knowledge that the parties are being observed the natural manner which one party behaves might be altered so as to impress the observer, Hence the student might have a distorted picture of the overall operations;

3.2.3.3 Findings from On-Site Observation

On-site observation proved to be more useful in that with account to the current technologies the student took pictures of the targeted materials consider Fig 3.1, Fig 3.2 and Fig 3.3 below.

Fig 3.1 ZINWA Records Department Markout Card
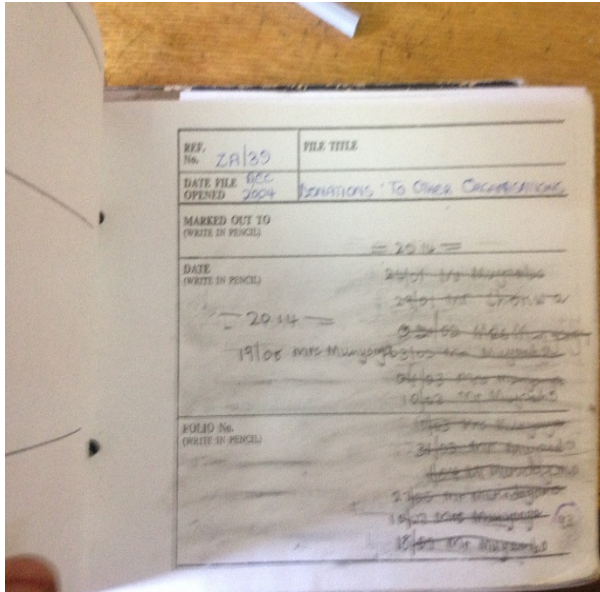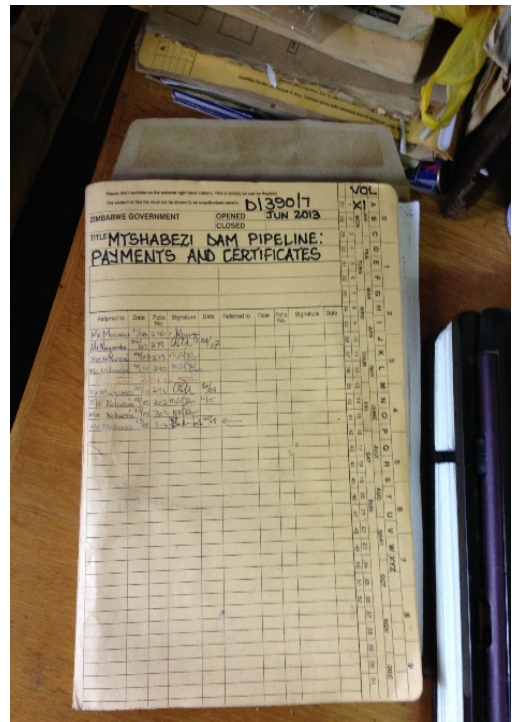

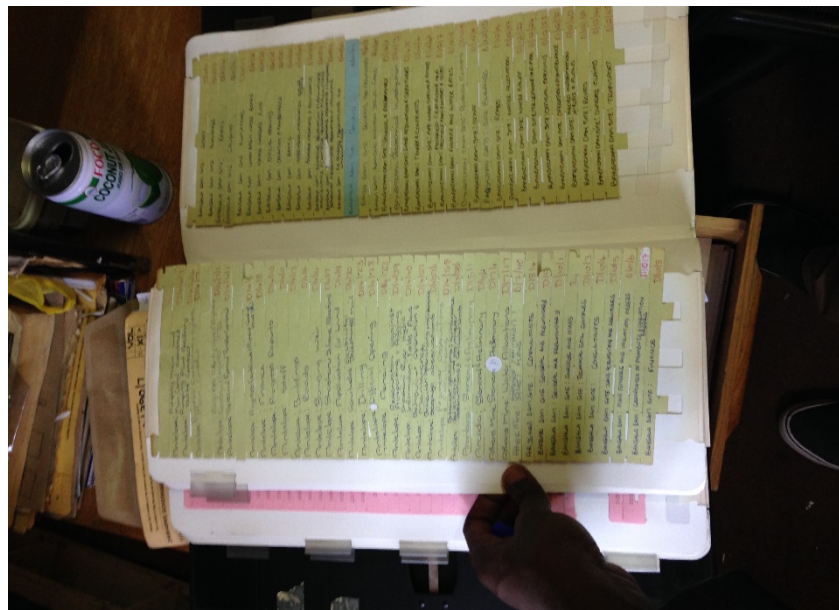*Fig 3.2* ZINWA File in the Records Department

Fig 3.3 ZINWA Records Department Opened Search Index Entries

The essential part of using more than one form of data gathering technics comes in play in that all these methods complement each other, a weakness in one method is the actual strength of the other and as a result this saves time for both the student and the ZINWA stuff.

3.3 ANALYSIS OF EXISTING SYSTEM

The current system is a manual system, the client has to physically contact the records department and make a file request to the records clerk. The records clerk then searches the search index files to physically locate the requested file in the repository. When the file is physically available the records clerk will then fill a Markout card in pencil before handing the requested file to the client. Similarly, upon the return of the file the records clerk will erase the Markout card and then place the file back to its respective location in the repository.

All things considered, to properly analyse the existing system the student has broken down the operations of the system into two distinct processes:

3.4 PROCESS ANALYSIS

This is basically a step-by-step breakdown of the phases of a process, used to convey the inputs, outputs, and operations that take place during each phase of the current system in handling the data of the authority.

Inputs
  - Client information;
  - File information;

Processes
  - Capturing client information;
  - Searching files from repository;
  - Booking out files to clients;
  - Returning files to the repository;
  - Write or erase Markout Cards;

Output
  - Printed Markout Cards;
  - File location;
  - File notes;

To understand the processes of the current system we draw out an Activity Diagram of the Current system consider Fig 3.4 below.
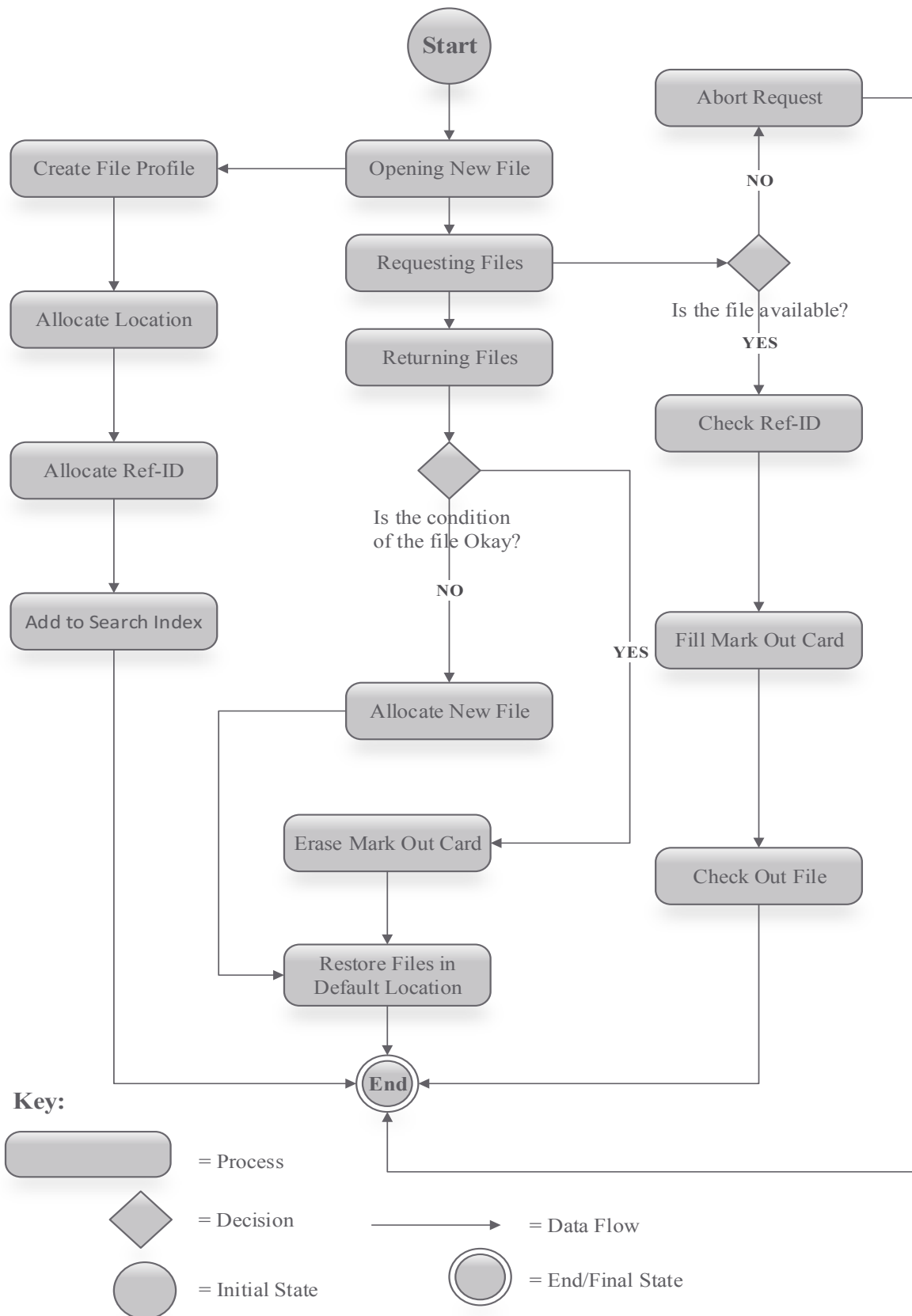
Fig 3.4 *Activity Diagram of the Current system*

3.5 DATA ANALYSIS

Context Diagram


```
Records Clerk                                    Management

  File Creation          Issue Out Files
  Searching Files        File Maintance    New File Creation Request    Operations Feedback

           Current Manual
           Records Management
           System
                                                                       File Booking Out

  File Requests          Returning Files

                    Client
```

KEY:

= Process

= Entity

→ = Data Flow

Fig 3.5 *Context Diagram of the Current system*

Data Flow Diagram
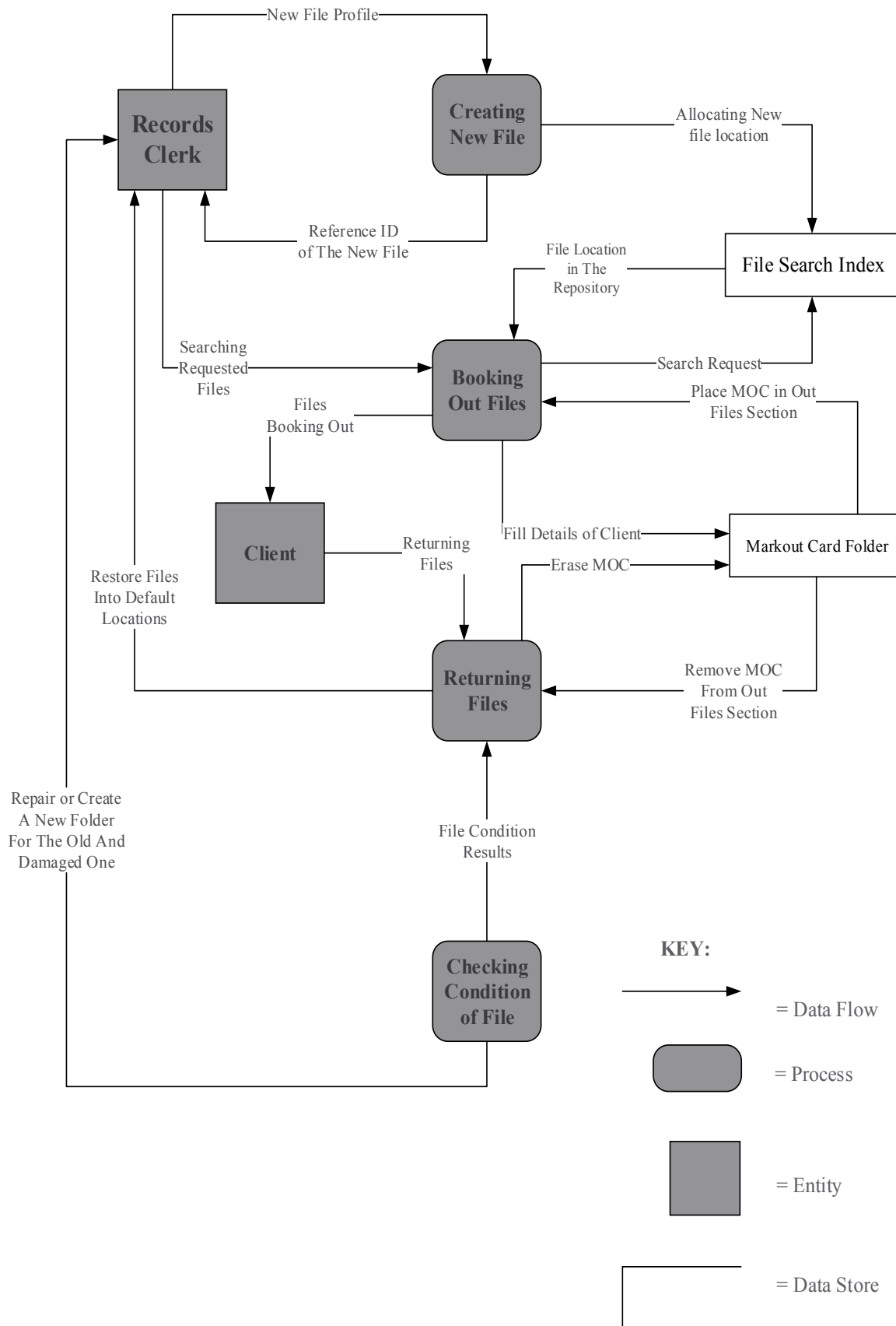
Fig 3.6 *ZINWA Data Flow Diagram for the Current System*

3.6 WEAKNESSES OF CURRENT SYSTEM

The current system is old and flawed and considering the advancement in technology to date, it is super slow and pushing back the entire authority. It is not as relevant as it was when the authority first started operating in the year 2000, it cannot keep proper record of the file activity as the traditional Markout cards are literally erased each time for reuse. Because it is a manual system there are no usernames and passwords to guard against the search index files hence the security of the files is a greatest threat amongst others. Lastly, it is difficult to amend new files into the files and or append them to the current system as the records clerk will re arrange all the entries (manually) in order to maintain an alphabetical order of files in the search index.

3.7 EVALUATE ALTERNATIVES

From the feasibility study, the proposed system was allowed to progress and now what is left is to decide which system development approach best suit the development of the proposed system flexibly for the authority.
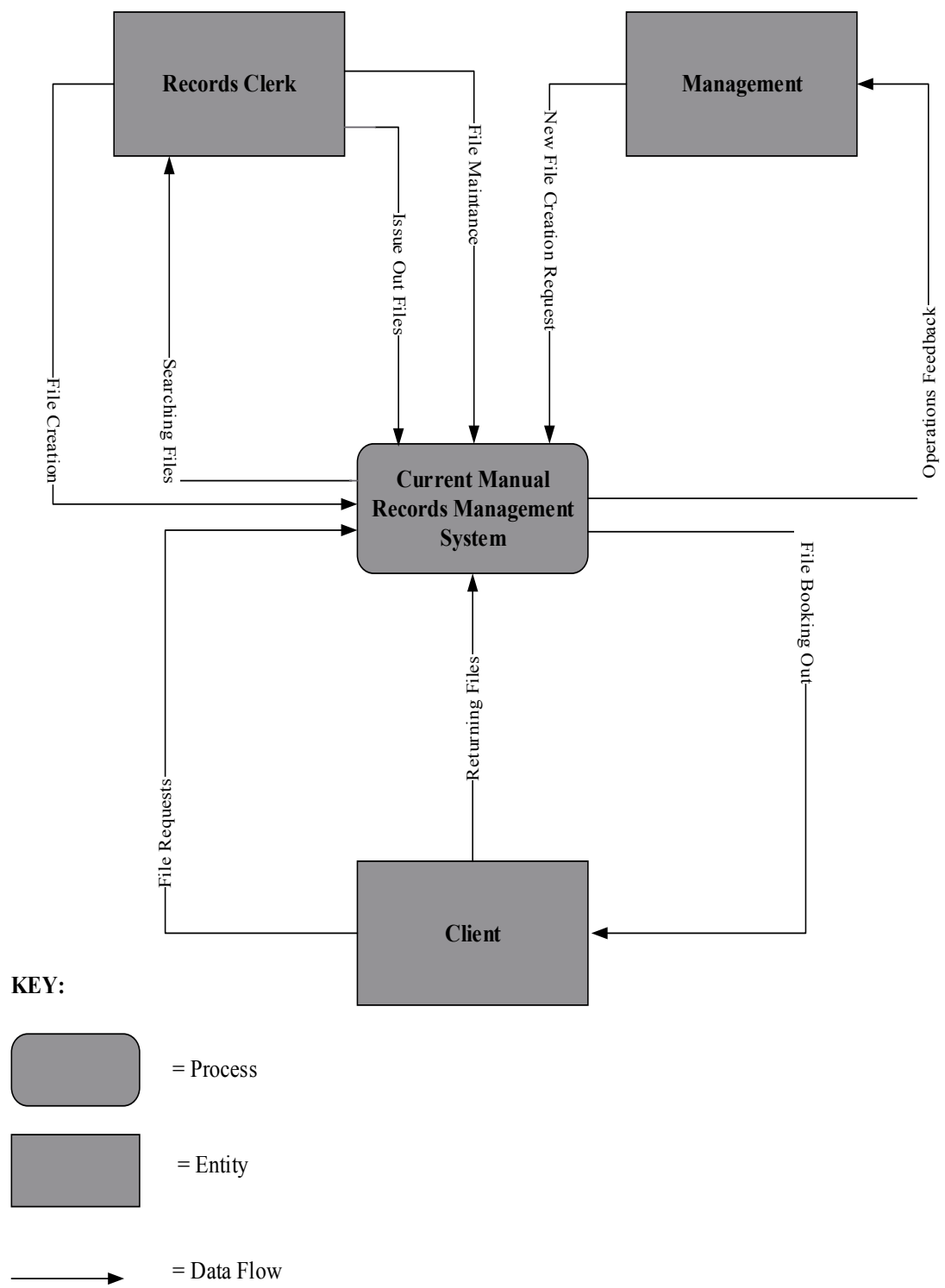
3.7.1 Outsourcing

To start with, outsourcing is characterised by turning over the responsibility of some or all of developing an organization's information systems applications and operations to an outside firm for a fee. ZINWA will contract an external or a third party to conduct all of the proposed system activities like the interviews, observations and the coding of the proposed system. The only input of the authority in outsourcing will be the fares they pay to the authority.

