# Abstract

The manual staff appraisal system at ZIMRA is slow and tiresome due to the length of time it takes to generate and fill in individual employees' evaluation forms resulting in low throughput of employees. The process is also not cost effective to the company as voluminous appraisals are posted to the head office for evaluation and back for feedback. The analysis phase saw the researcher using various data gathering methodologies which included interviews, questionnaires and focus groups among others. Therefore, from the analysis the researcher proposed development of a performance appraisal system that centrally locates all performance appraisal information within a formal framework. A detailed feasibility study was carried out and it resulted feasible to design the system and an in-house development solution was recommended. Various designing tools have been used which includes MYSQL and PHP servers. The system allows employees to fill appraisal forms online and submit them online. \Automated score cards computation, and feedbacks will provide the important features of the system. The system was successfully implemented and parallel changeover was the recommended changeover strategy due to its many advantages over other strategies. Maintenance was carried out using perfective maintenance strategy which allows for continual improvement of the system. It's the view and aspirations of the researcher to have the system integrating the training modules which manages recommended training schedules in a bid to continuously cope with changing technological environment.

# Declaration

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

Signature……………………………………… Date…………………………………………

# Approval

This dissertation entitled "**Zimra Performance Appraisal system**" by **Clayton Kasiyandima** meets the regulations governing the award of the degree of BSc HONOURS COMPUTER SCIENCE of the Midlands State University, and is approved for its contribution to knowledge and literal presentation.

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

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

# Acknowledgements

# Dedication

I dedicate this research to my parents and friends for their untiring support and source of inspiration

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# List of Acronyms

| DFD | Data Flow Diagram |
|-----|-------------------|
| ERD | Entity Relationship Diagram |
| EERD | Enhanced Entity Relationship Diagram |
| GUI | Graphic User Interface |
| LAN | Local Area Network |
| WAN | Wide Area Network |
| PBP | Pay Back Period |
| SQL | Structured Query Language |
| ROI | Return On Investment |
| NPV | Net Present Value |
| CBA | Cost Benefit Analysis |
| HTML | Hyper Text Mark-up Language |

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# Chapter 1: Introduction

## 1.1 Introduction

The ZIMRA performance appraisal system will automate the manual appraisal process. The system centrally locates all the performance appraisal information within a formal framework and provides recommendations for training needs of employees. It allows employees to fill appraisal forms online and submit them online. Automated score cards computation, and feedbacks will provide the important features of the system. Benefits to the company includes faster appraisal process, systematic and reliable storage capabilities which makes data mining easy.

## 1.2 Background of organisation

ZIMRA (Zimbabwe Revenue Authority) is a product of the Government's economic reform program which succeeded the Department of Taxes and Customs and Excise that became effective in 2001. ZIMRA is responsible for collecting taxes and duty in Zimbabwe. Since then, ZIMRA has put in place client centric strategies for the convenience of the transacting public. ZIMRA derives its mandate from the revenue Authority Act [Chapter 23:11] and other subsidiary legislation. The organisation forms a vital cog in the development of fiscal policies through its advisory role in the formulation of the national budget.  It is the responsibility of ZIMRA to facilitate trade and travel in the country as well as enforcement of controls apart from revenue collection.

### 1.2.1 Organisational structure

This is a relational and functional representation of the roles of individuals within the organisation. It presents a highlight of its operational and reporting protocols among superiors and subordinates.  Below is an illustration of the organisational structure for ZIMRA.
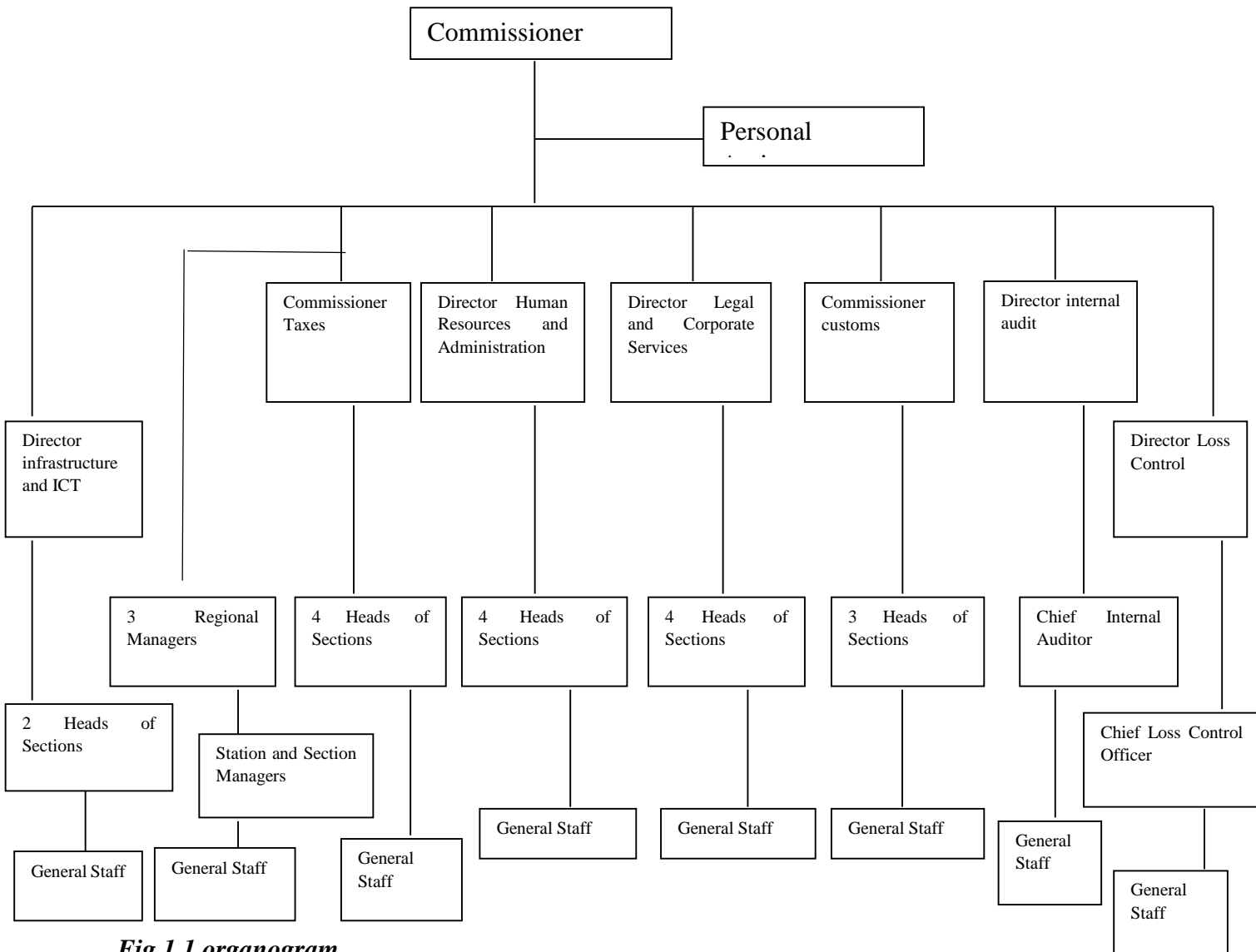
*Fig 1.1 organogram*