3.7.1.2 Advantages of Outsourcing

➢ It will allow the authority and all of its stuff to focus on some of the key issues that are urgent and require a total commitment for them to become a success;

➢ This ensures that the proposed system will be of great quality as the third party will ensure that they defend the reputation of their organisation;

3.7.1.3 Disadvantages of Outsourcing

➢ The training of the staff will be exorbitant as there will be a constant reference to the third party developers of the proposed system;

➢ Whenever there are bugs in the proposed system the authority will be getting back to the third party developer of the system creating unnecessary expenses in the long run;

➢ It requires specialists to maintain and install the proposed system developed by the third party hence increasing the operational costs of the proposed system in the long run.

- The third party can develop the same information system to the competitors of the authority as there is no binding for the third party not to do so;
- The proposed system might not leave room for improvement;
- The proposed system might face more resistance as there will be little interaction of the third party and the current stakeholders of the current system;

3.7.2 Improvement

Improvement is an alternative that is based to address the flaws of the current information system that lacks either the processing power or the correct algorithms that will make data processing faster and more accurate. But, it is impossible to improve the current system since it is a manual system, therefore, this option of improving the current system is totally out of consideration as it this is not feasible at all.

3.7.2.1 Advantages of Improving

- The users will require little or no training when the improved system is operational;
- Little or no additional hardware will be required;
- Faces little or no resistance from the users as their feedback on the current system will be used to create the improved version of the current system;

3.7.2.2 Disadvantages of Improving

- Bugs, security flaws and other weaknesses of the current system are more likely to be inherited by the proposed system as both systems will have;
- This will serve as a temporal solution as the improved system will fail in the short run;
- The costs of improving the system is almost the same as developing a new solution;

3.7.3 In-house Development

In-house software development is when the authority decides to develop the entire proposed system in-house. The authority will make an in-house survey, gather data internally

3.7.3.1 Advantages of In-house Development

- The costs for in-house development are friendly and can seamlessly fit in the authority's tight budget;
- It promotes the significance and operations of the new Programming department in the ICT department;

- This choice will see that the authority maintains its payback period, the proposed development costs, operational costs and lastly the percentage of the return on its investments to develop the proposed system;
- It ensures that most if not all of the users requests are met no matter how small their requests might appear to be;
- Low costs in maintaining the proposed system as all of the operations are done in-house;
- It solves unique user requirements as users are excessively involved throughout the system development processes;

3.7.3.2 Disadvantages of Development
- The proposed system might be full of bugs as there is no experience to the system development team;
- Custom development is time consuming;

3.7.4 Recommended Alternative

In-house development is the option that the authority chose to develop the proposed system. The authority chose this option as the development of the proposed system serves as a trophy to the new programming department as one of their first projects to totally design and the develop the proposed system which will be a great step in designing more complex systems that will in the future be integrated to this system. Additionally, in-house development is seen to be an affordable means to address the authority's flaws in the records department within the authority's budgets and means.

3.8 REQUIREMENTS ANALYSIS

This is a process of identifying requirements of the proposed system. To further this analysis, this process is broken down into two separate entities, that is:
- Functional Requirements and
- Non-Functional Requirements

3.8.1 Functional Requirements

Functional Requirements are expected features of an information system. To properly depict these requirements we use a Unified Modeling Language and create a use case diagram.

Use Case Diagram

A use case diagram is a visual summary of several related use cases within a system or subsystem Shelly and Rosenblatt (2010). Consider Fig 3.8 below for the Current System Use Case Diagram.

Key:

= Entity   = Process   = Data Flow

Manager

Create File Request

Operations Feedback

Creating New File

Processing File Requests

New File Profile

File Request Results

File Requests

Searching Requested Files

Booking Out File

File Booking Out

Fill Mark Out Cards

Client

Erase Mark Out Cards

Returning Files

Returning Files

Records Clerk

Assessing File Condition

Checking File Condition
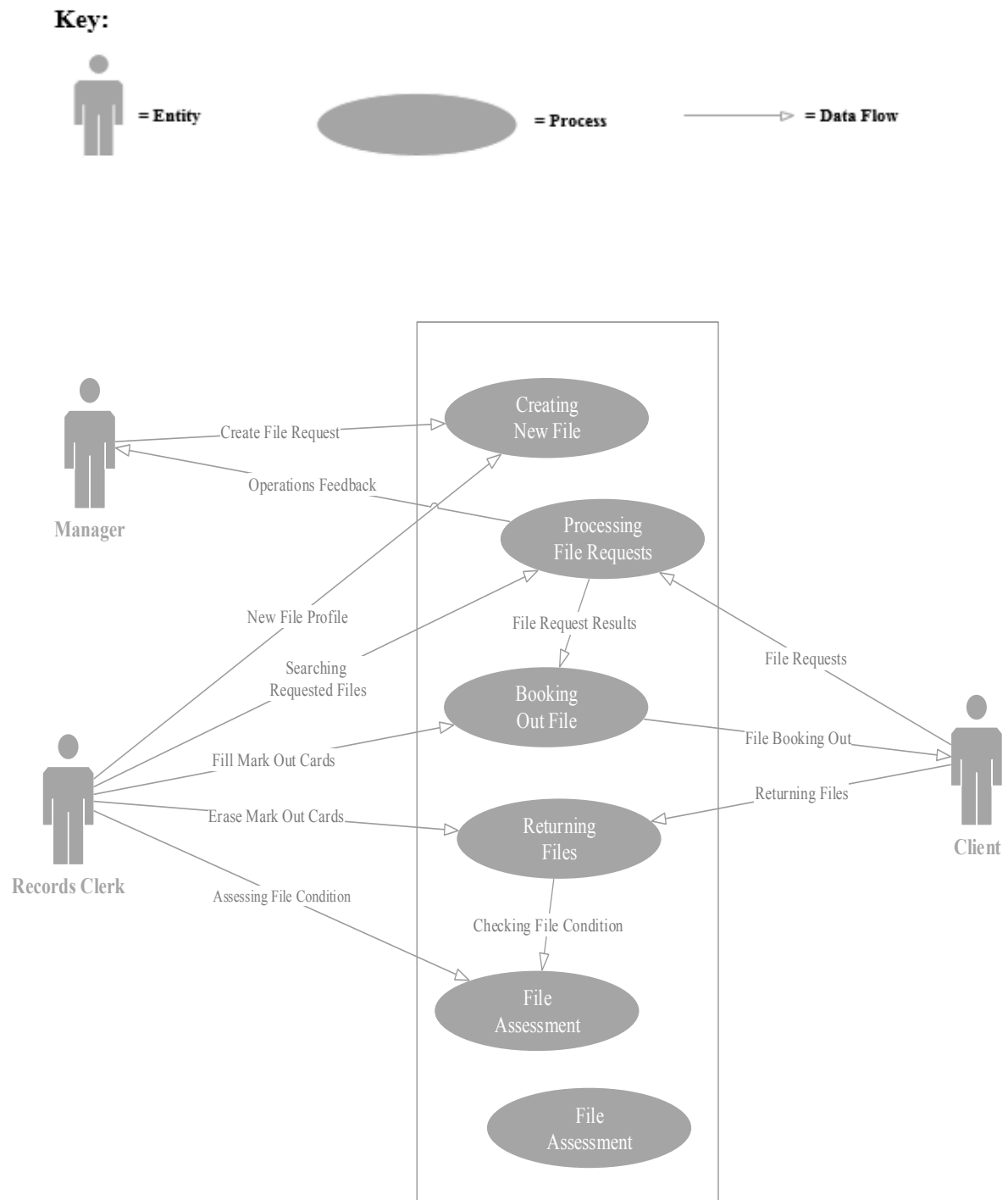
File Assessment

File Assessment

Fig 3.7 Use Case Diagram for the Current System

A use case model shows a view of the system from the user perspective, thus describing what a system does without describing how the system does it.

3.8.2 Non-functional requirements

Non-Functional requirements are constraints set on the systems development project. These are prerequisites to every computerised information system, these include:

Usability

The system is expected to:

➢ Have a user friendly Graphical User Interface

➢ Have common commands to perform tasks (Ctrl + F will prompt the user to Search the system for specific items)

Compatibility

The system is expected to:

➢ Work with all of the operating system upgrade (Windows 7, 8, 8.1, 10 or any other software update to follow in the near future);

➢ Integrate smoothly with current hardware and future hardware upgrades;

➢ Co-exist with other software including third-party applications that are currently installed on the PCs the proposed system would be running;

Maintainability:

The system is expected to:

➢ Able to support periodical updates of the program;

➢ Able to protect data and or to restore data in the even that there is system failure;

Reports

The system is supposed to:

➢ Generate periodical or as per user request detailed reports, summarizing the use or the utilization of the information system;

Documentation:

➢ An English based documentation and user manual to specifically instruct and inform the users on the simplest form of language as possible, where technical jargon and or abbreviations are used a glossary section must be in the documentation to explain these terms in full details;

3.9 CONCLUSION

In conclusion, using various information gathering eliminated the weaknesses of the data gathering methodologies in the development of the proposed system. Using the data gathered, an evaluation of the alternatives was done in favor of the in-house development of the proposed system and use case diagrams were drawn to assist the student in the following chapter of the System Design is to follow.

In the next Chapter, we will be focusing on, how the proposed system will work, the database design, hardware and software integration, user interface designs and lastly the security designs. Suffice it is to say that, the coding of the proposed system and all of its designs are carried out in the coming chapter.

CHAPTER FOUR: DESIGN PHASE

4.1 INTRODUCTION

This phase is when the student focuses on the practical setup of the new system and it is when the database, user interface, security and all the system functional aspects are all designed. The new system will answer questions like, "How will the new system work?" This will be summed up in a more easy way to understand by drawing context and data flow diagrams.

4.2 SYSTEM DESIGN

System design is defined as the process of defining the architecture, components, modules, interfaces, and databases for a system to satisfy specified requirements. This view was supported in the work of Bentley L.D. et al (2004). In other words, system design could be seen as the application of theory for the new system to its product development. Zimbabwe National Water Authority Electronic Record Support System will be developed in such a manner that clients that require services from the records department will search, book, and reserve the respected files online directly from the ZINWA website. The new system will also show competence in fast digitized searches, using barcodes to track the file activity to reduce human errors and also generate reports for all levels of management for the authority. To properly give a clear picture of the new system two diagrams are drawn that is, context diagram and data flow diagram.

4.2.1 How the New System (ZINWAER) Works

The new system ZINWAER works by first allocating barcodes onto all the files in the authority's repository and the barcodes will be used by the new system to track all the file activities in and out of the repository. A chronological and detailed presentation of the Markout Card history and the logs are created autonomously as the users will be using the new system. Additionally, the new system bridge the gap in distance as it now offers a chat application specifically to serve the records department stuff for them to discuss issues that concern their department.

Moreover, the new system is integrated into the procurement system and can now make it possible for the procurement committee to monitor the use of stationary from the records department without the use of many requisition forms and they can now know what to buy and

when to buy it as the files that need a brand new flat file replacement are highlighted before the files are torn out.

To summarize how ZINWAER work consider how the inputs and the processes are related to produce the outputs.

Inputs
- ➢ Employee's Details;
- ➢ File Details;
- ➢ Barcodes numbers;
- ➢ Chat Conversations;
- ➢ File requests;
- ➢ Checking stock from procurement storehouses;

Processes
- ➢ Generating barcodes;
- ➢ Scanning barcodes;
- ➢ Searching files;
- ➢ Sending/receiving conversations;
- ➢ Generating reports;
- ➢ Updating procurement stock;

Outputs
- ➢ Printing of barcodes;
- ➢ Booking out/returning files;
- ➢ Sending reports to management;
- ➢ Delivering of messages;
- ➢ Feedback on file requests;

4.2.2 Context Diagram

Context diagram as the name suggests, displays the whole of the new system in context with its environment, Wiley (2012). All process models have one context diagram. The whole system and its data stores are presented as just one process and shows the data flows to and from external entities.
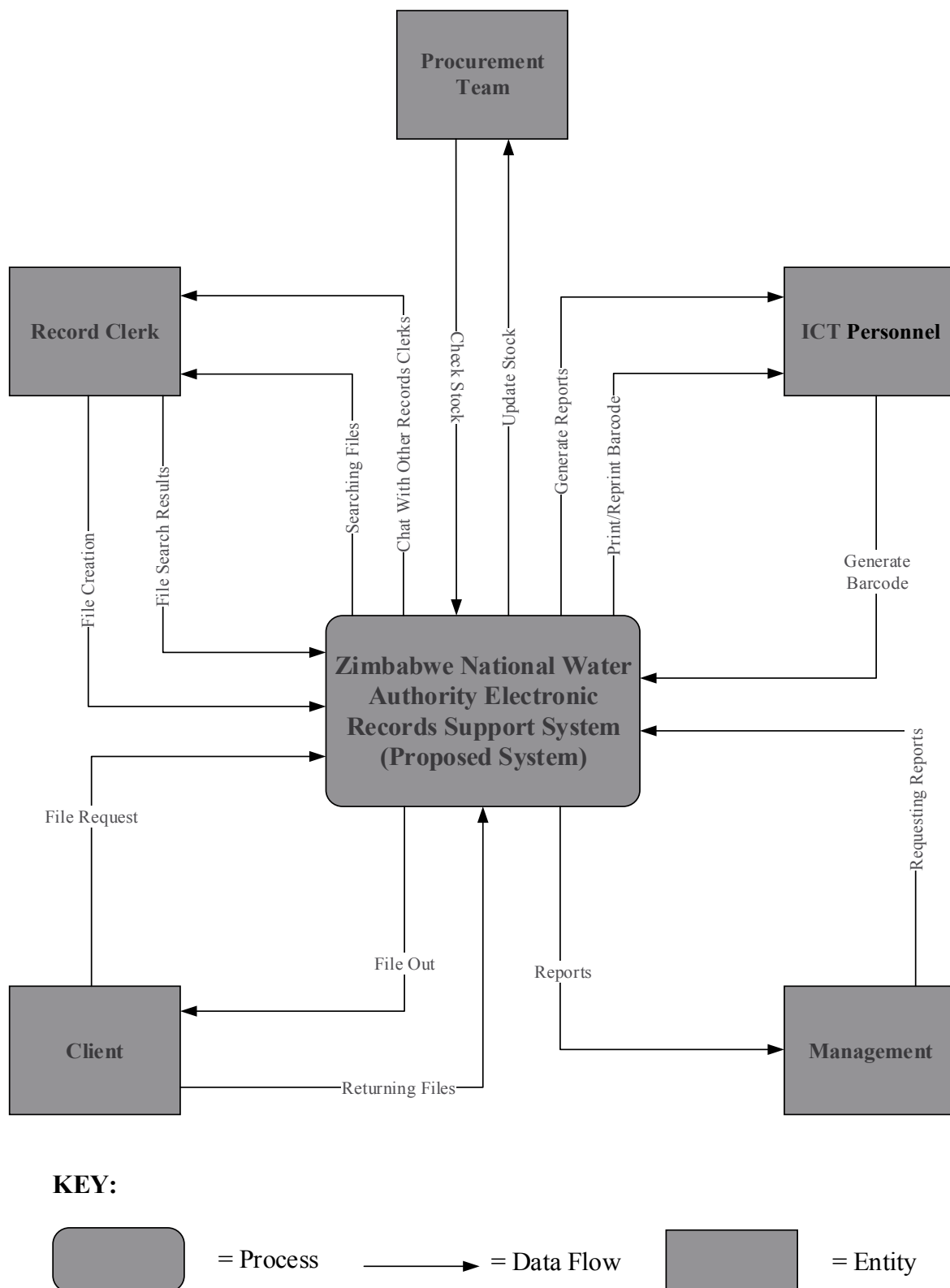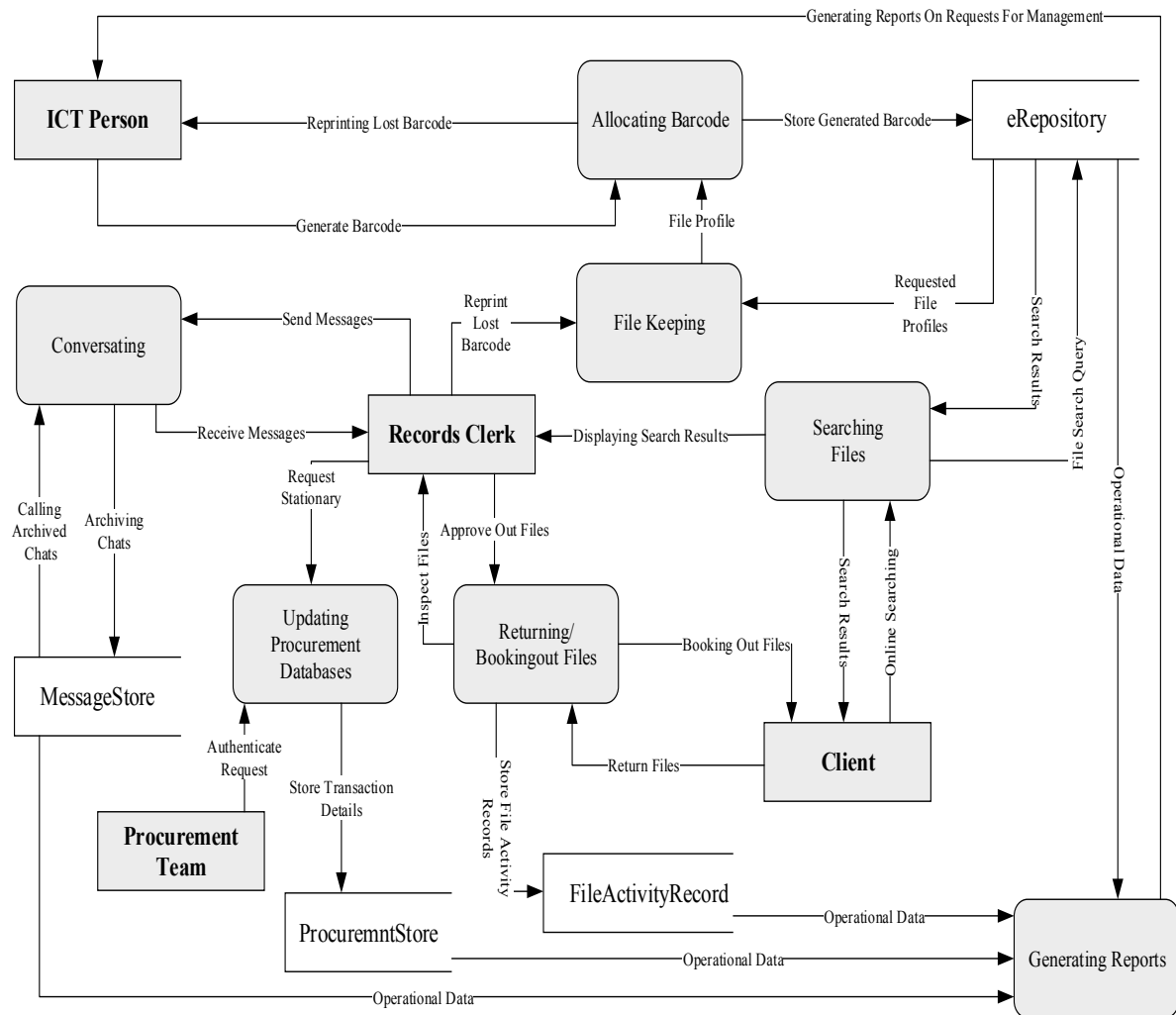
Fig 4.1 *Context Diagram for the new system*

4.2.3 Data Flow Diagram

The data flow diagram is known as the graphical depiction of data processes, data flows, and data stores in an information system. Data flow diagrams show how the system stores, processes, and transforms data in the new system.
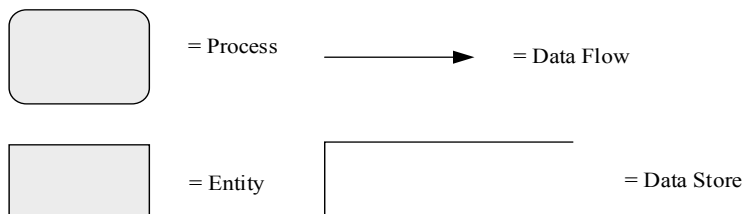

Fig 4.2 *Data Flow Diagram of the new system*

4.3 ARCHITECTURAL DESIGN

Architectural design is the concept that spotlights on the components or elements of the system and binds them into a coherent and functional whole, In short, the architectural design will assist the student to create an acceptable product. The new system is to be backed up at regular intervals on both the physical disks and the cloud storage. The student is taking advantage of the UPS that are already at work at the authority's site in that power will always be available to the server and all the nodes connected to this system.
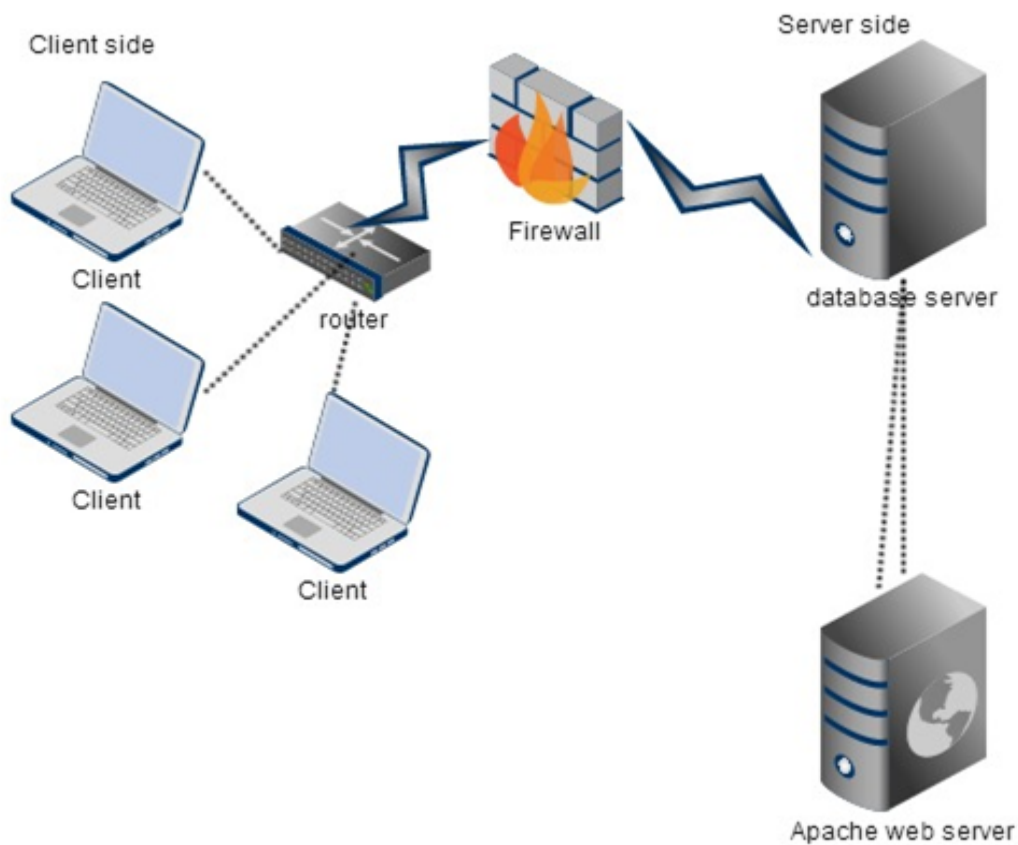

Fig 4.3 Architectural Design Diagram

4.4 PHYSICAL DESIGN

The physical design of the new system is the understanding of how the software parts and the hardware parts of the new system interact to achieve the objectives and altogether solve the problems experienced by the authority. Having latest fast and efficient hardware is not enough, a further step is to be taken in optimising the hardware and the software in order to achieve reliable and efficient experience for all the system's shareholders.

Fig 4.4 Physical Design of the new system
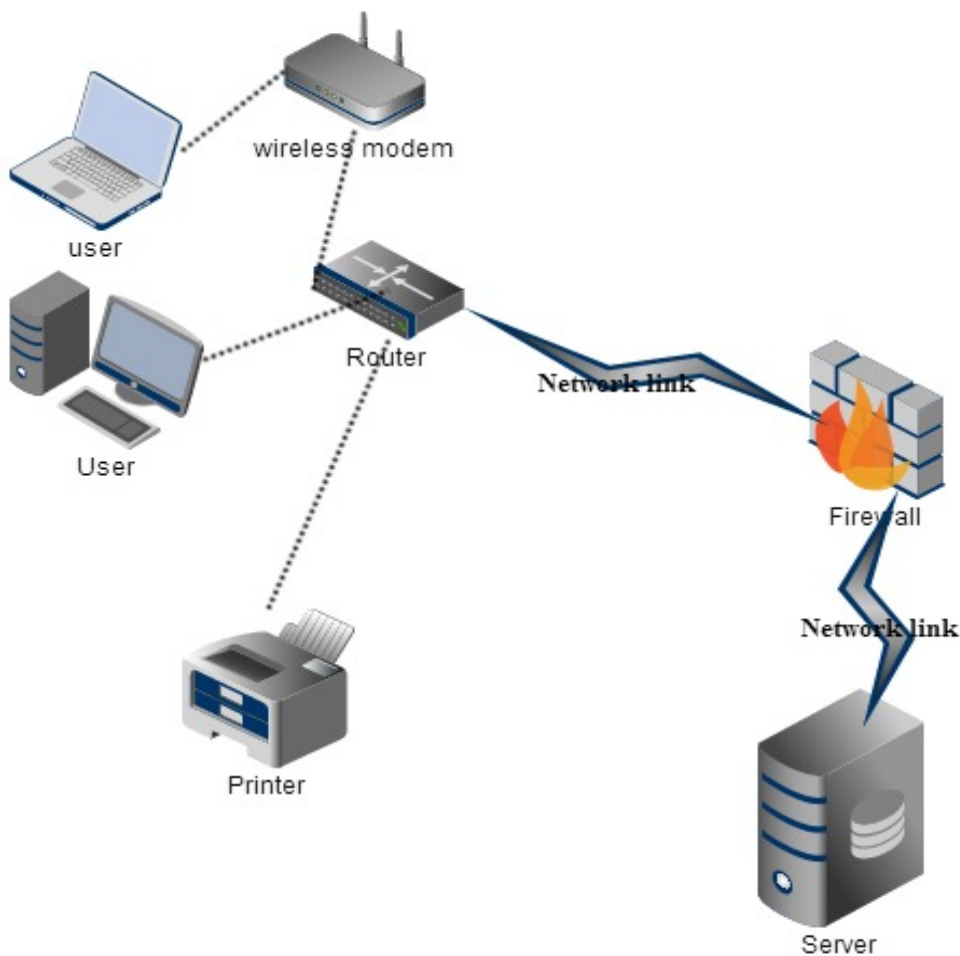
4.5 DATABASE DESIGN

Pratt and Adamski (2008) defines databases as a structure that can store information about multiple types of entities, the attributes of the entities and the relationships among the entities. Designing databases for the new system call to attention three main aspects of databases that is, *Architecture Designs, Entity Relationship Diagram* and *Database Tables*.

4.5.1 Database Architecture

For the system to properly function the database architecture was developed using the ANSI-SPARC Architecture which is an abstract design standard for a Database Management System (DBMS) and it was first proposed in the year 1975. It is summed up to have 3 levels which are the External Level, Conceptual Level and Internal level. Consider Fig 4 Below for a basic ANSI-SPARK architecture model.

ANSI-SPARC Architecture for database
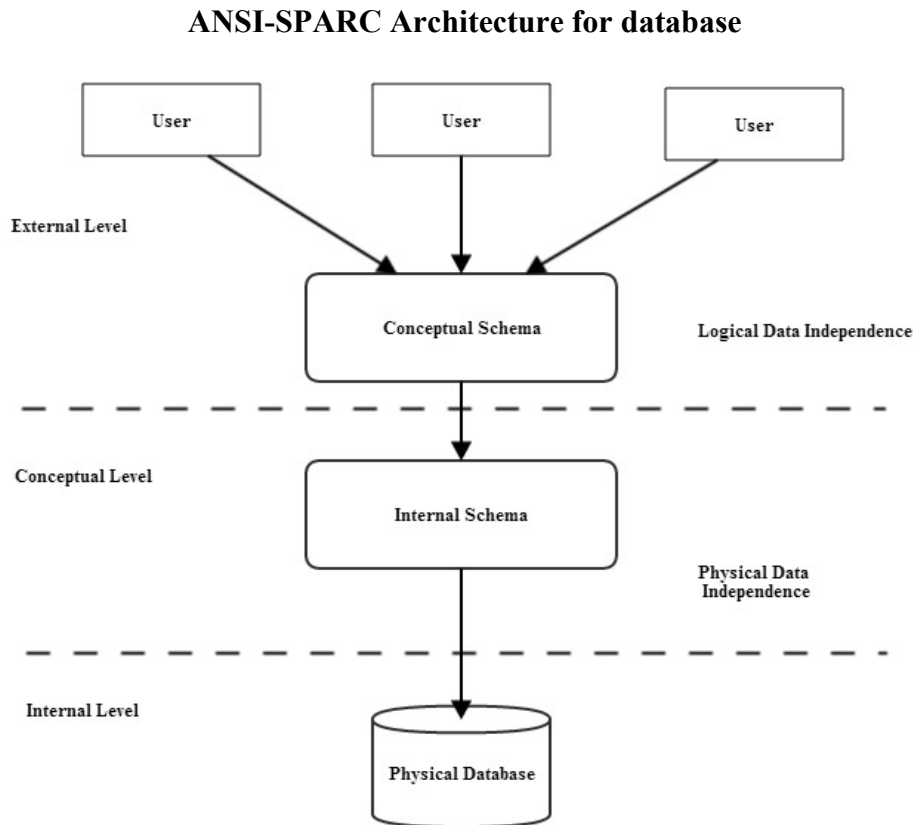
Fig 4.5 ANSI-SPARC Architecture

External Level

At this level, the system is designed (different GUI) is such a way that different class of users of the system will access the same database according to their respective viewing rights. For instance, the records clerk will only view the records lists and can only book out files, return files and make a request for the client to be notified when the file status changes (if the file is available again in the repository). On the other hand the ICT personnel will have the ability to add new file, print or allocate barcodes from the database, add or delete or update new users to the new system.

The different views also works as a form of security as specific controls are given to the specific users to specifically serve their roles on the new system.

Conceptual Level

This is the global logical representation of the database solely shared by all users. It is this level that the different graphical user interface take data to different users of the new system. This level acts as a buffer between the internal level and the external level parts of the database.

Internal level

This refers to the physical way data is stored. It is at this level that the right space allocation techniques, data compression techniques (if need arise in the future), security and encryption and the access paths the software can take to retrieve the data

4.5.2 Database Tables

A database consists of one or more tables and is it these tables that databases store information. A table is defined as a data structure that organizes information into rows and columns. It can be used to both store and display data in a structured format. Databases store data in tables so that information can be quickly accessed from specific rows.

Markout Cards			
#	Field	Data Type	Description
1	RefNumber	varchar (10)	File Reference number
2	FileTitle	varchar (100)	Title of the file
3	DetailsOfTheFile	varchar (100)	Description of the physical file
4	BarCodeOfTheFile	varchar (15)	Barcode number from sticker label
5	DateFileOpened	varchar (20)	Date the file was created
6	DateFileClosed	varchar (20)	Date the file was full and closed
7	FirstNameOfEmployee	varchar (50)	Name of the client/employees
8	LastNameOfEmployee	varchar (50)	Surname of the client/employees
9	Emails	varchar (30)	Email address of the client/employee
10	Department	varchar (20)	Department that the client/employee works
11	DateFileBookedOut	varchar (20)	Date/Time stamp of when file was given out to the client/employee

| 12 | DateFileReturned | varchar (20) | Date/Time stamp of when file was returned to the repository |
| 13 | ID [AUTO_INCREMENT] | bigint(255) | Reference ID on Markout cards |

Table 4.1 *Markout Cards*

	Markout Cards History		
#	**Field**	**Data Type**	**Description**
1	RefNumber	varchar (10)	File Reference number
2	FileTitle	varchar (100)	Title of the file
3	DetailsOfTheFile	varchar (100)	Description of the physical file
4	BarCodeOfTheFile	varchar (15)	Barcode number from sticker label
5	DateFileOpened	varchar (20)	Date the file was created
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8	LastNameOfEmployee	varchar (50)	Surname of the client/employees
9	Emails	varchar (30)	Email address of the client/employee
10	Department	varchar (20)	Department that the client/employee works
11	DateFileBookedOut	varchar (20)	Date/Time stamp of when file was given out to the client/employee
12	DateFileReturned	varchar (20)	Date/Time stamp of when file was returned to the repository
13	ID [AUTO_INCREMENT]	bigint(255)	Reference ID on Markout cards

Table 4.2 *Markout Cards History*

	Record List		
#	**Field**	**Data Type**	**Description**
1	TitleOfTheFIle	varchar (100)	Title of the file
2	DetailsOfTheFile	varchar (100)	Description of the physical file
3	DateFileOpened	varchar (20)	Date the file was created
4	DateFileClosed	varchar (20)	Date the file was full and closed

5	ReferenceID	varchar (10)	File Reference number
6	ReferenceDecriptionNumber	varchar (10)	Describes the category of the file
7	BarcodeOfTheFile	varchar (15)	Barcode number from sticker label
8	Status	varchar (15)	Indicates the availability of the file

Table 4.3 *Record List*

	SystemLoginLogBook		
#	**Field**	**Data Type**	**Description**
1	UsrNames	varchar (10)	Username logged in to the system
2	PWD	varchar (100)	Password used to access the system
3	Date	varchar (20)	Date the system was logged in
4	Time	varchar (10)	Time the system was logged in
5	ID [AUTO_INCREMENT]	bigint (255)	Logical sequence of the log in entry

Table 4.4 *SystemLoginLogBook*

	ZinwaUsers		
#	**Field**	**Data Type**	**Description**
1	FirstNames	varchar (50)	Employee name
2	LastNames	varchar (100)	Employee surname
3	EmployerNambers	int (10)	ZINWA's employer number
4	AccountType	varchar (20)	User's access level to the system
5	Emails	varchar (30)	Emails to use to reset account
6	Usernames	varchar (10)	Username to log in to the system
7	Passwords	varchar(100)	Password to confirm the usernames

Table 4.5 *ZinwaUsers*

	Conversations		
#	**Field**	**Data Type**	**Description**
1	ChatID	varchar()	Chat ID for the conversation
2	Usernames	varchar(10)	Username to log in to the system
3	UserID	int (12)	Stores the chat user
4	ChatContent	longtext (10 000)	Stores the conversations
5	DateTime	varchar (20)	Prints date and time of conversation

6	Status	varchar (12)	Reflects the availability of chat user
7	Catchments	varchar(20)	Identifies ZINWA Catchments

Table 4.6 *Conversations*

ProcurementTeam			
#	Field	Data Type	Description
1	<u>ItemsNo</u>	bigint (255)	Reflects the item numbers
2	ItemsNames		
3	ItemsDescription	varchar (50)	Stores the item descriptions
4	Available stock	int (20)	Stores the number of available stock
5	StockRefID	int (30)	Reference ID of the items requested
6	HistoryOfStock	varchar (50)	Stores the history of requests
7	RequisitionID	int (40)	Stores Requisition ID
8	RequisitionStatus	varchar (50)	Displays the status of the request
9	RequisitionAuthNo	int (30)	Stores the unique authenticating number