### 1.2.2 Vision

A beacon of excellence in the provision of fiscal services and facilitation of trade and travel.

### 1.2.3 Mission statement

To promote economic development through efficient revenue generation and trade facilitation. This is achieved by:

- ➢ Developing competent and motivated staff.

- ➢ Using environmentally sustainable processes, and engaging with the global community in a socially responsible way.

## 1.3  Problem definition

The manual staff appraisal system at ZIMRA is slow and tiresome due to the length of time it takes to generate and fill in individual employees' evaluation forms resulting in low throughput of employees. The process is also not cost effective to the company as voluminous appraisals are posted to the head office for evaluation and back for feedback. Another key problem is the need to assemble composite profiles of an employee's performance for example over long periods of time for performance based rewards.

Additional problems identified include:

➢ Deficiency of suitable standard storage space for the forms. The use of filling cabinets to store forms has resulted in overcrowding in the HR offices and the security and storage conditions of appraisals has been put to question.

➢ The business recruits new personnel quarterly largely in its remote branches due to increase in business. This has conversely seen a notable continuous escalation in the mailing cost of appraisals.

➢ The Human resources office presently lags behind in drafting an all-inclusive training schedule to cover all the employees based on their performance as this is an arduous task requiring composite marks from various quarters to be manually calculated.

➢ Key decision makers are finding it inflexible to arrive at objective decisions on performance based rewards and promotions as they do not have composite structured and graphic profiles of employees' performance over given time periods which negatively impacts the rewards system and making data mining difficult.

## 1.4  Aim

To develop an online performance appraisal system.

## 1.5 Objectives

> ➢ To develop a system that centrally locates the performance appraisal information.

> ➢ To capture and process balanced scorecard percentile scores.

> ➢ To heighten security of the appraisal process through the application of robust password and access rights procedures.

> ➢ To enable tracking of appraisals in formulating suggestions to the management for strategic planning.

> ➢ To provide training needs of employees based on appraisal information.

> ➢ To provide an offline backup storage facility for the human resources department.

> ➢ To provide a data repository storage platform for feedback analysis and data mining.

## 1.6 Hypothesis

An internally generated solution is recommended based on the needs and customisations required. The following needs are a requirement:

> ➢ **Microsoft Windows 8**:   forms the system development environment. It has been chosen for its ease of use as well as encryption capabilities. It also presents a file format that is easy to manage and work with.

> ➢ **Microsoft Office**: chosen for document support and documentation. Presents easy to use graphical and menu based interfaces.

> ➢ **Oracle's MYSQL**: the database management system to be used. Supports standard SQL and presents built in security protocols and ease to use interfaces.

> ➢ **APACHE server**: Runs PHP effectively

> ➢ **Dreamweaver CS6**: an application customised to support coding platform as well as interface design and is a rapid application design tool.

> ➢ **Microsoft essentials**: A windows based anti-virus software with automatic free updates and works best with the chosen operating system.

## 1.7   Justification

An effective performance appraisal system is important to making proper personnel decisions. The proposed system is centrally managed which makes extraction and analysis easy. Development of an in-house system has been recommended for the following benefits which are derived from this system:

- ➢ By centrally pinpointing the performance appraisal information within a prescribed framework, managers can more easily communicate business strategy and create measurable goals for employees that will support company objectives.
- ➢ The use of a centrally managed database supports report generation in a more cost effective way and the hence saves time.
- ➢ Provides tools to measure individual performances more effectively thus individual goals can be effectively communicated and measured.
- ➢ Use of the system ensures that a track of individual projects is kept and centred upon company affiliated goals. Tools can be used to evaluate completion and non-completion of these goals more effectively.
- ➢ Educated business choices concerning promotions, rewards, and succession planning can be made based on application of data mining and analysis technics on the collected information.
- ➢ Provides a platform for feedback and analyses of goals by presenting graphical representation of performances against goals for easy analysis.
- ➢ The business is large and full consideration has to be made in line with its organisational structure if information strategy is to be adopted effectively without compromising its values and culture thus an in-house development is preferred.

- ➢ The company boasts of well-trained developers and systems analysts hence the system can be internally developed while maintaining the same level of integrity and  effectiveness thus cutting the cost associated with licencing and training consultancy that an off the shelf system would require.

- ➢  Reporting structures are not broken since existing managers can also work as project managers during development work.

➢ Features specific to the organisation can be easily optimised and chances of redundant processes are reduced.

➢ Security procedures can be maintained during development and company data is managed internally.

## 1.8 Conclusion

The problems associated with the manual system have been clearly explored and a vibrant presentation of objectives has been made. A presentation of the organisational structure has been put in place. Tools to be used in development have been identified and the system development is justifiable. The next chapter is the planning stage which includes a detailed feasibility study.

# Chapter 2: Planning Phase

## 2.1  Introduction

This phase seeks to gather and sort out organisational resources with the aim of evaluating feasibility of carrying out the project through analysis of availability of resources and the requirements. A comprehensive evaluation of benefits against cost will be done. This phase clarifies the work plan and sets stage for the analysis stage.