Table 4.7 *ProcurementTeam*

4.5.3 Enhanced Entity Relationship Diagram

KEY

d = Disjoint Contraint

= Attribute

= Relationship

M = More that one relationship
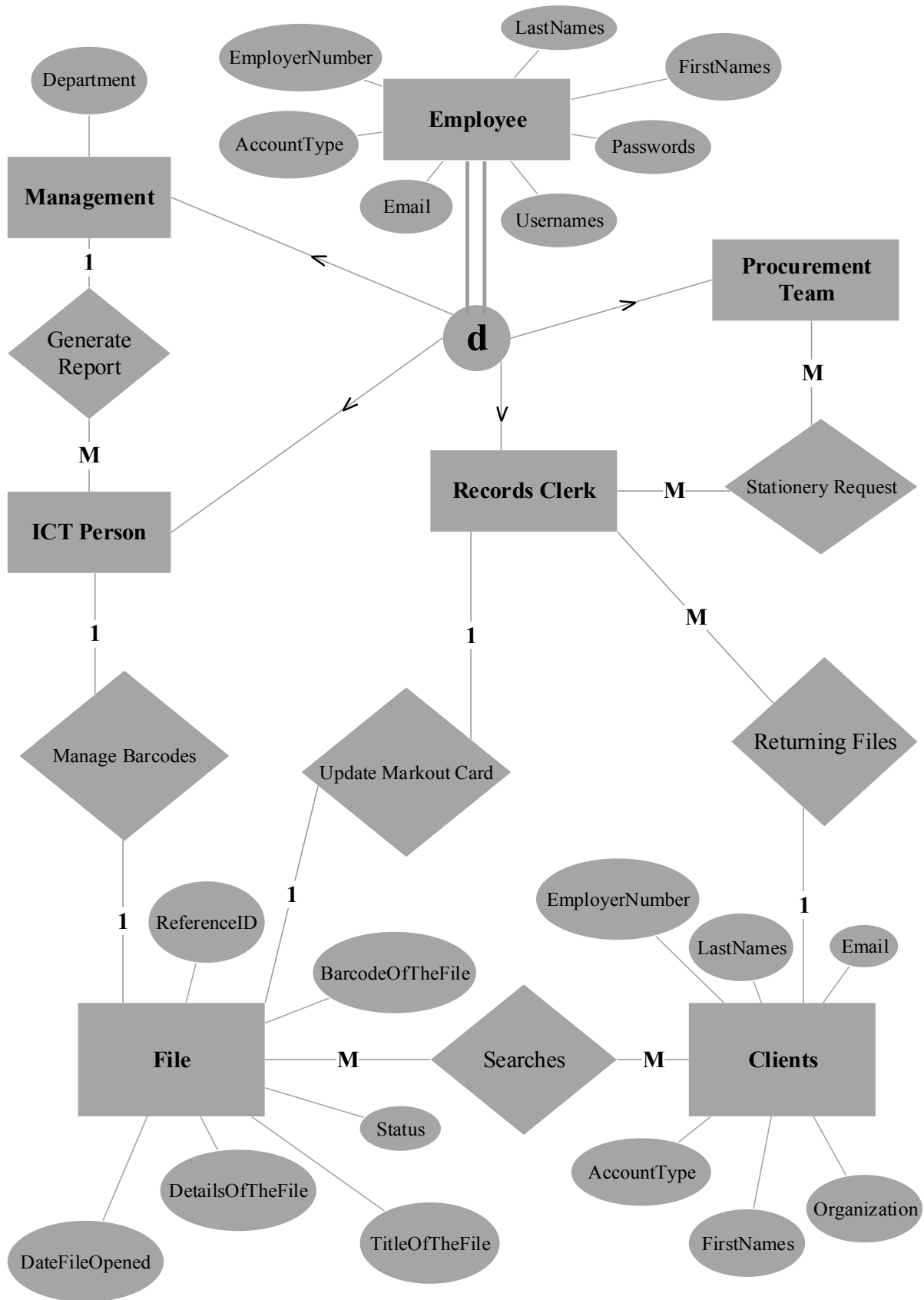
1 = One to one relationship
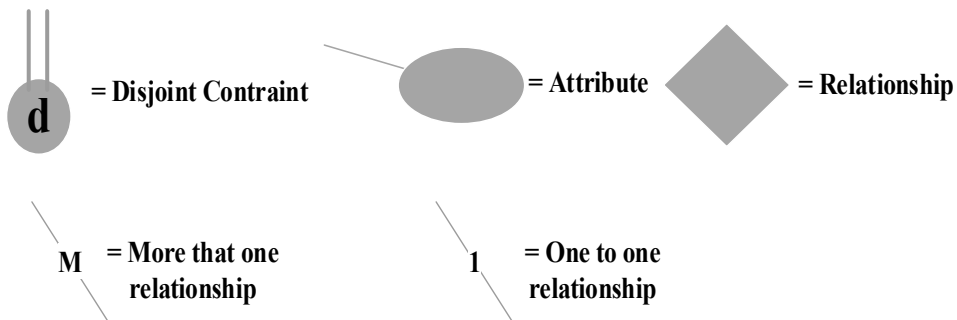
Fig 4.6 Enhanced Entity Relationship Diagram

4.6 PROGRAM DESIGN

Program design is the beginning stage of the technical setup of the new system where by the designing of modules, classes and functions of the new system are commenced. To further understand the program design of the new system, the student will draw pictorial views of the system using Package Diagrams, Sequence Diagram and Class Diagram.

4.6.1 Package Diagram

Kendall (2011) defines packages as the containers for other Unified Modeling Language (UML) things, such classes. It depicts the dependencies between the packages that make up a model.
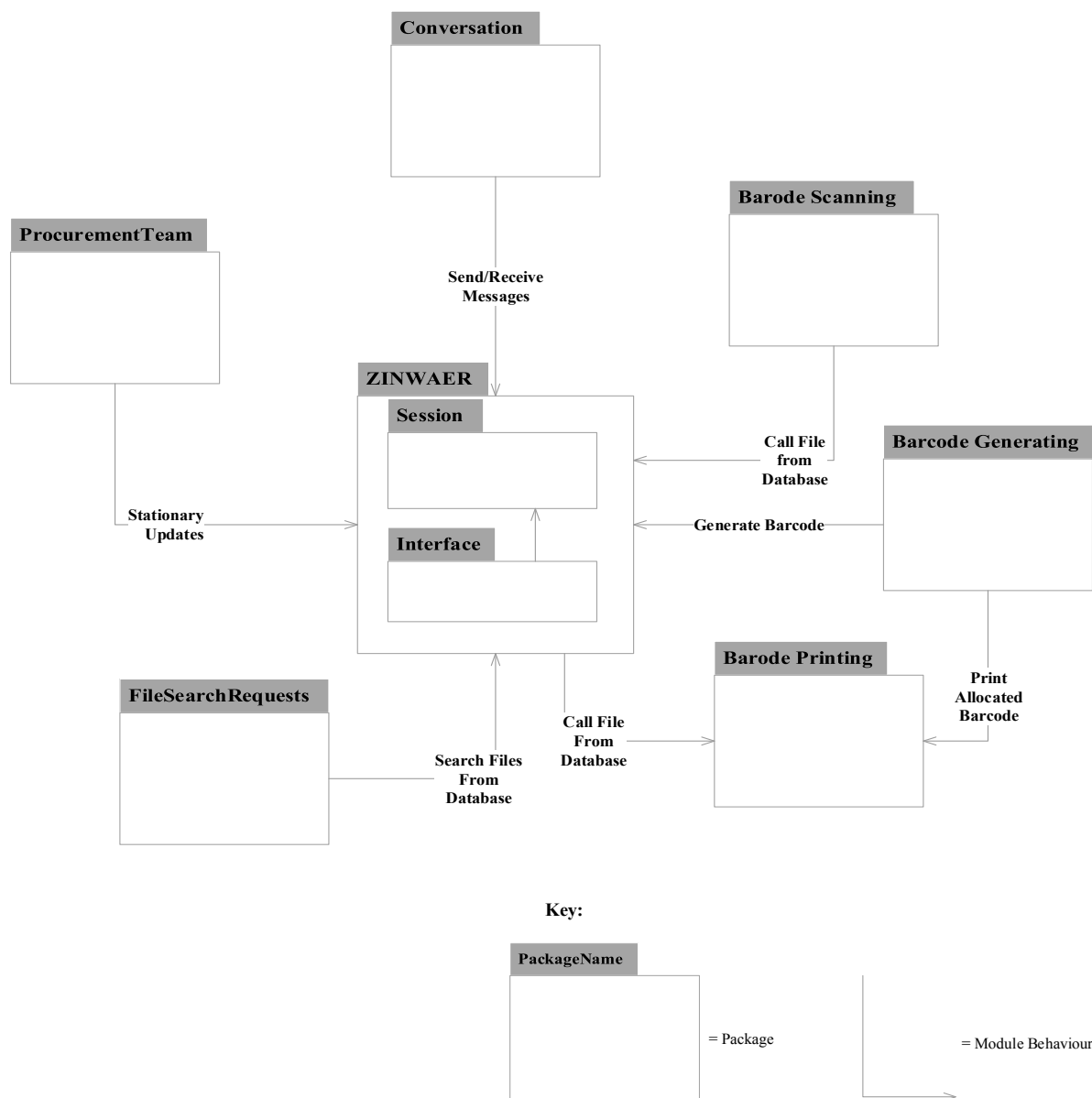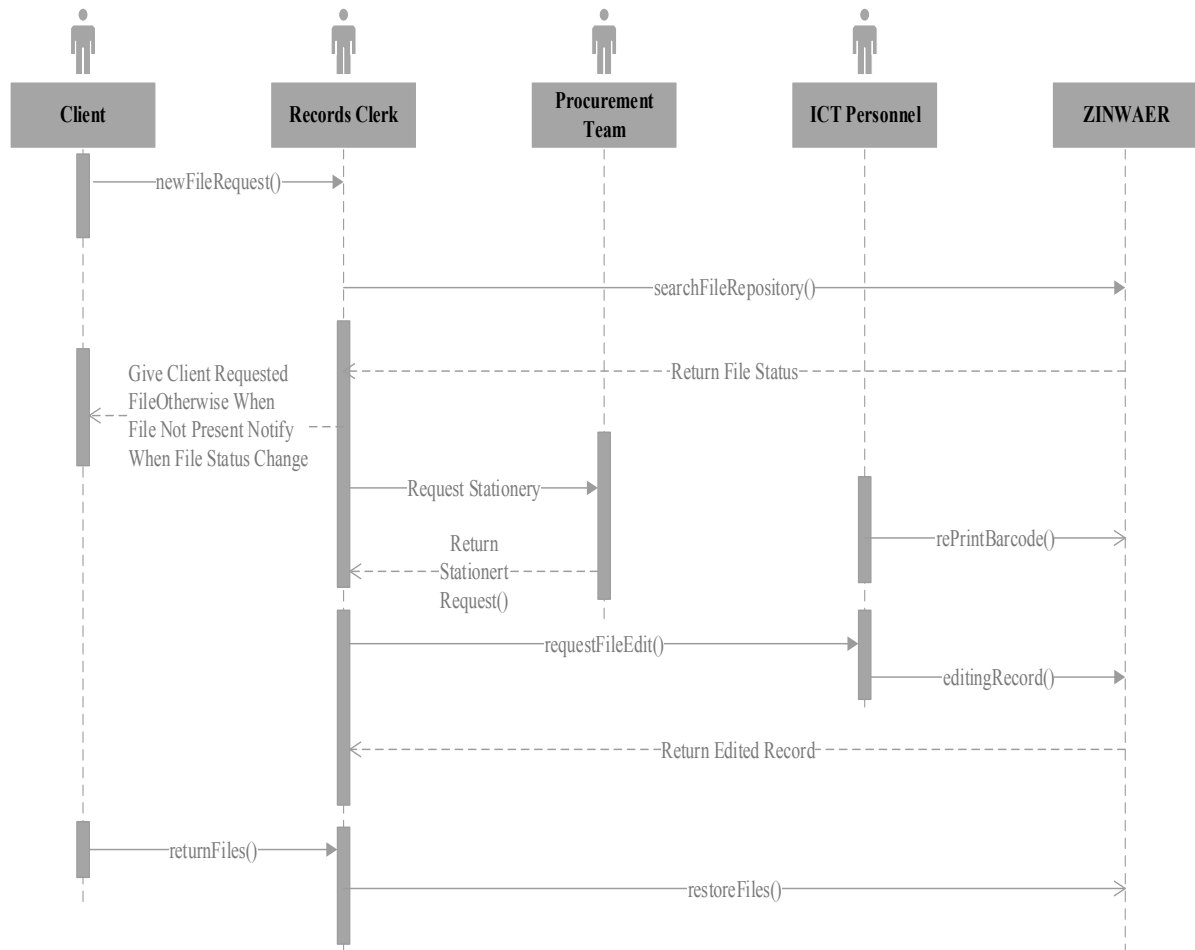

Fig 4.7 *Package Diagram of the New System*

4.6.2 Sequence Diagram

A Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is used to show the dynamic communications between objects during execution of a task.
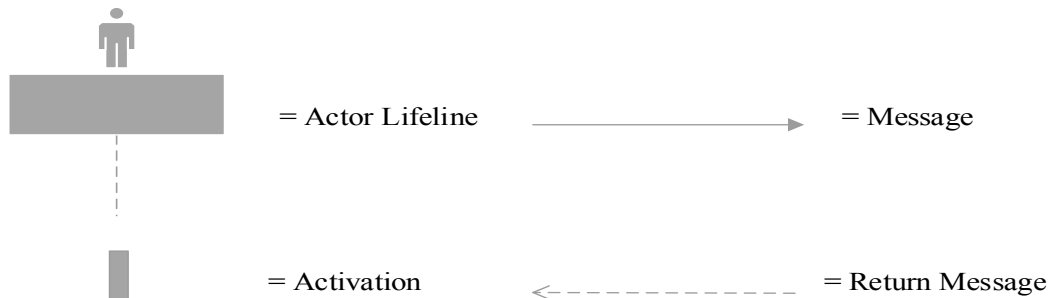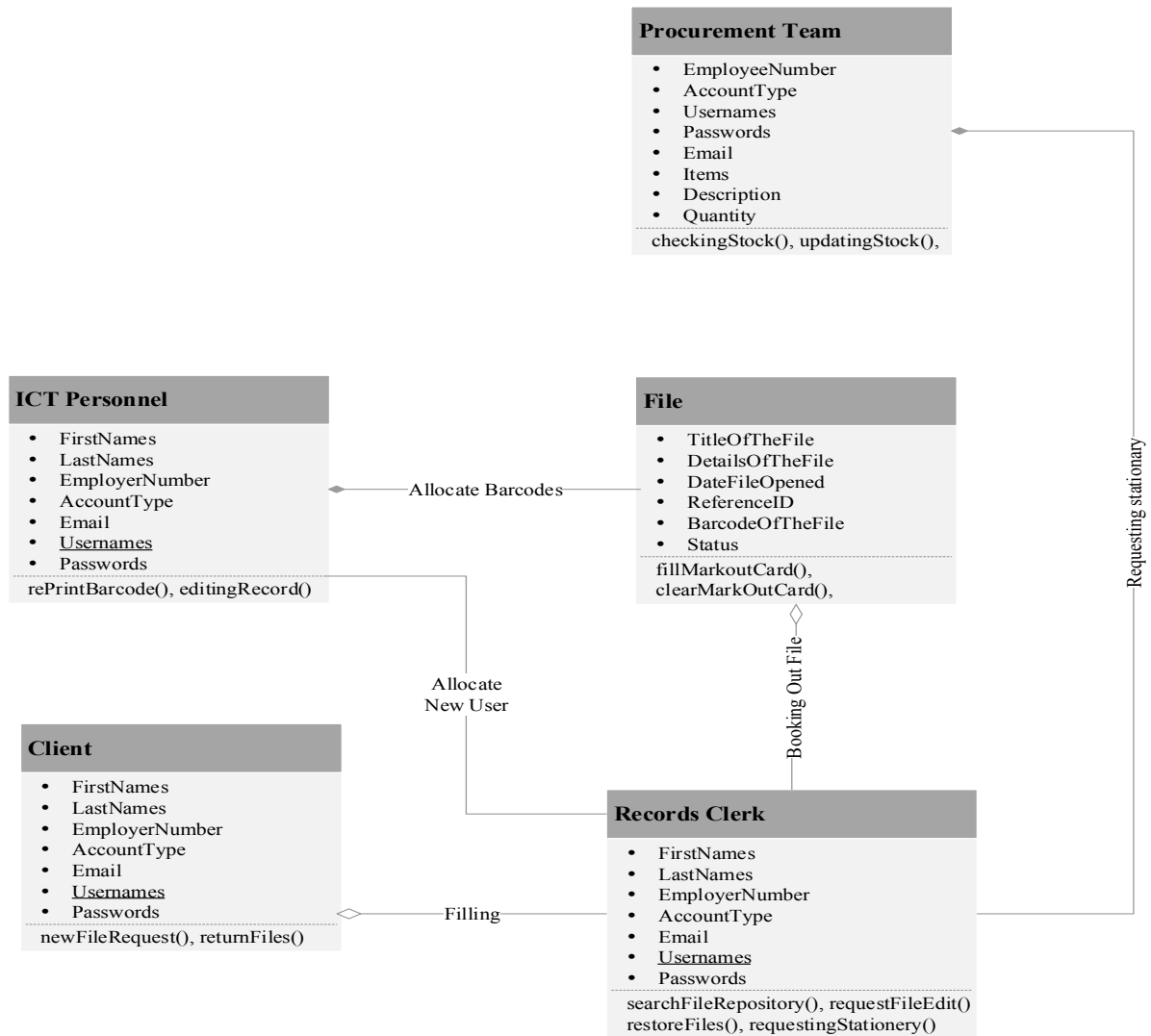

Fig 4.8 Sequence Diagram of the new system

4.6.2 Class Diagram

The class diagram is a static model that supports the static view of the evolving system. It shows the classes and the relationships among the classes that remain constant in the system over time.
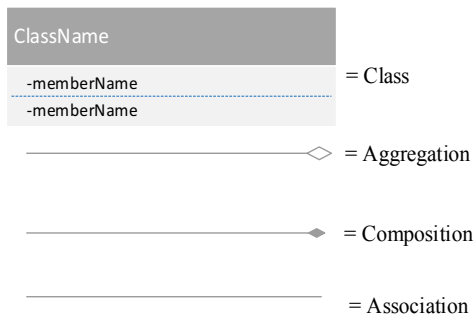

Fig 4.9 *Class Diagram of the new system*

4.7 INTERFACE DESIGN

Interface design is the staging area of the entire new system, here we find the system's shareholders interact with the new system. Users will always comment on the user interface of the system, therefore careful approaches were observed in developing these user interfaces for them to be easy to navigate, eye catching and at the same time achieve the set goals of the new system. Wireframes of the new system were designed, developed from the information gathered from the previous chapter in the data gathering methodologies and presented to the system users.
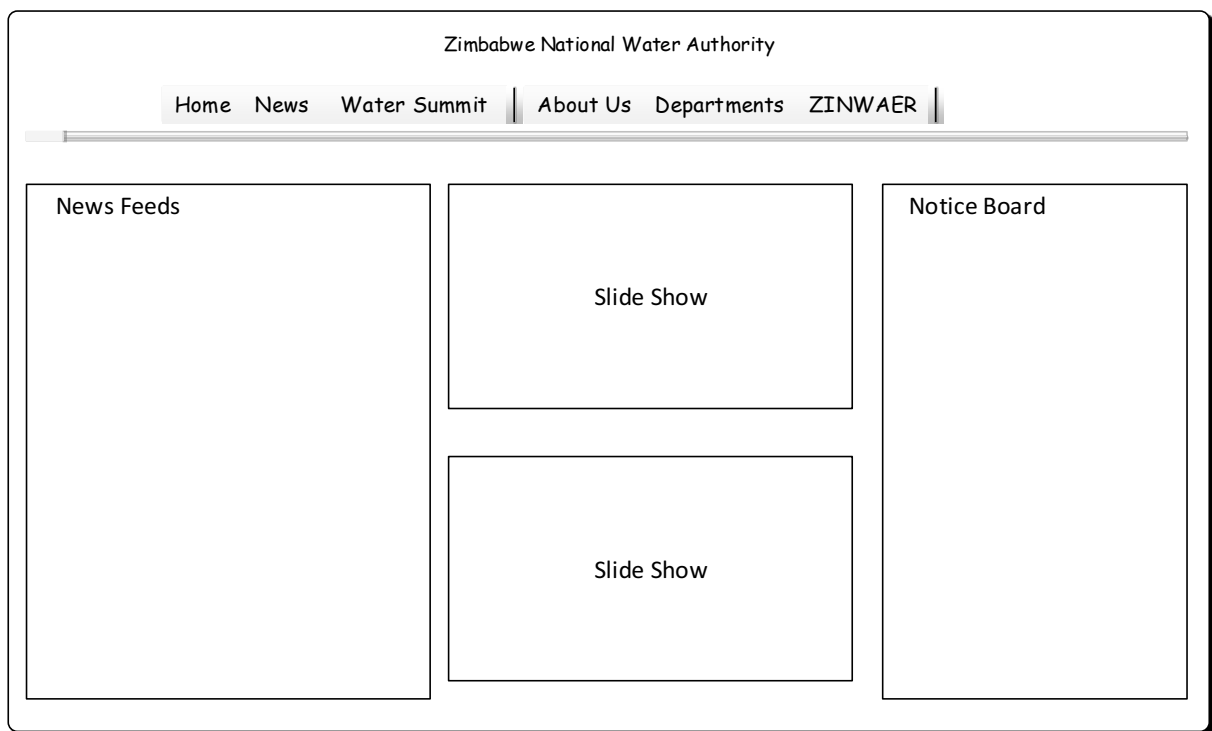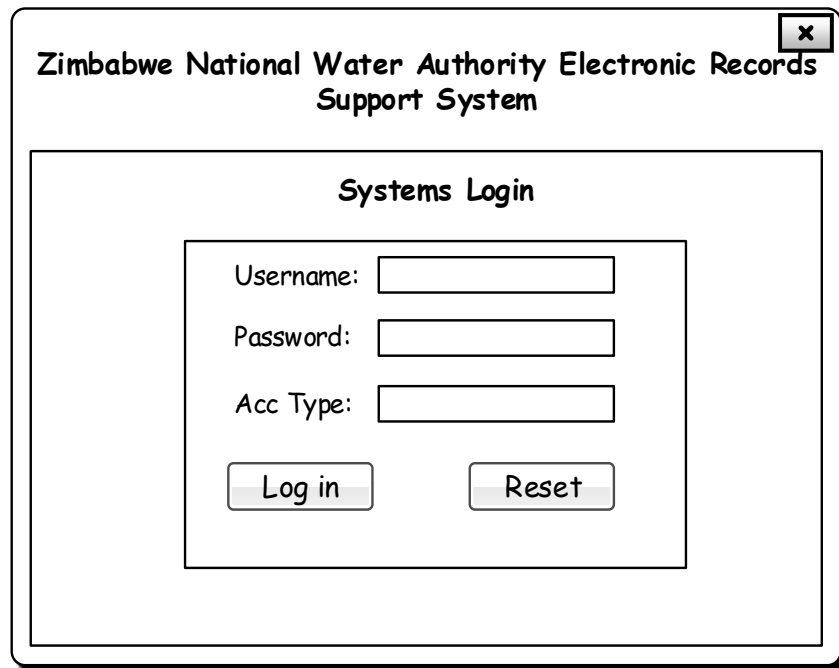
4.7.1 Main Menu

Fig 4.10 *Main Menu*

After visiting the ZINWA official website the user will then navigate to the main menu of the web application where he/she will enter the usernames, passwords and finally the account type to gain access to the ZINWAER.

4.7.2 User Login
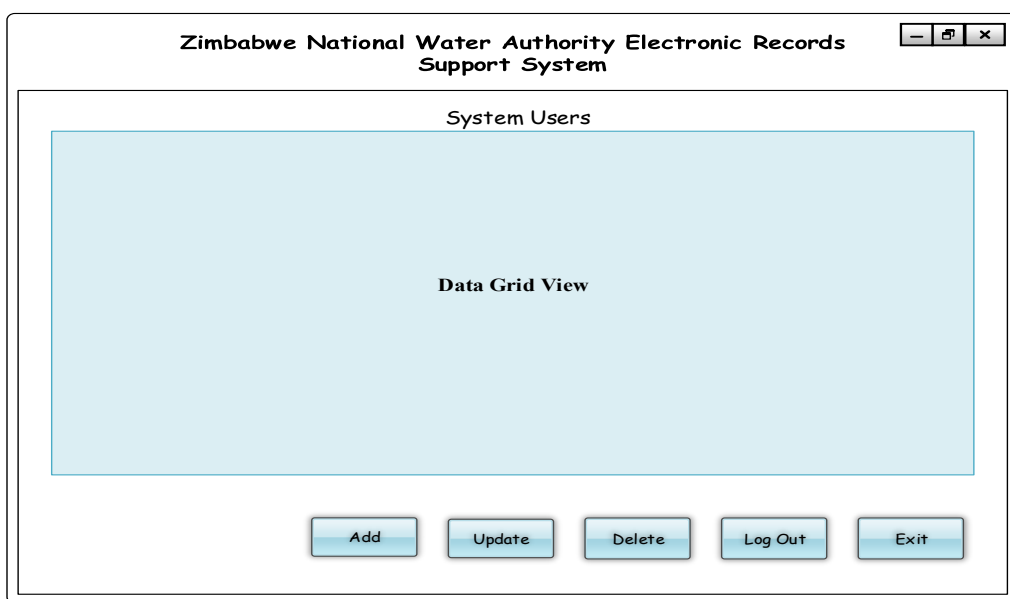
Fig 4.11 *New system Login Form*

The new system login form will prompt the user to input his/her Username, Password and lastly the Account Type. User details are inputted onto the same windows form and in the background the system will open the correct windows form that corresponds to the user details provided thereof.

4.7.3 Adding New Users

Fig 4.12 *System Users Form*

After inputting the administrator's details, navigate to the System users tab, upon pressing add or update button a new form will pop up where the administrator will fill in the User profile form to add the new user to the system's user database.

Fig 4.13 *Add/Update Pop up Form*

4.7.4 File System Administration

This the form that is responsible to add, update and delete file entries to the new system database.
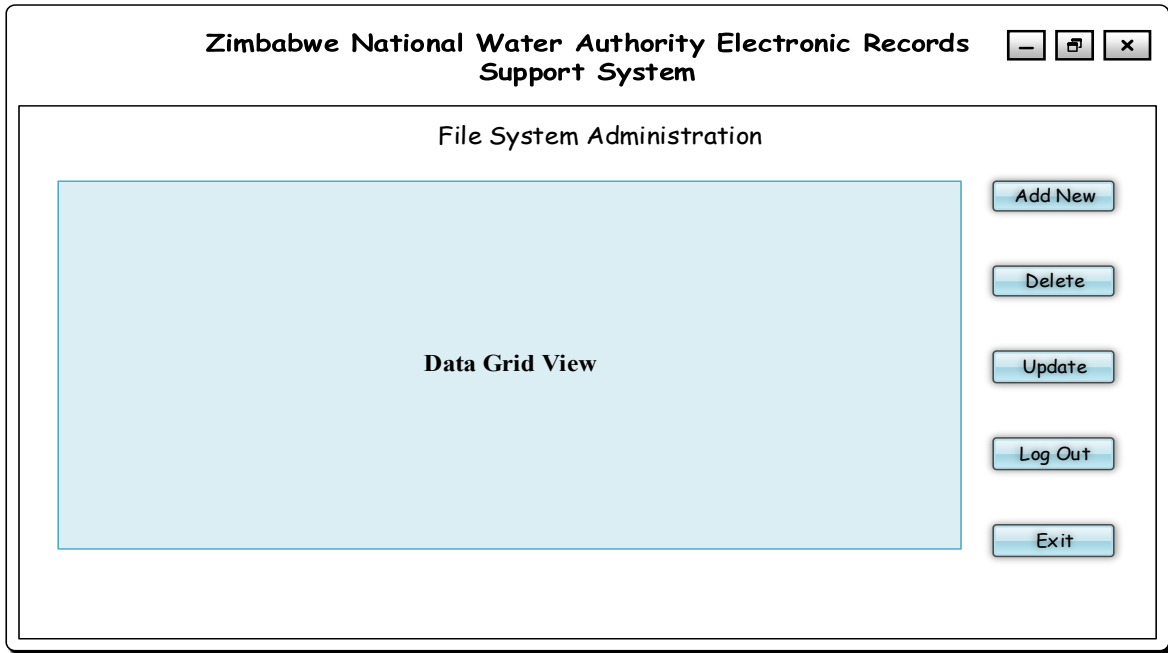
Fig 4.14 *File System Administration*

When the administrator presses the add/update button, the dialogue box below will pop up prompting him/her to fill the file profile below. When all the detailed are filled then be saved in the system's database.
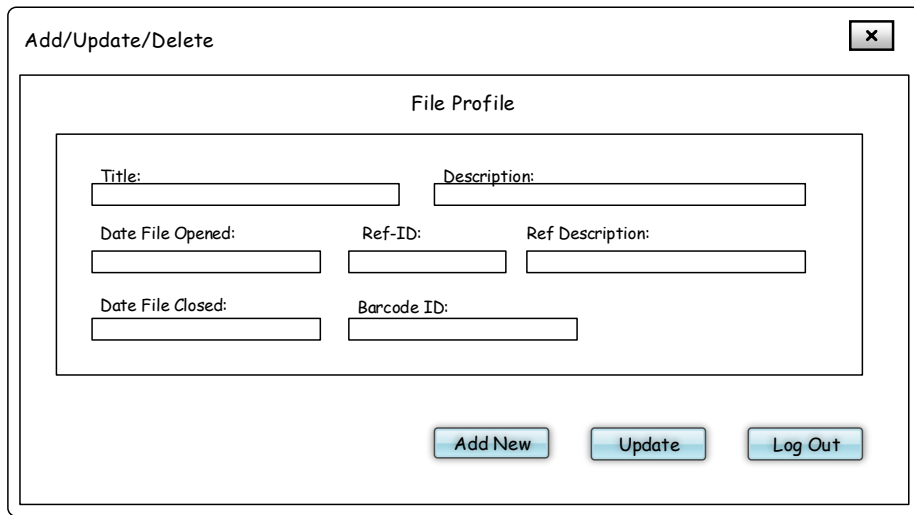
Fig 4.15 *Adding and Updating File Profile*

4.7.5 Booking out and returning of Files:

Fig 4.16 Booking out and returning of files

After the records personnel found the files, he will scan the barcode of the file which will then automatically update the data grid view or the table with file profile and upon confirming that the right file was selected he will then fill the clients details and the date file was booked out will be filled automatically by the system.

4.8 PSEUDO CODE

Pseudo code is an artificial and informal language that helps programmers develop algorithms. Pseudo code is a "text-based" detail (algorithmic) design tool. This was supported on the researched submitted at www.unf.edu but the author is unknown This is also known as false code and is essential to explain complex code to someone in plain and simple English.

Login Authentication

If Login Details = Username & Password in Database Then

    Display (The Respected Form)

Else

    Message (Error Username or Password Does Not Exist)

Barcode Search

If BarcodeScanInput == EntryInDatabase Then

      FillTheDataGridView (With File Details)

Else

      Message (File Not Repository)

End If

Deleting a Record

Scan the Barcode of the File to get Record ID

If record not found Then

      Message (Error, Record Not Found From Repository)

Else

      Display Record Details

      Allow ICT Person to Delete Record

End If

4.9 SECURITY DESIGN

For the new system to properly function in a reliable manner various forms of security have to be enforced and these include *Physical Security*, *Network Security, and Operational Security*.

4.9.1 Physical Security

This aspect covers the physical environment on which the new system will reside. The new system will take advantage of the physical security that is already available at the authority's catchment offices throughout the nation of Zimbabwe. These physical security includes lockable server racks, wall mounted network cabinets, CCTV, biometric and RFID centred entrances to secure the server rooms. Not to mention, but this aspect is already covered.

4.9.2 Network Security

Network security refers to any activities designed to protect your network. Specifically, these activities protect the usability, reliability, integrity, and safety of your network and data. With

this in mind, the new system will also take advantage of the secure network that has been developed by the authority's network engineers over the years.

4.9.3 Operational Security

Operational security refers to measures put in place to safe guard ZINWAER to limit or totally avoid any disruptions of the new system once it goes online. The new system was designed with various user access levels. For instance, the records clerks will be using PHP based web pages and the ICT personnel will use VB.NET developed standalone applications for all the administration purposes.

4.10 CONCLUSION

To sum up, after a successful system design of the user interface that suit the needs of both the new system users and the authority's needs, the database was designed and security measures were put in place. Package, sequence and class diagrams were drawn to properly understand the operations of the new system and their change in state with respect to time changes. On the next phase, we will be discussing the testing, installation and maintenance of the new system.

CHAPTER FIVE: IMPLEMENTATION PHASE

5.1 INTRODUCTION

The implementation phase of the research ushers the proper designing of the user interface, the databases and the security aspects of the new system were also put in place and observed. This resulted in the properly designed information system and at this phase more concern is given to check and recheck the errors that are related to the new system. After the testing is done, we will look into how the new system will be installed and then later maintained throughout the information system's life cycle.

5.2 CODING

Zimbabwe National Water Authority Electronic Record Support System was coded using two main programming languages that is, PHP (a Server Side Scripting Language) and Visual Basic.Net (a stand-alone app development language).

5.3 TESTING

Software testing is the process of analyzing a software item to detect the differences between existing and required conditions that is, bugs and to evaluate the features of the software.
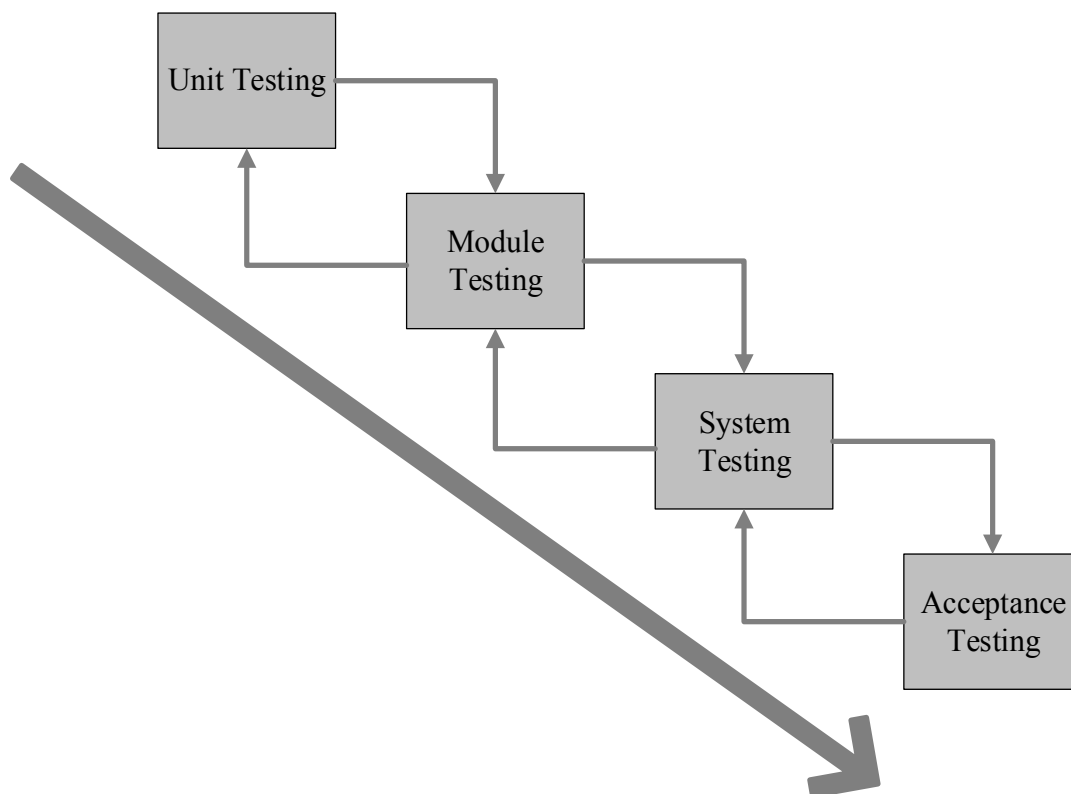

Fig 5.1 Testing Process

That is, in software testing we challenge the functionality of the newly developed system (ZINWAER) to confirm that it is in line with the authority's requirements. Testing identifies the bugs associated with the newly developed information system. Various software testing techniques were employed to properly test the new system and these techniques includes *unit testing, module testing, system testing* and *acceptance testing*

5.3.1 Unit Testing

Unit testing is a software testing process in which the smallest testable components of an information system, called units, are individually and independently scrutinized without other modules. The aim here is to prove whether or not the systems units are doing exactly what they are supposed to be doing.