## 2.2  Why Build the System

One of the most fundamental concepts of system design is first is asking why the system should be built. Only then would integrity be met, and system requirements can be clearly defined. The following are some of the reasons for building the system:

- ➢ **Increased productivity:** By centrally pinpointing the performance appraisal information within a prescribed framework, superiors are able to straightforwardly communicate business strategy and create quantifiable goals for their employees that will support overall company objectives.
- ➢ **Cost Reduction**:   Provides tools to measure individual performances more effectively thus individual goals can be effectively conversed and measured while greatly reducing mailing costs and stationery processing costs.
- ➢ **Effective Tracking of goals:** Ensures that projects are kept on track centred upon recognised goals that are affiliated to organisational objectives. Tools can be used to evaluate completion and non-completion of these goals more effectively.
- ➢ **Adaptability**: The organisation gains inherent benefits of adapting information systems strategy and educated business choices concerning promotions, rewards, and succession planning can be made based on application of data mining and analysis technics on the collected information
- ➢ **Heightened security:** institution and maintenance of highly secure security protocols in providing a platform for feedback and analyses of goals by presenting representation of performances against goals under secure system protocols.

## 2.3 Business Value

The cornerstone to which information systems are built relies upon how much of importance the system is to the business. An effective innovation should therefore return business value and be cost effective if it is to be effectively adapted. Business value seeks to explore all business units including aspects of economic value, social value and not limited to monetary value alone. These include:

➤ **Improved availability:** the client server architecture that the web function guarantees ensures that business is not limited to business hours only and employees can access vital information in the comfort of their homes.

➤ **Performance throughput**:   Provides tools to measure individual performances more effectively thus individual goals can be effectively communicated and measured while greatly reducing mailing costs and stationery processing costs.

➤ **Improved security**: the use of strong access controls and security protocols ensures data security thus integrity is returned which forms a vital cog in safeguarding organisational outlook and maintaining a repute competitively.

➤ **Reliability**: the secure nature of the system returns confidence in its use thus management can rely upon the system in decision making.

➤ **Functionality**:  The appraisal system goes past merely accepting and storing input data but expands the scope of the appraisal process to embrace online capture of percentiles to automated referencing of reports, in so doing enhancing business value by supplying numerous forms of reports for qualitative decision making.

## 2.4 Feasibility Study

The process of feasibility analysis critically assesses whether the projected benefits of the system outweigh both the initial set up costs and the development costs or not and sets stage for debate on the way forward concerning continuing with the project. It evaluates if the project is viable within constraints of time and resources. It is observed under technical, economic, operational and social feasibility.

### 2.4.1 Technical Feasibility

This process assesses whether the proposed system can actually be built and maintained within the constraints of available time and resources, including human resources. It measures the required functionality of the proposed system against the available hardware, software and human resources. Aspects such as infrastructure requirements also forms a vital part of the study.

### 2.4.1.1 Hardware Requirements

Breaks down the hardware and infrastructural requirements to ensure successful implementation of the project. Table below identifies and documents these requirements together with their state of availability and quantities.

| Item required | Specification | Quantity | Availability | Comments |
|---|---|---|---|---|
| Laptops | 2Gig Ram,1.8GHz, 250HDD,DVD/RW | X 7 | YES | Users already have the required machines. |
| UPS(uninterrupted power supply unit) | APC 180Watts 300VA 230V (I/O) standby time 10Hrs | X4 | NO | The admin has agreed to purchase and quotations have already been made |
| Server | 4Gig RAM, 400HDD SATA-RAID 3GHz+ quad Core Processor(oracle Sun Server) | X2 | YES | Zimra boasts of modern oracle SUN servers already In use |
| Cisco switch | 24 Port adaptor | X2 | YES | - |
| Printers | HP LaserJet 4700 | X3 | YES | - |

*Table 2.1 hardware requirements*

### 2.4.1.2 Software requirements

Breaks down the software requirements to ensure successful implementation of the project. Table below identifies and documents these requirements together with their state of availability.

| Required software | Availability | Comments |
| --- | --- | --- |
| Dream Weaver CS6 | NO | Admin has agreed to purchase and a quotation has been made |
| Microsoft office | YES | - |
| Windows 8 OS | YES | Already in use and licence for updates and patches already purchased |
| MYSQL and APACHE Server | NO | A free download that can be easily accessed |
| Microsoft Essentials | YES | - |

*Table 2.2 software requirements*

### 2.4.1.3 Technical Expertise

This assesses the handiness of the necessary human resources with the technical knowhow to develop, use and maintain the proposed system.

> **Developers**: The Company already boats of well-trained developers well versed with the PHP, MYSQL and other software development packages required during development. It can also be noted that the company secure external services of organisations such as Oracle and Microsoft who also aids internal staff where consultation is needed.
> **Users**: The proposed users of the system already uses sophisticated systems and training them to use the proposed system proves to be a stress-free task, and the existence of a home-grown training centre further simplifies the already easy charge.

Clearly it can be noted from the above hypothesis that all the required software and hardware and technical expertise are met. A conclusion can be made that the technical feasibility passes resoundingly.

**2.4.2   Economic Feasibility**

Measures the financial impact of the project and its emphasis is based primarily on the monetary value.  It assesses the development costs and operational costs and measure if they are outweighed by the projected monetary benefits. Various techniques are employed to determine viability and they include:

> Cost benefit Analysis
> Pay Back Period
> Net Present Value
> Return On Investment

**2.4.2.1   Cost Benefit Analysis**

It is often necessary to decide if the proposed project is the best of several alternatives, even if the estimated benefits exceed the estimated costs. Any meaningful cost benefit analysis should identify the costs and benefits associated with the project and operating the delivered application expressed in common units.

**2.4.2.1.1   Benefits**

The thought of determining benefits often leads to categorising them into tangible and intangible benefits. Tangible benefits are quantifiable and a value can be assigned to them. On the other hand intangible benefits cannot be discretely assigned a value to.

**2.4.2.1.1.1   Tangible Benefits**

> **Reduced costs**: online capabilities offered reduces overall mailing costs of appraisals, saves stationery and increases printer idle time due to less use of stationery.
> **Increased Productivity**: increased throughput through faster reports retrieval and ready recommendations.
> **Reduced workload**: the need to manually calculate score card percentiles is eradicated thus reducing work for the HR.

### 2.4.2.1.1.2 Intangible Benefits

- ➢ **Improved employee morale**: due to flexibility of the system through online capabilities
- ➢ **Easy decision making**: due to comprehensive reports that the system produces.
- ➢ **Improved information security**: the application of strong passwords heightens security of appraisal information.
- ➢ **Reduction of random errors**: the automated process ensures that human errors are kept at bay thus a more accurate appraisal process.

### 2.4.2.1.2 Costs

These are the projected or expected costs of designing and operating the system. They are categorised into development and operational costs.

### 2.4.2.1.2.1 Development Costs

- ➢ **Additional computers:** Although users already have them which they use for day-day work, additional computers are needed for the project team.
- ➢ **Additional human resources:** Effective implementation of a project requires assigning people who are fully committed to the project. More staff may be needed to ensure projects continues while day-day work is not disrupted.
- ➢ **On project costs:** Minimising project breaks requires financial backing to ensure that members are glued to the project. Provision of lunch and transport goes a long way.

### 2.4.2.1.2.2 Operational costs

- ➢ **User training costs:** To retain best results users of the system needs training to be able to effectively carry out their expected deliverables.
- ➢ **Maintenance costs**

Below is the breakdown of the cost benefit analysis table for the next four years. All unit amounts are in USD.

| | 2014 | 2015 | 2015 | 2016 | |
|---|---|---|---|---|---|
| **BENEFITS** | | | | | **Total** |
| Increased productivity | 750 | 800 | 400 | 300 | |
| Reduced mailing costs | 300 | 350 | 400 | 450 | |
| Reduced storage costs | 250 | 250 | 250 | 250 | |
| Improved efficiency and security | 200 | 200 | 150 | 150 | |
| Reduced workload | 450 | 400 | 350 | 350 | |
| **Total benefits** | **1950** | **2000** | **1550** | **1500** | **7000** |
| | | | | | |
| **DEVELOPMENTS COSTS** | | | | | |
| Additional software and hardware | 500 | 00 | 00 | 00 | |
| Additional computers | 500 | 00 | 00 | 00 | |
| Additional human resources | 300 | 00 | 00 | 00 | |
| **Total development costs** | **1300** | | | | **1300** |
| | | | | | |
| **OPERATIONAL COSTS** | | | | | |
| Maintenance costs | 200 | 300 | 100 | 100 | |
| User training costs | 300 | 150 | 100 | 100 | |
| **Total operational costs** | **500** | **450** | **200** | **200** | **1350** |
| | | | | | |
| **Total projected costs** | **1800** | **450** | **200** | **200** | **2650** |
| | | | | | |
| **NET BENEFITS** | **150** | **1550** | **1350** | **1300** | **4350** |
| | | | | | |
| **Net Profit over four years** | | | | | **4350** |

*Fig 2.1   Cost Benefit Analysis Table*

The table summarises the total costs against and benefits accrued over fours. The resulting net profit of $4350 is obtained. The net profit figure obtained endorses the project as economically feasible.

**2.4.2.2   Payback Period**

Assesses the period required to return or break even the primary stock

Payback period = initial investment   X time (years)

  Net benefits

$$\frac{1800}{1950} \ \text{X } 12 \ = 11$$

The initial investment is returned within the first 11months which is economically equitable.

### 2.4.2.3  Net Present Value

An evaluation technique that takes into account the profitability of the project as well as the timing of the cash flows that are produced.

$$\text{Present value} = \frac{\text{value in year t}}{(1 + r)^t}$$

Where: **r** is the discount rate =0.1

 **t** is the number of years  that the cash flow occurs

year1: PV= $\frac{1950}{1.1^1}$ = 1772

Year2: PV= $\frac{2000}{1.1^2}$ = 1818

Year3: PV= $\frac{1550}{1.1^3}$ = 1409

Year4: PV= $\frac{1500}{1.1^4}$ = 1364

NPV= (PV1+PV2+PV3+PV4- Initial Outlay)

=1364+1409+1818+1772-2650

=3713

### 2.4.2.4  Return on Investment (R.O.I)

Compares the net gain to the investment required.

$$ROI = \frac{\text{mean annual profit}}{\text{Total investment}} \times 100$$

$$\text{Mean annual profit} = \frac{\text{net profit}}{\text{Number of years}}$$

Year1:    $R.O.I = \frac{150 * 100\%}{1800}$

$= \mathbf{8.33\ \%}$

It can be noted that the profit margin increases linearly every year. This is due to the decrease in overall expenditure once the system becomes functional. A strong positive R.O.I in the first year sets stage for even more positive values for the following years.

The values obtained in the calculations above clearly show positive results. This analysis certifies the project feasible from an economic point of view thus passing the economic feasibility.

### 2.4.3   Social Feasibility

Social feasibility assesses the social benefit that the system presents to the business and society at large. Successful implementation of an information system strategy requires full consideration of business processes and relating them to the impact of the proposed system to cultural and societal values of the organisation and the employees. The following are some of the social benefits of the system:

➢ Improved flexibility of the appraisal process increases employee morale which can be extended to good working relations within the organisation and community at large.

➢ Reduced appraisal errors ensures a fair appraisal process that is likely to be acceptable to all employees thus they can go back to their families stress free hence improving relations at home.

➢ Financial benefits obtained from the use of the system can be channelled to support social events thus improving organisation's corporate social responsibility.

➢ Reduced workload means employees may spent more time with their families and loved ones.

Retrenchment packages have already been put in place for a few who may lose jobs. Nevertheless, the benefits still outweigh the shortcomings thus social perspective of feasibility study gives it a go.

### 2.4.4 Operational Feasibility

Operational feasibility assesses the system compatibility with the current business structures as well as how usable and acceptable the system is. It also looks at how the system affects stakeholders and the training needs of employees is assessed. The key operational competences of the system includes:

- ➢ **User interface:** the system has an easy to use interfaces which makes it easy to use and support.
- ➢ **User manuals:** Upon implementation user manuals shall be produced to aid users thus increasing the usability of the system.
- ➢ **Back up capabilities**: It can be noted that employees are excited by the prospect of using a flexible online system that also allows for restoring and backing up of data.
- ➢ **Flexibility**: The availability of the system online makes it possible for employees to access it even from the comfort of their homes.
- ➢ **Involvement of local developers**: the fact that local ICT personnel are participating during development makes it easy for them to provide user support and carry out maintenance work.