5.3.1.1 Black Box Technique

Williams (2006) states that black box testing (also called functional testing) is testing that ignores the internal mechanism of a system or component and focuses solely on the outputs generated in response to selected inputs and execution conditions. This technique focuses on the way users relates to the new system and cultivate an unbiased response from the system users. This technique is simple and it does not require the tester to have little or no programming skills. Errors in the presentation of records data was identified and corrected using this form of system testing.

Nevertheless, on a downside this form of testing is unrealistic in that the tester has to test every possible input into the system which is infinite.

5.3.1.2 White Box Technique

White box testing also called structural testing and glass box testing is a testing technique that takes into account the internal mechanism of a system or component. This is a technique implemented to examine if the code is working as expected, Beizer (1995). The student used various parameters and executed its methods to ensure that the new system was secure and reduce the vulnerability of the new system to malicious users with intention to sabotage the new system. Some member that were initially coded as public were corrected and declared private or protected to ensure more security.

5.3.2 Module Testing

Module testing eases the task of debugging this is aimed at seeing how the units that were tested separated if they can work together error free. The report generation modules were tested

together with the file activity records modules to generate a first report for the new system. Barcode generation and scanning were also tested together as these two were tested separately earlier in unit testing.

5.3.3 System Testing

To perform system testing, the initially separated units that were integrated into modules will now be collectively merged into one system. System testing will evaluate the new system functionality against the earlier set objectives of the proposed system. It also takes into account how well the new system integrates into the already available hardware for instance the IBM Power 720 server will be tested as to what extent it successfully runs the new system.

5.3.4 Acceptance Testing

This form of testing is based on the user, basically acceptance testing is simple user feedback on the new developed system. This form of testing checks to see if the student have developed a system that meets the needs of the authority and its users. Acceptance testing helps us ascertain to what extent are the users confident of their new system. All these are made possible in two ways verification and validation

5.3.4.1 Verification: Did we building the product right?

Through verification, we make sure the product behaves the way we want it to behave. For instance, ZINWAER was designed to keep records of all the entries and attempts to access the system

5.3.4.2 Validation: Did we building the right product?

Through validation, we check to make sure that somewhere in the process a mistake hasn't been made such that the product build is not what the customer asked for; validation always involves comparison against requirements of the user.

5.3.4.3 Validation test cases

Case	Description	Output
Barcode Inputs	All inputs are designed to be numerical and when users press any non-numeric value the system flags an error.	
Date Validation	The system was validated in such a manner that the dating system must be realistic and in the format *mm-dd-yyyy*.	
Barcode Duplication	ZINWAER was designed to generate one barcode set for one file. It flags errors in barcode duplication.	
Username and password null values	The log in parameters does not allow null values when signing in to the ZINWAER	
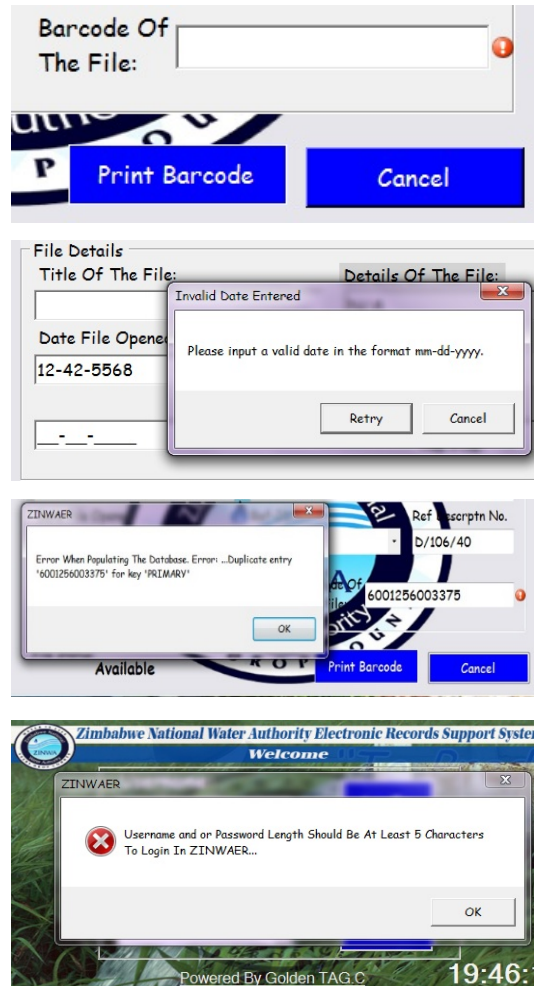
Table 5.1 Testing Process

5.3.5 System vs. Objectives

The entire functionality of the system was evaluated against the initially set objectives. That is, this form of testing checks to see if the organisation problems were met by the development of the new system. It also identifies whether or not the new system have extra features aside from meeting the objectives initially set in the beginning phases of the system development.
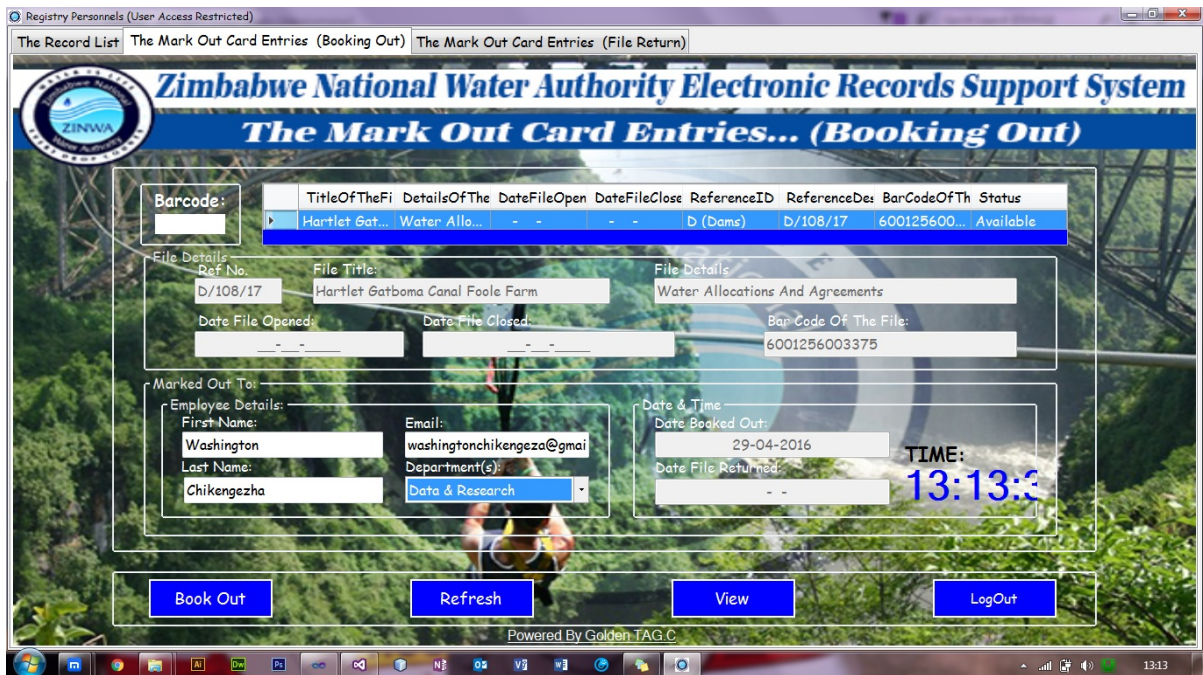
Fig 5.2 *Booking out and returning files*
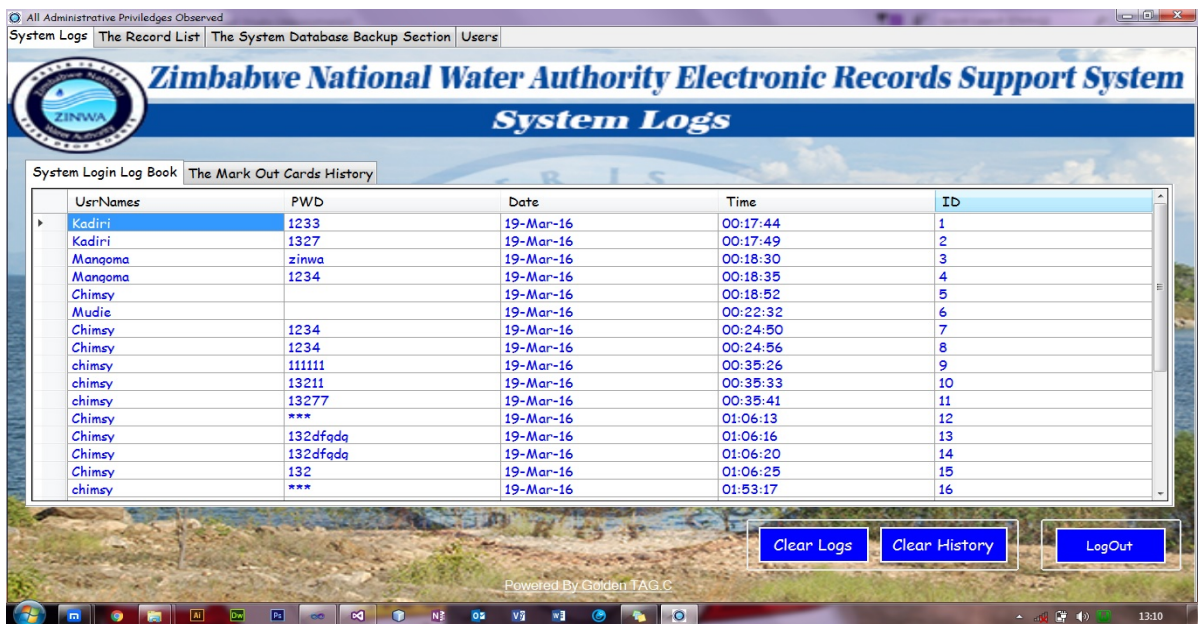
Fig 5.3 *System logs*

After the new system is tested and all its errors are properly resolved and addressed, the next stage is the installation of the new system

5.4 INSTALLATION

Installation is a process whereby the new developed system is installed in the real environment with all the shareholders and real life variables on the same ground. This is the first point where the system shareholders feel the effects of the changes implied and paused by the new system.

This is also the stage where data capturing is done, all the files in the repository are allocated a unique bar code printed sticker label adding file references to the new system.

5.4.1 Data Migration

Data migration is a process of transferring data from the manual way of recording files into the new electronic databases of the new system. All the files in the repository are taken assessed and then their file profiles are captured into the newly erected database of the new system and the barcode sticker is embedded onto the outside of the file for use of the barcode scanner in the new system. The new database is centralized and physically the database servers are located at the ZINWA head offices in Harare and when queried by these databases will transfer results using the Internet as a backbone.

5.4.2 Steps in installation
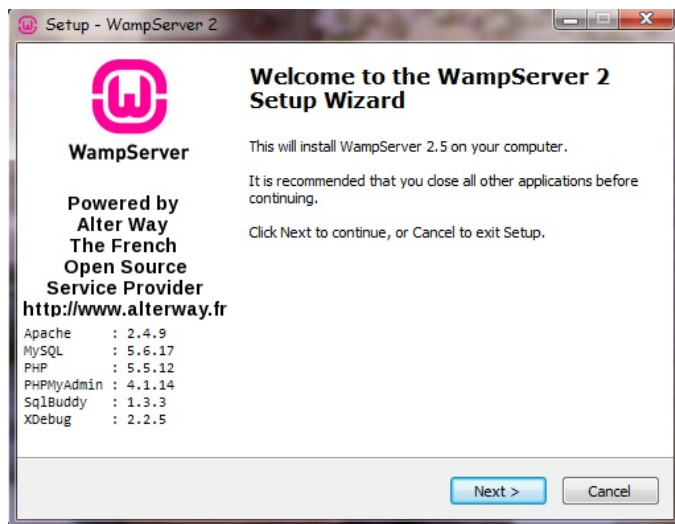
Fig 5.4 Wamp Server Installation
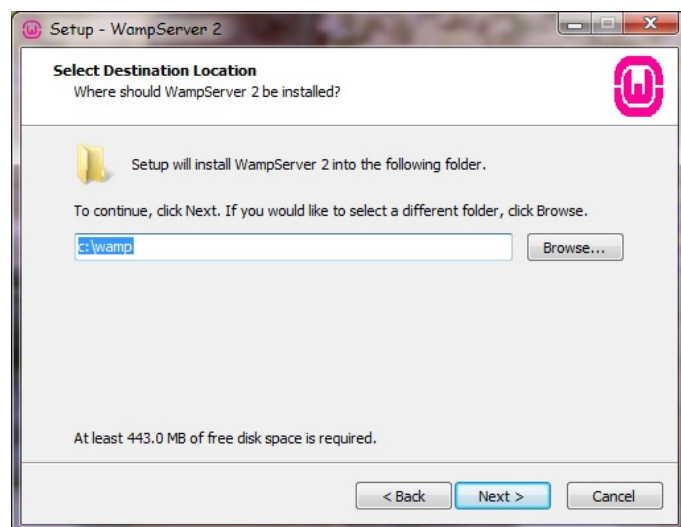
Fig 5.5 Select Wamp Server installation folder
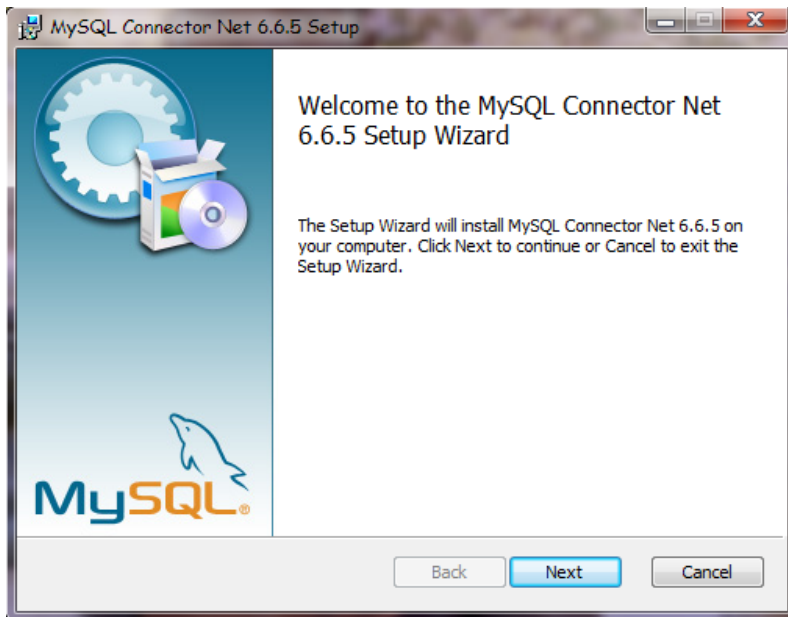
Fig 5.6 *MySQL Connector Installation*

System installation to path C:\wamp\www
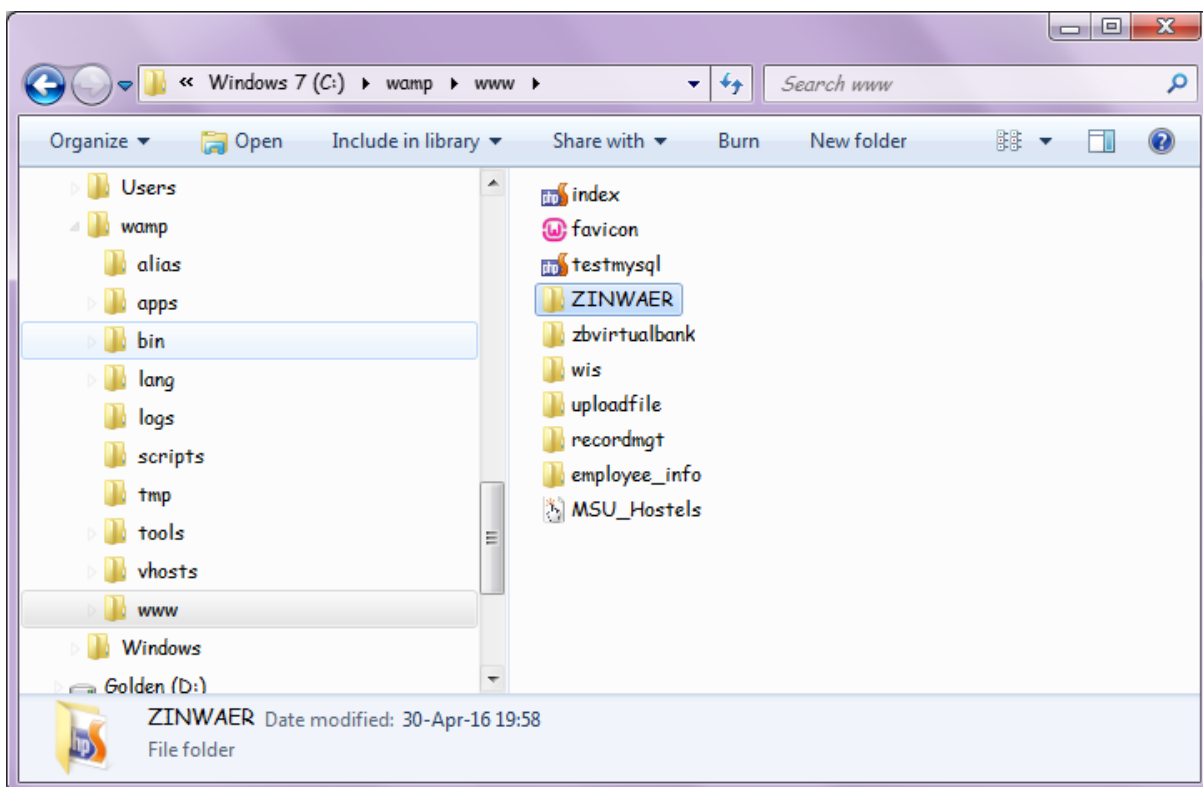
Fig 5.7 *MySQL Connector Installation*

Database connection

```php
<?php

    $db_host = 'localhost';
    $db_user = 'root';
    $db_pass = '';

    $db_name = 'chat';

    if($connection = mysql_connect($db_host, $db_user, $db_pass)) {
        echo 'Connected to Database Server....<br />';

        if($database = mysql_select_db($db_name, $connection)){
            echo 'Database has been selected....<br />';
        } else {
            echo 'Database was not found.<br />';


        }
    } else {
        echo 'Unable to connect to MYSQL server.<br />';

    }

?>
```

Fig 5.8 MySQL Connector Installation

5.4.3 System User Training

A user training event is scheduled to further educate all the users of the new system. The dates to conduct workshops were scheduled separately with reverence to the access level of the user and his/her roles pertaining to the new system. To assist the users which will fail to attend these workshops and those which will need a personal training a detailed user manual is also created to serve them in the comfort of their offices.