It can be concluded that the system is operationally feasible since it fits well into the current business structures

### 2.4.5 Risk Analysis

Risk analysis identifies, evaluates, and tries to pre-empt project threats before they surface. It also looks at ways to deal with threats already in motion. Below is the risk analysis log for the project which shows how risks will be mitigated:

| reference | Risk statement | chance of occurrence | Impact(if risk occurs | Preventive / contingence measures |
|---|---|---|---|---|
| 1 | Poor time management | medium | Failure to complete project in time | Formulation of an implementation plan and monitor individual contributions. |
| 2 | Failure to meet quality requirements | medium | Failure to meet objectives | Specifying and tracking requirements at every stage. |
| 3 | Strained in house resources | low | Failure to cope with increased workload during development | Creating a stand-alone project team together with backup project members |
| 4 | Disagreements | low | Derails authority | Encourage participation of all members. |

*Table 2.2 risk log*

## 2.5  Work Plan

The design methodology chosen for this project is the waterfall model. Its key processes include:

- ➢ **Problem definition**: clearly identifies and outlines the problems the system seeks to address and in what way.
- ➢ **Feasibility study**:  Assesses practicality and effectiveness of a solution.
- ➢ **System analysis**: a detailed study of the existing system setting ground for design.
- ➢ **System design**: the translation of the theoretical model to a feasible system or logical model.
- ➢ **Implementation**: The institution of the developed working system
- ➢ **Maintenance**: The consistent review and re-examining of the developed system to ensure that remains functioning at optimal

### 2.5.1 Schedule Plan

Shows a breakdown of development phases and their associated durations.

| PHASE | START | END | DURATION(weeks) |
|---|---|---|---|
| **Proposal** | 21/02/2014 | 28/02/2014 | 1 |
| **Planning** | 01/03/2014 | 14/03/2014 | 2 |
| **Analysis** | 15/03/2014 | 29/03/2014 | 2 |
| **Design** | 30/03/2014 | 20/04/2014 | 3 |
| **Implementation** | 21/04/2014 | 28/04/2014 | 1 |
| **Evaluation** | 29/04/2014 | 06/05/2014 | 1 |
| **Maintenance** | 07/05/2014 | ongoing | ongoing |

*Table 2.2 the schedule*

### 2.5.2 The Gantt Chat

The activities to be carried out and the estimated time periods to completion are also shown in the Gantt chat below.

**Time (weeks)**

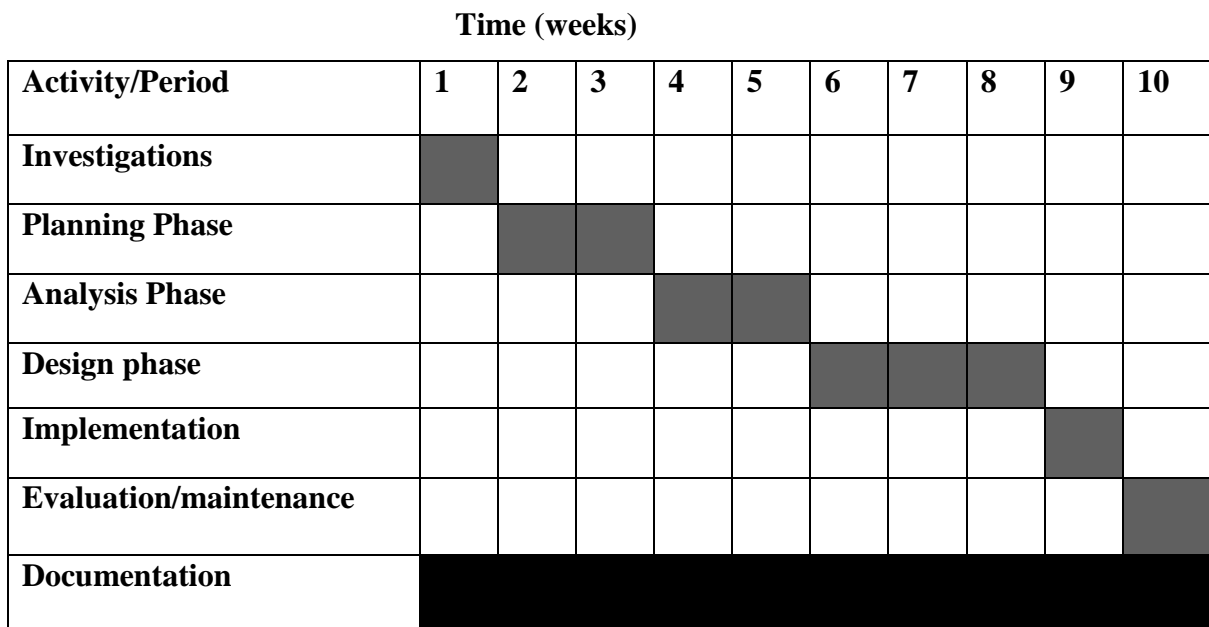| Activity/Period | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Investigations** | ▓ | | | | | | | | | |
| **Planning Phase** | | ▓ | ▓ | | | | | | | |
| **Analysis Phase** | | | | ▓ | ▓ | | | | | |
| **Design phase** | | | | | | ▓ | ▓ | ▓ | | |
| **Implementation** | | | | | | | | | ▓ | |
| **Evaluation/maintenance** | | | | | | | | | | ▓ |
| **Documentation** | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ |

*Fig 2.1 Gantt chart*

## 2.6   Conclusion

Feasibility study was carried out with respect to economic, social, technical and operational feasibility and it was determined that the project can proceed. Business value has also been identified and reasons to why the system must be built also clarified. A detailed work plan and time schedule has been clearly illustrated. The project can proceed to the next phase, analysis of the current system which looks at how the current system operates.

# Chapter 3: Analysis Phase

## 3.1 Introduction

(Cashman, 2001) A process of gathering actual data, recognize processes involved, identifying glitches and vouch for viable proposals for system improvement. This includes reviewing the business processes, collecting operational data, recognise the information stream, discovering tailbacks and developing solutions to incapacitate the flaws of the system. Complex process involving the entire system are also subdivided into workable modules to identify data storage platforms, formats and physical procedures.

## 3.2 Information Gathering Methodologies

These are various techniques that are implemented to gather data about the current system. The following techniques were used:

➢ Interviews
➢ Questionnaires
➢ Onsite observations
➢ Focus groups

### 3.2.1 Interviews

(Holstein's, 2002)An interview describes the denotations of central themes of real world subjects. An interview seeks to understand the meaning of what the interviewees say. Set of questions are asked to a selected group of individuals. In this research employees were the subjects and various levels of employees were interviewed. At least a member of each level was interviewed, this involved senior managers, supervisors, human resources personnel and trainees. Mostly they were carried out during lunch times when employees were free.