5.4.3.1 Training Plan

These venue of these workshops is the Zimbabwe National Water Authority Head Office's conference rooms. The first group to have these workshops are the ICT Personnel (this will not take much time as this group already has an extensive knowledge in computing), the second group is the Records Clerk will patiently be trained last as it will take time to keep them up to speed of the technological advancement brought into their circles by the new system. This group was scheduled last as the data gathered during the system's development suggested that this group owns some individuals who has little or no basic computer skills therefore patience is to be extended and for everyone to function well in their roles of the new system.

5.4.4 System Conversion

In their researches, Shelly and Rosenblatt (2010) found that, System conversion is the process of putting the new information system online and retiring the old system. This is the procedure and or a set of rules that are to be observed when the new system is to be fully implement into the authority's daily operations. For the scope of this research four system conversion techniques were taken into account before selecting one that best suits the needs of the authority when implementing the new system. The techniques observed includes:

- ➢ Direct Conversion;
- ➢ Parallel Conversion;
- ➢ Pilot Conversion;
- ➢ Phased Conversion;
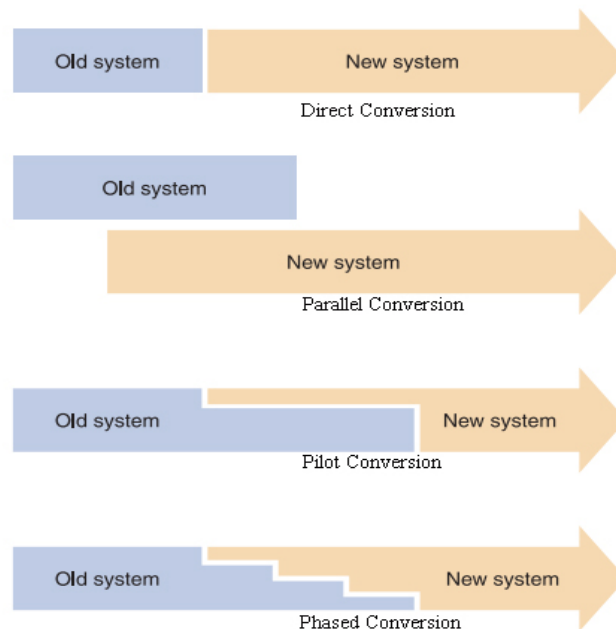
Fig 5.9 *Four System Conversion Methods*

5.4.4.1 Direct conversion

This form of system conversion suggests that the authority retire the old manual system immediately when the new system becomes operational, ensuring that only one system is operational. In other words, this would mean that the authority would retire all the manual search indexes and lock up all the old Markout Cards and start using the new electronic databases.

Advantages of Direct Conversion

➢ It is cheap as only one system is running and maintained at a time;

➢ It is fast and bold in making the transitions from the old into the new system;

➢ When the operating environment fails to support both system or the systems incompletely are only integrated by direct cut over method.

Disadvantages of Direct Conversion

➢ It exposes the authority to great unimaginable risks if the new system fails to live up to its expectations;

➢ Doesn't give the users of the system to properly adjust into the new system;

➢ There is no way to compare the two systems to see as to what extent has the new system really solved the problems faced by the authority;

➢ It takes away the old system before we could make a controlled comparison on the old and new way of doing things. Some tests cannot be made unless the system is live and operational.

5.4.4.2 Parallel conversion

This method requires both the old manual system to function in parallel with the new developed system for a set period of time. The authority will use the paper based file search indexes, pencil based Markout Cards and the new electronic databases for a period of time only until all the users are satisfied that the new system is ready to completely replace the old system.

Advantages of Parallel conversion

➢ The old system will serve as a point of reference and comparisons can be drawn from both systems operating in the same environment;

➢ It mitigates the risk upon implementation as the old system will work when the new system faces trouble in operating in a live environment;

➢ Gives the users more time to familiarize with the new system before decommissioning the old system;

Disadvantages of Parallel conversion

➢ It makes the authority incur additional costs as both systems are concurrently during the parallel period;

➢ Some of the system users will be working twice than normal;

➢ The process is time consuming;

5.4.4.3 Pilot conversion

This is generally the full implementation of the new system as a whole but in one of the ZINWA Catchments then when it works properly in that **pilot site** (the group that uses the new system first is called the pilot site). When the new system works properly in the pilot site, then the new system is implemented fully to the rest of the catchments using the direct conversion method.

Advantages of Pilot conversion

➢ Allows a hands-on testing of the new system on the actual ground it will operate in;
➢ It limits the amount of risks to the pilot site and as a result shield the rest of the organization from the same risk;

Disadvantages of Pilot conversion

➢ Some of the system modules cannot be tested since they depend on the full implementation of the system to the rest of the organization;
➢ It increases the risk of delaying the full implementation of the new system since the pilot is constantly being improved;

5.4.4.4 Phased conversion

The phased conversion allows the implementation of the new system in stages or modules. For instance, instead of installing the whole new system, we start by implementing a barcode printing and the barcode generating module, then the digitized online search module and so on.

Advantages

➢ This slow and steady approach limits the potential of system errors and the costs associated with system failures;
➢ The time for the user to adapt to the new system is longer;
➢ When the module fails, the risk of errors or failure will be limited and only associated to the implemented modules only and not to the rest of the new system;

Disadvantages

➢ System delivery milestone is unclear;
➢ Training sessions are confusing for users as they are asked to work with the new and the old system;
➢ This method of system conversion is not practical as all of these modules were designed simultaneous for the new system and it is difficult to separate them;

Recommended: Parallel conversion

After a careful considerations of various aspects like that of risk and practicality parallel conversion was preferred to be the system conversion as it allows a close up comparison between the old system and the new system and that it also serves to rescue the new system in the event that of errors and or failures until all of these errors are resolved and all the system's shareholders are satisfied by the performance and the operations of the new system.

5.5 MAINTENANCE PROCESS

Software Maintenance is defined as the process of modifying a software system or component of the delivered system after delivery to correct faults, improve performance or other attributes, or adapt to a changed environment. Maintenance is a catchall term used to describe various forms of periodic reviews and or monitoring of the ZINWAER. This task is expected to be carried out by the authority throughout the lifecycle of the newly implemented information system, but when the authority needs assistance of the student he will be happy to assist them.

Three types of system maintenance processes:
- **Adaptive maintenance**
- **Corrective maintenance**
- **Perfective maintenance**

5.5.1 Adaptive maintenance

This type of maintenance is carried out to make ZINWAER usable in a changed environment. This can be as a requirement that ZINWAER need to interface with other newly developed information systems of the authority. To achieve this goal additional hardware might be required and many resources are also needed hence before this operation is commenced, there is need to consult the management for approval. It is safe to say that, in this sense that there is no fault or error in the new system but the system is adjusted to address new needs.

5.5.2 Corrective maintenance

This is the maintance performed to address faults and errors in either hardware or software of the newly implemented system. The major aim is to address errors without altering any system functionalities of the system. These errors are to be addressed quickly and silently as this in a way can pause a bad image to the authority.

5.5.3 Perfective maintenance

This type of maintenance is aimed at improving the performance, maintainability, or other attributes of the information system. Extend the software beyond its original functional or nonfunctional requirements. It is solely to prestigiously meet the extra needs of the users for instance allow the users to change the color preferences of their graphical user interfaces.

5.6 RECOMMENDATIONS FOR FUTURE WORK

The development of the Zimbabwe National Water Authority Electronic Record Support system has brought the authority's stuff and the student closer together and this relationship has been fruitful to both ends. The student recommends that the authority continuously assist other researchers and students the same way they made it possible for this research into becoming a success.

If possible, the authority can make it possible for researchers (university students) to collectively come together and start working onto its systems (that aren't digitized as of yet) to achieve a digitized and green organization with affordable and flexible budgets.

5.7 CONCLUSION

ZINWAER has met all the objectives pointed in the problem definition of the authority in many disciplines and it was successfully implemented, but suffice to say that, this is the first step into a paperless office in the Zimbabwe National Water Authority. This project has come to an end and it was a success.

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APPENDICES

APPENDIX A: USER MANUAL

The user manual of the **Zimbabwe National Water Authority Electronic Record System** comes in two sections. These sections include the Administrator section and The Security Personnel section.

Login Form

The system's Administrator default Username and Password are as follows:

- ➢ Username = **tagc**
- ➢ Password = **golden..**

The systems's Registry Personnels default Username and Password are as follows:
- ➢ Username = **hunny**;
- ➢ Password = **golden..**;

These can either be changed or deleted when the system is delivered to the authority's IT department.

Note: The username and password have a *minimum of 4 characters*, and a *maximum of 8 characters*, therefore all passwords and usernames of all the users of this system must fit within the above stated range.

The Administrator Section

After the system loads all the necessary components, the Zimbabwe National Water Authority Electronic Records System will load a default login form, which has the same GUI for different user's login in the system, but it has an intelligent code that will pick different distinct access levels from the login details supplied by the users.

If correct login details are entered then the administrator will be directed to the administrator's default page. The administrator's default page have five distinct tabs in one form. These tabs allows the administrator to oversee the entire system. It is important to note that at this point that the *administrator has no limitation in access of this entire system*. He can add, edit, delete and search all the files, users and system logs details from the system's database.

System Logs

The first tab *after a successful login is the System Logs tab;*
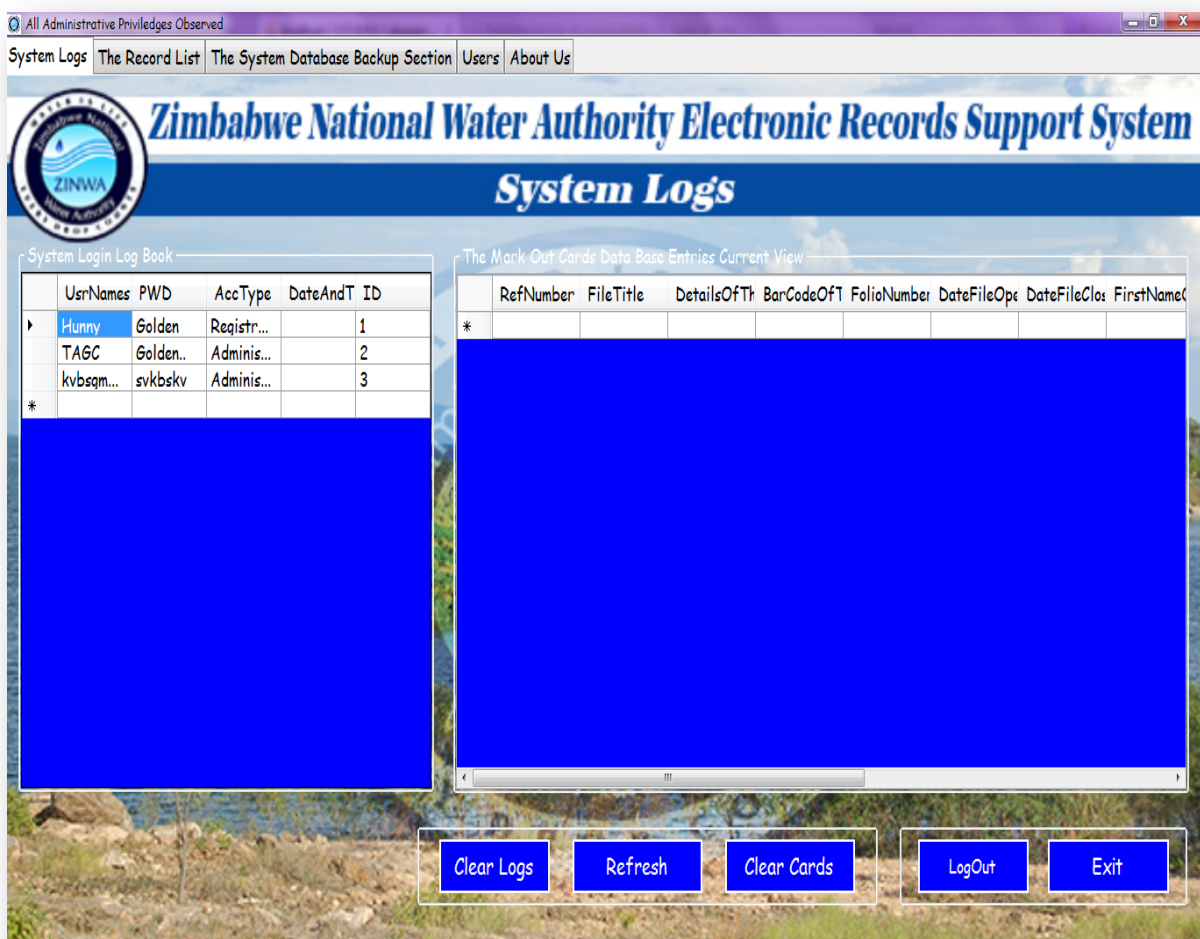
> ➢ This tab displays all the current login logs of the the Electronic Records Support System;

- There are also options to clear the logs from the database as a way to start a new log on a given period;
- The system will ask the admin if he is sure on the decision to clear the logs as this is a very sensitive process;

The Record List
- The second tab of the default administrator's form
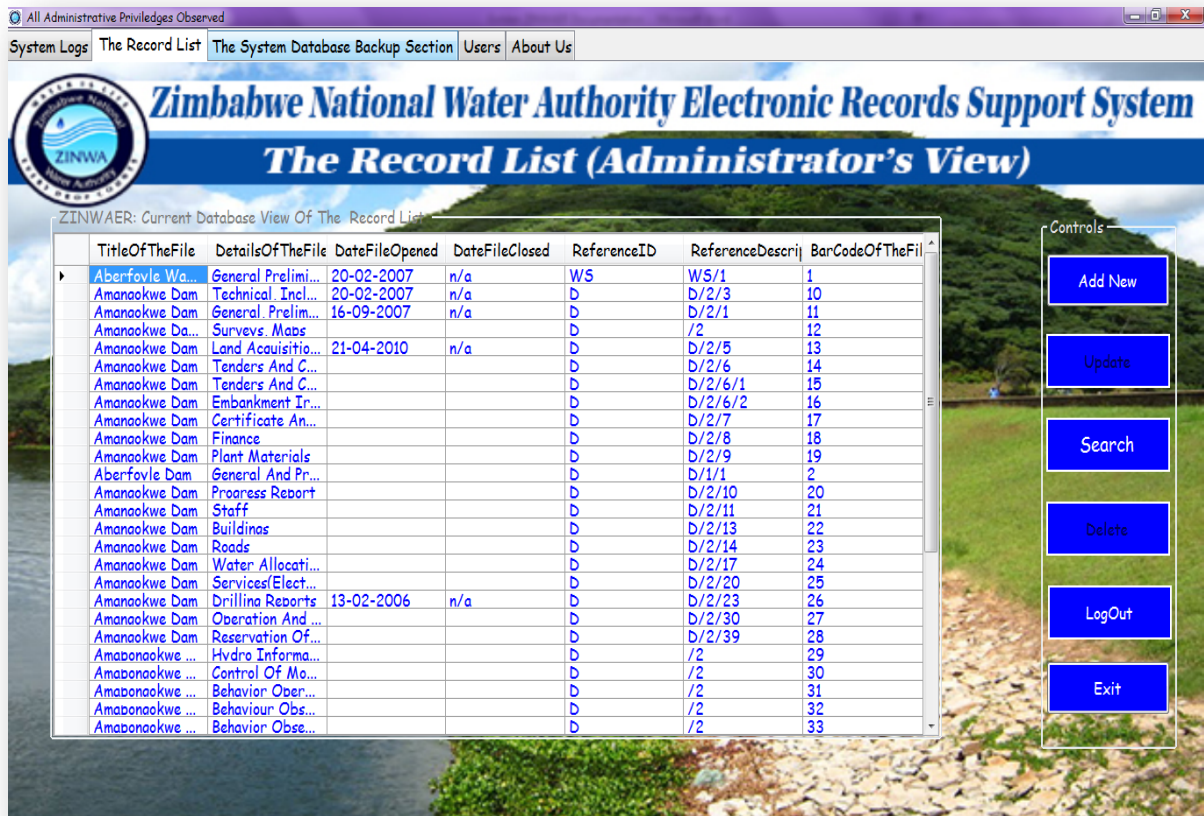
- When the administrator click press any collumn for editing or updating of the Record List provided on the datagridview, the system will automatically & magically fill the form that was initially not visible to the previous form. Consider the other screen shot below. To add new and or search the database consider the controls to the right.

The System Database Backup Section

> ➢ The third tab is one of the most essential tabs of this system it serves with a function to backup the system's database and or restore it thereof;

Users

> When the administrator wishes to add a new user into the system's database, he simply fills in the form readily available on the Users Tab;

Feedback

> After the correct details are inputed the system will then verify the details provided and give a feedback to the user (in this case the administrator).

> Feedback in this entire system is given in two distinct forms:

i. A beeping sound.

ii. A messagebox (these have various categories, ie. Critical, informative e.t.c).