#### 3.2.1.1 Advantages of Interviews

➢ They allowed interviews to describe everything imperative to them and allowed clarity to be made enforced on matters which needed explaining thus ensuring efficient data gathering.
➢ Immediate responses ensured timely answers to questions

➢ Personal interaction allowed unspoken gestures to be noted and interpreted on the mental state of employees concerning the use of the system.

➢ An insight to the context of the research could be explained to subjects more effectively.

### 3.2.1.2 Disadvantages of Interviews

➢ Personal interaction sometimes became intrusive which made subjects feel more like being interrogated thus withholding some information.

➢ Personal interaction between the interviewee and the rest of the employees raised issues of bias and misrepresentation due to the interviewer having previously worked with them.

➢ Proved time consuming to set up as many employees were busy during the times of interviews and some out of offices.

### 3.2.2 Questionnaires

This basically an expression of enquiry that invites a reply. They are made up of a set of questions which have a definite purpose that is related to the objectives of the study and a set of guidelines on how to answer. The target group was supervisors, managers and general employees. Questioners were sent through the head office for distribution to employees and filling. Employees where given a about week to return the filled in forms.

### 3.2.2.1 Advantages of Questionnaires

➢ Administering was quite cheaper even when collecting data from a large sample since distribution could be done using existing information distribution means within the organisation.

➢ Reference point information was collected and can be easily tracked over time.

➢ There was a significantly abridged chance of surveyor prejudice since users could fill in without pressure of being singled out.

➢ People felt more willingly to participate in a survey than any other methodology as it kept the confidentiality of their responses immune to anyone.

### 3.2.2.2 Disadvantages of Questionnaires

➢ There was limited control over who completes the questioners thus some important information could have been left out and some untargeted members could have participated.

➢ Good set of questions important to the objectives of the research took time to structure.

➢ Structured questions made it difficult to probe for more information as participants only answer to what is asked.

### 3.2.3 Focus Groups

This the grouping various groups of individuals in the organization based on various criterion such as department, hierarchical level, social group or gender. This enabled an appreciation of the same challenges across the different groups and helped greatly in achieving an optimum solution to these in the new system. In this regard existing departments were used as distinct groups for the research.

### 3.2.3.1 Advantages of Focus Groups

➢ These were easy to set up since Zimra is already grouped into department.

➢ Groups provided more useful information that could not be obtained from individuals.

➢ Proved useful in gaining intelligence to topics other methods could not bring or more difficult to obtain

### 3.2.3.2 Disadvantages of Focus Groups

➢ The views of dominant individuals sometimes slowed down the process and in some can be a source of bias.

➢ The information provided to the individual level was less sufficient to clearly bring out the expected deliverables than other methods could thus personal level interaction lacked.

➢ The presents of superior members deterred effective group participation.

### 3.2.4    Onsite Observations

These involves the actual observing of the operations and processes of the current system. This maybe either be passive, where the researcher simply watches and take notes or actually participating in the use of the system.  Primarily used not only information gathered during the researcher's tenure at Zimra, but also visited the human resources to observe the grading process.

#### 3.2.4.1    Advantages of onsite observations

- ➢ Day-day work was not disturbed during data collection.
- ➢ Data could be collected silently and did not rely on employees' willingness to provide information.
- ➢ Gave first hand clarity to other information gathered through other means.
- ➢ Data relies on what is done rather than what is being said.

## 3.3    Analysis of the Current System

This provides a detailed description of the current systems operations and processes based on information gathered. The current Zimra appraisal system comprises of three key processes which are:

### 3.3.1    Initial Form Generation

This is the initial process that occurs at the very individual level. The human resources provides a generic template in a custom form. The form consists of key result areas and performance measures. The employee fills in all personal information, then they grade themselves against each performance measure in adherence to prescribed standards. Each performance measure is rated against a range of values which makes the percentile range. This provides the basis for the balance score card. The employees then appends their signature before forwarding to their supervisor for review.

### 3.3.2    Secondary Review and Supervisor Review

The supervisor reviews the employee's submission with them, re-grades, ensures that all sections have been filled in correctly, inserts their comments and appends their signature before forwarding the whole section's batch of appraisals to the human resources at the head office.

### 3.3.3   Human Resources Review

Upon arrival, a selected group of human resources personnel assesses all the appraisals and fills in their comments and accords scores based on the scorecard and assessment of performance. Marks are then recorded and a bonus allocation is determined and copies are made for filling. A recommendations schedule is then manually compiled by the human resources officer based on the scores then copies are sent back to divisional supervisors with the suggested training schedule for distribution back to subordinates together with their bonus entitlement.

## 3.4   Process Analysis

They basically look at the interrelationships among processes of the current system. They are best illustrated by an activity diagram that shows processes that causes an event to occur as well as start and end of a process tree. The process start with the employee filling the form and ends when the form is sent back from human resources.

### 3.4.1   Inputs

➢ Generic form template from human resources
➢ Filled in form by employee
➢ Primary grades by employee
➢ Supervisor's corrected form
➢ Balanced score card from human resources

### 3.4.2   Processes

➢ Form template generation by human resources
➢ Form filling by employee
➢ Initial form submission by employee to supervisor
➢ Assessing, correcting and form evaluation by supervisor
➢ Form submission by supervisor to human resources
➢ Human resources receives forms from divisions
➢ Makes assessments of the forms
➢ Marking, recording and storage of appraisal information

- ➢ Generating of final balance score card percentiles by human resources.
- ➢ Calculation of bonus multiple for employees
- ➢ Generating recommendations of training needs of employees by human resources.
- ➢ Return appraised form to employee

### 3.4.3 Outputs

- ➢ Recommendations on training needs of employees
- ➢ Appraised form and comments
- ➢ Bonus multiple allocations
- ➢ Appraisal information reports and performance record.

The activity diagram below shows the process structure of the system. It integrates all these processes and clearly shows who does what in a diagrammatic manner.
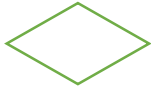
| Employee | Divisional supervisor | Human resources |
|---|---|---|

**start**

Obtains and fills in form

Submits form

Reviews, comments and corrects

Receives all appraisals

Makes corrections ← YES ← Errors

Marks and scores appraisals

NO

Compiles all divisional forms and submit to HR

Records marks, compiles training Recommendations

Calculates bonus and store copies

Receives back appraisal

Receives back appraisals and forwards to employee

Returns appraisals to division

**finish**

*Fig 3.1 activity diagram*

**Key**

Process

Decision

Start/Finish

Flow

## 3.5  Data Analysis

This allows for a clear presentation of data flow to be drawn. It gives a vibrant step to step analysis of both processes and data and how the events which leads to processes occur. Data analysis can be represented using context diagrams and data flow diagrams.

### 3.5.1  Context Diagram

Represents the overall superposition of the whole system. It views the whole system as a single channel to which all processes merge. Context diagrams shows the interaction between all entities with the system and each other. The diagram below shows the context diagram for the system.

**Employee**

**Supervisor**

Compiled appraisals

Filled in appraisals

Appraisal

details

Recommendations

And bonus allocation

**Appraisal System**

Balanced score cards,

Employee grades

Employee performance record

**Human Resources**
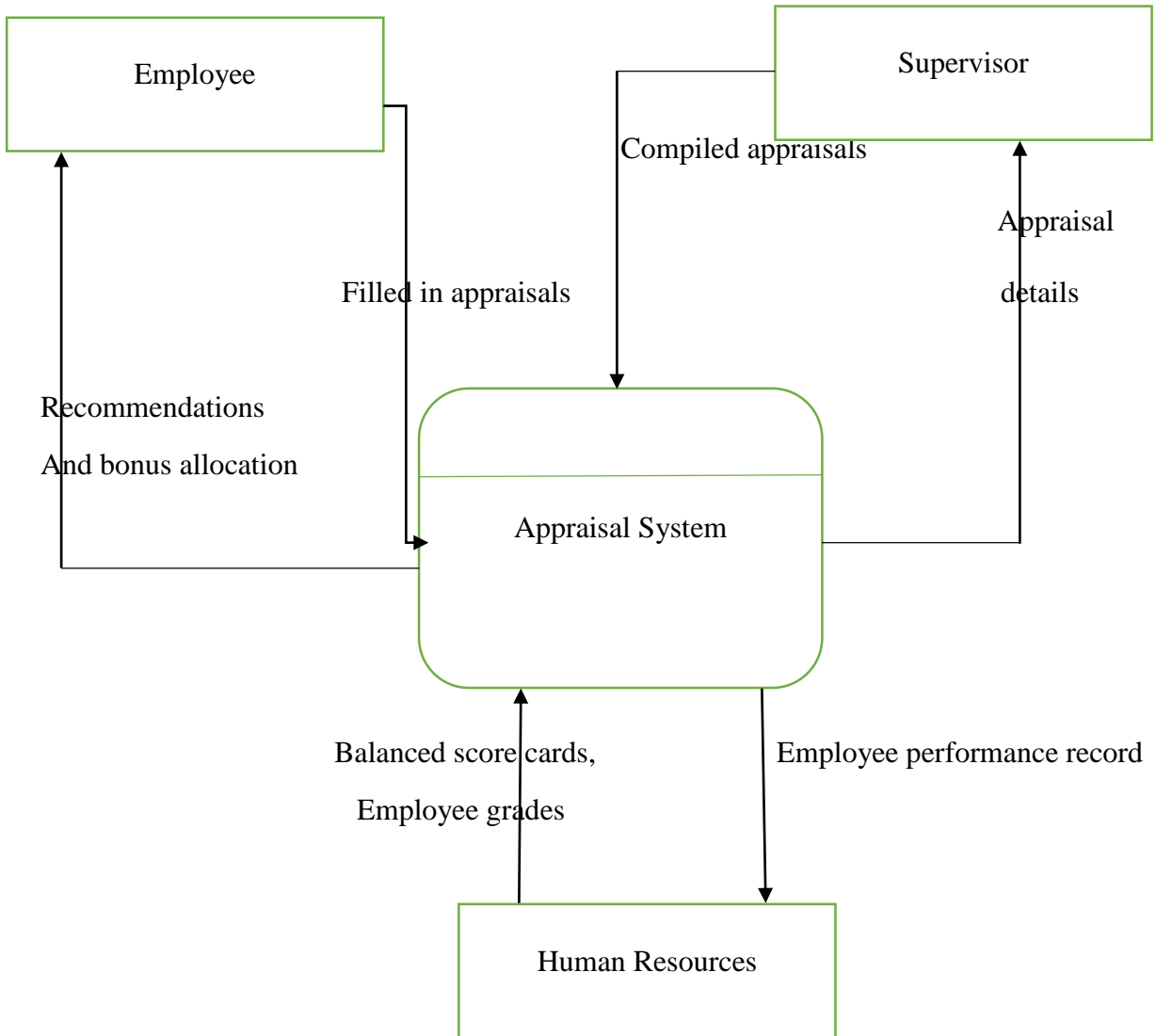
*Fig 3.2 Context Diagram*
**Key**
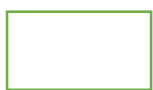
Entities
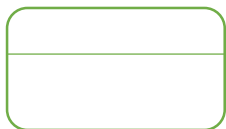
Data Flow