> These messageboxes are found at work in this system as follows

The critical messagebox, giving feedback to the admin user that it is not practical to save a user with a null value;
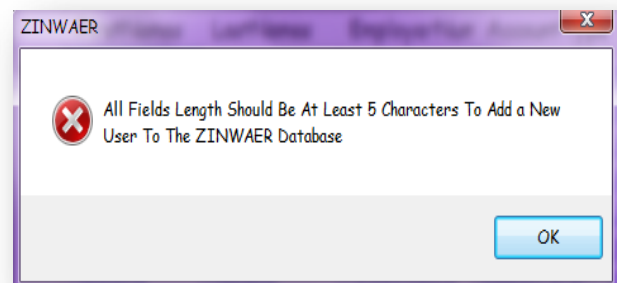
➤ The is an informative messagebox, giving feedback to the admin user that the data input to the system was successfully updated;

➤ The Question Messagebox, gives feedback request asking the administrator if he is sure to execute the command if yes then the command will be executed.
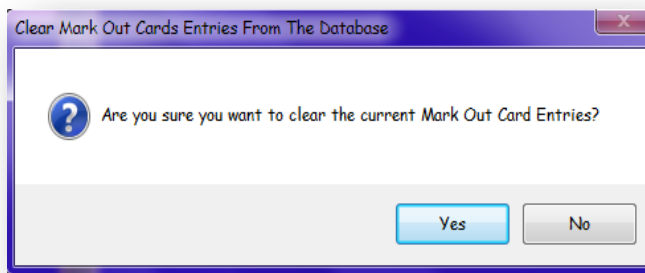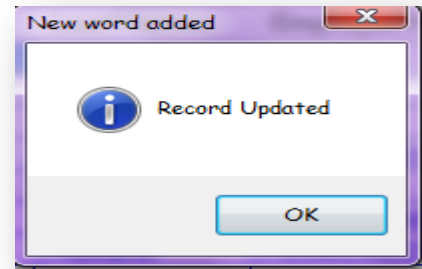
Printing the Barcode Stickers from the ZINWAER System

➤ When pressed the "Print Barcode" button; the system will launch another special program in a separate window.
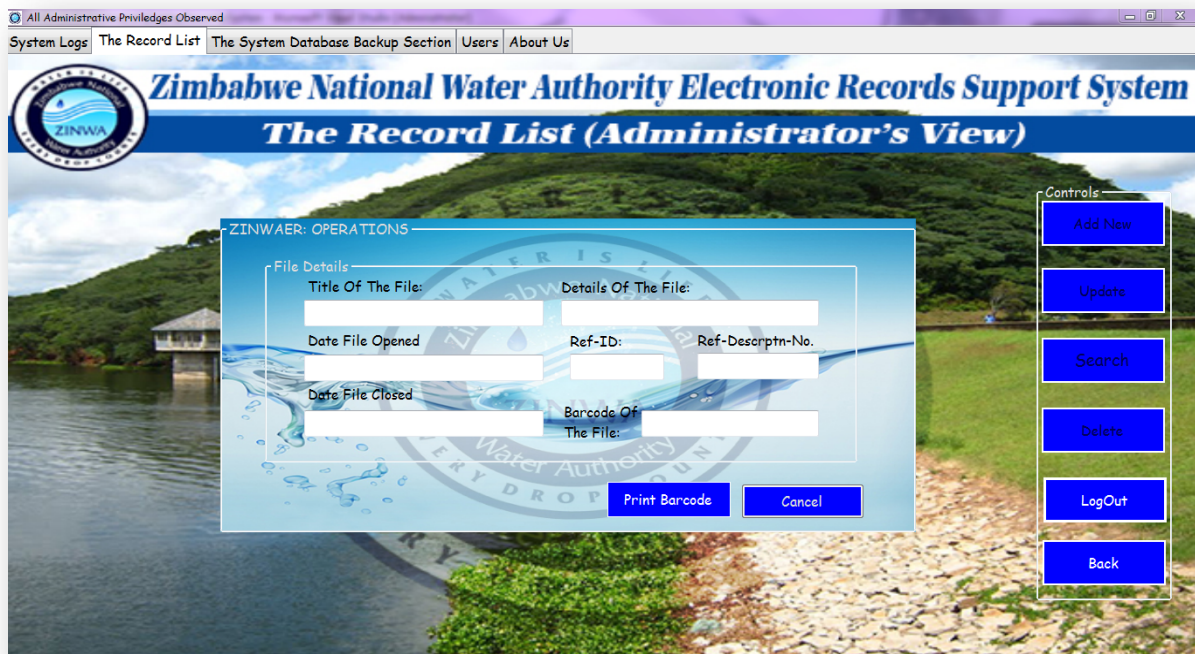
➤ The command button will open the barrilo barcode software, which makes it possible to assign a **UAE-13 1-D barcode** with thirteen figure code.

Note:

➢ Within the scope of this system the barcoding type to be used are the **UAE-13.**

➢ These are seleceted as they can catter for a large population sample, in other words they have a bigger range as compared to EAN-8 with 8 digits; UPC-A with 12 digits and UPC-E with 12 digits.

➢ The other reason for selection of the **UAE-13** is that they can be read by the scanner more efficiently than the rest.

The Barrilo Barcode Software
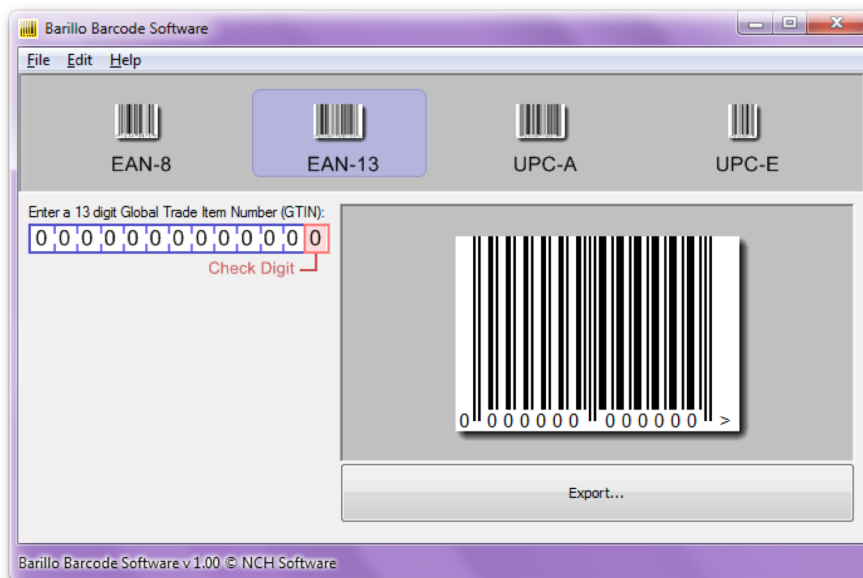
➢ Barillo Barcode Software is an easy to use application for creating barcodes. Barcodes may be previewed, then exported to any image file formating (.png,.jpg,.jpeg,.jpe etc).

System Requirements of running the barcode software

> Windows XP / 2003 / Vista / 2008 / 7 / 8/8.1

Usage

> A barcode type may be selected from the top panel. See Barcode Types for a list of supported types.

> The value (payload) for the barcode can be entered using the entry box on the left. As you type, the preview window on the right will update.

> To export an image of the barcode, click the "Export..." button or select "Export..." from the file menu.

Barcode Types

> **EAN-8**

   o EAN-8 is an international barcode type used for universally identifiable products. It is only used when there isn't enough space on the packaging for an EAN-13 barcode. An EAN-8 encodes a GTIN-8 (8 digit Global Trade Item Number).

> **EAN-13**

   o EAN-13 is the most common barcode type used internationally for universally identifiable products. An EAN-13 encodes a GTIN-13 (13 digit Global Trade Item Number). EAN-13 type barcodes are an extension of UPC-As, which encode an extra digit allowing them to be used internationally.

> **UPC-A**

   o UPC-A is the most common barcode type used in the USA and Canada for universally identifiable products. A UPC-A encodes a GTIN-12 (12 digit Global Trade Item Number).

> **UPC-E**

   o UPC-E encodes a GTIN-12, like UPC-A, but creates a barcode suitable for smaller packages by using "zero-suppression" to reduce the number of bars needed.

Note: Not all GTIN-12's can be encoded as UPC-E barcodes. The barcode preview will show "Invalid barcode data" when this is the case.
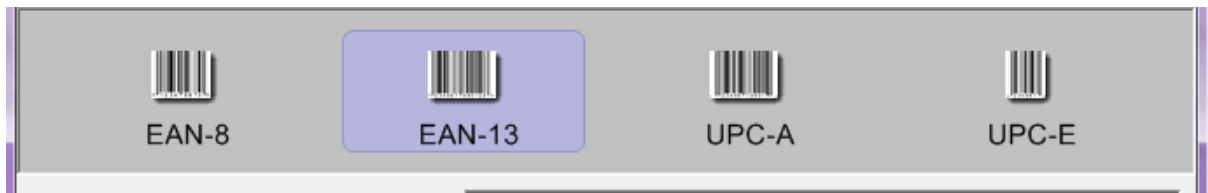
Entering A Barcode Value (Payload) [EAN-8, EAN-13, UPC-A, and UPC-E]

For **EAN-8**, **EAN-13**, **UPC-A**, and **UPC-E** type barcodes, the entry method provided is a fixed-count decimal digit input box. To enter a number, click on the first digit to select it, then begin typing the number. As you type, the check digit (marked) will change to reflect the current digits. You do not need to type the check digit. Digits can also be pasted from the clipboard, by selecting any digit then pressing Ctrl+V.

The number can also be entered directly using a barcode scanner. When a barcode scanner is attached to the computer in the "Keyboard Wedge" mode, scanning a barcode will simulate the typing of the number via the keyboard. So under these circumstances, you may select the first digit in the entry box and then scan a barcode; the digits will be entered into the box.

Exporting Or Printing A Barcode Image
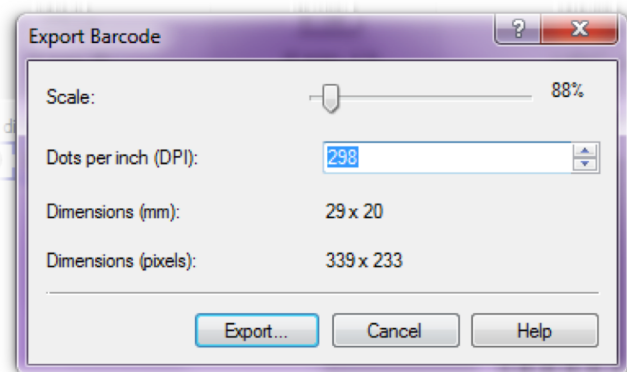
- o Barillo supports exporting barcodes to a variety of image file formats. To open the export dialog, click the "Export..." button or select "Export..." from the file menu.

Scale

- o The scale determines the physical dimensions of the barcode when it is printed. ***Barcode scanners can scan larger barcodes more accurately than smaller barcodes***, so choose the scale that gives the largest dimensions that will fit on your document or packaging.

Note: Barillo will adjust the scale internally, taking into account the chosen DPI (see below), to ensure that bars do not start or end "in between" pixels. This keeps bars as crisp as possible, for better scanning accuracy, but does mean that the scale value shown here is approximate only.

Dots Per Inch (DPI)

o The dots per inch (DPI) determines the definition of the exported image. Higher DPI values allow fine differences in the image to be better defined.

Dimensions

o The dimensions in millimetres and pixels are calculated automatically from the chosen scale and DPI.

Click the "Export..." button to choose a saving destination and file format. The image file formats supported by Barillo are: BMP, GIF, PCX, PNG, TGA, TIFF. For increased clarity and better scanning, use of lossless formats is recommended.

Note: - if great need of understanding arise on the Barillo Barcode Software please kindly visit the Barillo Barcode Software Homepage online, I am sure they will be willing to help on the following: URL: http://www.nchsoftware.com

The USB Barcode Scanner User Manual Points

Installation and Setup

1. Connect the USB cable between scannerand PC.
2. To enable USB keyboard emulation, scan the appropriate barcode below:

0 000000 000239 >

3. If the scanner does not perate properly, remove the scanner from the USB port and plug it into another port after scanning one ofthe USB HID barcodes above.
4. If the scanner still does not operate properly, remove the cable from the PCand pull the cable out of the scanner. Reinsert the cable in the scanner.

The Registry Personnel Section

After a successful login with Registry Personnel credentials, the system will automatically display the default Registry Personnel form. The security personnel is characterised with 2 fully functional tabs.

The Record List

The first tab on the default Registry Personnel page has a form that displays a list of all the records in the **ZINWAER** database entries.

As a registry personnel user of the system, you can only search the entries and cannot add, edit or even delete the items (these were coded as the administrator privileges);

The Mark out Card

The Second and last tab is the mark out tab. This serves by providing easier means and ways to track all the logs of the folders and file issued out requests and returns.

➢ A barcode on the file is scanned all the file details are called from the database and printed on a data grid view.

➢ When the user confirmed the details to be relevant; he will have to click on the data grid view and the system will then automatically transfer the details from the data grid view filling the request file details to electronic log book of the system.

Since it is a tab for a restricted user; the form is designed to limit the flexibility to edit and or delete the entries from the database.

➢ A system's clock is also visible on the form;

APPENDIX B: MANAGEMENT QUESTIONNAIRE

 TO BE ANSWERED BYZIMBABWE NATIONAL WATER AUTHORITY STAFF.

Where answer boxes are, tick inside the box that best suits your answer.

1. What is the name of the current system?

…………………………………………………………………………………………..

2. Is the system computerized or not?

Manual ☐   Partially Computerised ☐   Computerised ☐

3. Are you satisfied in using the system?   Yes ☐   No ☐   Partially ☐

4. How do you rate the current system?

Poor ☐   Good ☐   Average ☐

5. What are the processes involved in the booking out and returning of the files back in the repository using the manual system?

…………………………………………………………………………………………
…………………………………………………………………………………………
………………………………………………………………………………………..

6. What problems are you facing when using the current system?

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

7. What recommendations do you suggest as solutions to the problems stated above?

…………………………………………………………………………………………
…………………………………………………………………………………………
………………………………………………….……………………………………
………………………………………………………….……………………………

8. Do you think the development of dissertation support system will overcome the problems? Why

……………………….……………………………………………………………………
…………………………….…………………………………………………………………
………………………………………………………………………...…………………

9. Do you think the electronic support system will improve the way files are trafficked?

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10. What do you suggest as the requirements of the system?

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APPENDIX C: INTERVIEW CHECKLIST

INTERVIEW SCRIPTS FOR SYSTEM USERS

1. What is the name of the current system?

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

2. Are there any problems in using the current system, how does the current system operate?

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

3. How do you feel when you are using the current system to perform your daily work activity? Explain your answer.

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

4. What problems are you facing in using the current system?

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

5. What do you recommend as solutions to tackle these problems?

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

6. Do you think the development of a new electronic record support system will overcome the problems you mentioned earlier? Explain.

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

7. What do you recommend on the development of the new system?

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

APPENDIX D: OBSERVATION SCORE SHEET

OBSERVATION SHEET FOR ZIMBABWE NATIONAL WATER AUTHORITY.

Date: .... **Observer**: …………………………………………………………..

Time: ……………………………………

Department

……

……

Observation

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Conclusion………………………………………………………………………………………

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APPENDIX E: CODE SNIPPET

Code to Connect To DB

```vbnet
Dim conn As MySqlConnection
'connect to DB
conn = New MySqlConnection
conn.ConnectionString = "server=localhost; user id=root; password=; database=zinwaer"
```

Code to Log In

```vbnet
    Try
        Dim myAdapter As New MySqlDataAdapter
        Dim sqlquery = "SELECT * FROM zinwaerusers WHERE AccountType like '%" &
CmbBxAccType.Text & "%' AND Usernames like '%" & TxtUsername.Text & "%' AND Passwords like
'%" & TxtPwd.Text & "%' "
        Dim myCommand As New MySqlCommand()
        myCommand.Connection = conn
        myCommand.CommandText = sqlquery

        'start query
        myAdapter.SelectCommand = myCommand
        Dim myData As MySqlDataReader
        myData = myCommand.ExecuteReader()
        'see if user exists
        If myData.HasRows = 0 Then
            TxtUsername.Focus()
            MsgBox("Invalid Login!!!", MsgBoxStyle.Critical)
            Call Reset()
        Else
            If CmbBxAccType.Text = "Administrator" Then
                Me.Hide()
                AdministratorDefaultForm.Show()
                Me.Close()
            ElseIf CmbBxAccType.Text = "RegistryPersonnels" Then
                Me.Hide()
                RegistryPersonnels.Show()
                Me.Close()
            Else
                MsgBox("Error Please Select Account Type")
            End If
        End If
    Catch ex As Exception
        MsgBox(ex.Message)
    End Try
```

Code to Log Out

```vbnet
        Me.Hide()
        FrmLogin.Show()
        Me.Close()
```

Code to Create Account

```vbnet
If txtbxAdmnFirstName.Text = "" Or txtbxAdmnLastName.Text = "" Or
txtbxAdmnEmployerNmbr.Text = "" Or CmbBxAccType.Text = "" Or txtbxAdmnEmailAddress.Text =
"" Or txtbxAdmnUserName.Text = "" Or txtbxAdmnPWD.Text = "" Then MsgBox( "Cannot Populate
Database... Fields should not contain null value",MsgBoxStyle.Critical, "Unable to save")
        Else
            Call Connect()
            SQLStr = "INSERT INTO
zinwaerusers(FirstNames,LastNames,EmployerNumbers,AccountType,Emails,Usernames,Passwords)
VALUES('" & txtbxAdmnFirstName.Text & "','" & txtbxAdmnLastName.Text & "','" &
txtbxAdmnEmployerNmbr.Text & "','" & CmbBxAccType.Text & "','" &txtbxAdmnEmailAddress.Text
& "','" & txtbxAdmnUserName.Text & "','" & txtbxAdmnPWD.Text & "')"
            Try
                myCmd = New MySqlCommand(SQLStr, myConn)
                DataRader = myCmd.ExecuteReader()
                DataRader.Close()
            Catch ex As Exception
                MsgBox("Error in saving to Database. Error is :" & ex.Message)
                Exit Sub
            End Try
            txtbxAdmnEmailAddress.BackColor = Color.White
            txtbxAdmnEmailAddress.ForeColor = Color.Black

            ResetTextBoxes()
            Call ResetTextBoxes()
            Call DisplayRecords()
        End If
```

Code for scanning barcode files

```vbnet
  'BARCODING METHODS CALLED WHEN THE BARCODE TEXTBOXES ARE CALLED
  Public Sub BarcodeInputScanningInput()
        Dim con As MySqlConnection = New MySqlConnection("Data Source=localhost; user id=root;
password=; database=zinwaer;")
        Dim ds As DataSet = New DataSet()
        Try
            myConn.Close()
            myConn.Open()
            SQLStr = "SELECT * FROM recordlist WHERE BarCodeOfTheFile LIKE'%" &
TRextBxMCDBarcode.Text & "%' AND Status LIKE'Available'"
            MyDataAdapter = New MySqlDataAdapter(SQLStr, con)
            MyDataSet = New DataSet
            MyDataAdapter.Fill(ds, "recordlist")
            DataGridViewMCDBarcode.DataSource = ds
            DataGridViewMCDBarcode.DataMember = ds.Tables(0).ToString
            myConn.Close()
            TRextBxMCDBarcode.Clear()
        Catch ex As Exception
            MsgBox(ex.Message)
        End Try
    End Sub
```