Process

### 3.5.2 Data Flow Diagram

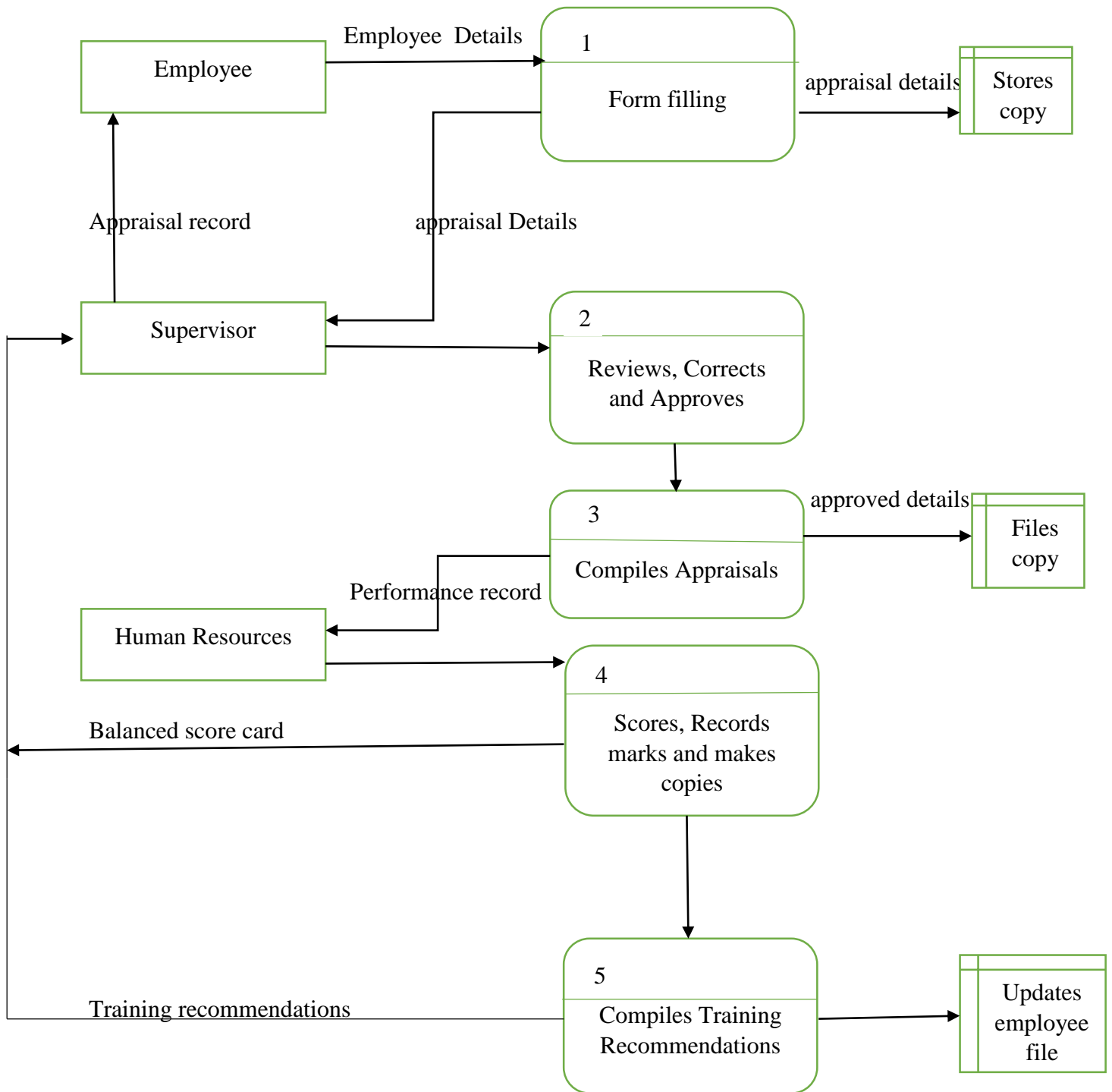It shows visual process representation and how data is transformed into information. A data flow diagram also show stages during the process where information is stored.



*Fig 3.3 Data flow diagram*

## 3.6 Weaknesses of the Current System

➢ Deficiency of suitable standard storage space for the forms. The use of filling cabinets to store forms has resulted in overcrowding in the HR offices and the security and storage conditions of appraisals has been put to question.

➢ Slow and tiresome due to the length of time it takes to generate and fill in individual employees' evaluation forms resulting in low throughput of employees.

➢ The business recruits new personnel quarterly largely in its remote branches due to increase in business. This has conversely seen a notable continuous escalation in the mailing cost of appraisals.

➢ The Human resources office presently lags behind in drafting an all-inclusive training schedule to cover all the employees based on their performance as this is an arduous task requiring composite marks from various quarters to be manually calculated.

➢ Key decision makers are finding it inflexible to arrive at objective decisions on performance based rewards and promotions as they do not have composite structured and graphic profiles of employees' performance over given time periods which negatively impacts the rewards system and making data mining difficult.

## 3.7 Evaluation of Alternatives

This assess the possible options and development alternatives that can be used to effect the desired change in the system. The options include:

➢ Outsourcing

➢ In house development

➢ Improvement

### 3.7.1 Improvement of the Current System

This option puts in place measures to ensure that the current system is improved to retain same functionality but with better performance.it also includes little adjustments to fit the effected changes.

#### 3.7.1.1 Advantages of Improving the Current System

- ➢ Reduced workload on human resources and faster process as a result of increased staff.
- ➢ Cuts costs due to reduced frequency of appraisal

#### 3.7.1.2 Disadvantages

- ➢ A reduction in the frequency of appraisal may defeat the purpose which is to provide a constant performance measurement standard.
- ➢ The option of increasing staff accrues expenses as these new staff will increase employee rewards expenses
- ➢ Defeats the organisational goal to have fully adopted information system strategy by 2018

### 3.7.2 Outsourcing

Involves engaging an external party in the development of a solution such as the use of a development house or even purchasing an off-the shelf package

#### 3.7.2.1 Advantages of Outsourcing

- ➢ Puts the system in the hands of users more quickly and saves time.
- ➢ Additional unrequired modules associated with off the shelf software may give the organisation an expansion direction to increase its scope of appraisal process.
- ➢ Allows for diverse external thoughts to be incorporated in the appraisal process

### 3.7.2.2    Disadvantages of Outsourcing

➢ Outsourced software needs licencing over time and maybe more costly.

➢ Features specific to the organisational requirements can be omitted or customisation can be difficult.

➢ May require consultancy on use and maintenance which is more expensive

➢ May require regular updates as new versions are continually released.

➢ Company data is not managed internally during development and/or customisation

### 3.7.3    In House Development

This involves development of the proposed system internally using the available resources and internal staff. External staff may help with consultancy but ownership of the project is internal. Usually existing managers work as project leaders.

### 3.7.3.1    Advantages of In-House Development

➢ The business is large and full consideration has to be made in line with its organisational structure if information strategy is to be adopted effectively without compromising its values and culture thus an in-house development is preferred.

➢ The company boasts of well-trained developers and systems analysts hence the system can be internally developed while maintaining the same level of integrity and  effectiveness thus cutting the cost associated with licencing and training consultancy that an off the shelf system would require.

➢  Reporting structures are not broken since existing managers can also work as project managers during development work.

➢ Features specific to the organisation can be easily optimised and chances of redundant processes are reduced.

- ➢ Security procedures can be maintained during development and company data is managed internally.

- ➢ Upgrades can be implemented internally when needed.

### 3.7.3.2  Disadvantages

- ➢ May lack experienced personnel and often requires robust training for project team.

- ➢ Day-day operations may delay project completion and additional staff maybe required to make project team.

### 3.7.4  Decision

As clearly shown above, an in house development proves to have more merits than any other option thus making it the best choice of the three alternatives. In house development is recommended.

## 3.8  Requirements analysis

This process identifies and documents the customer's requirements for the proposed system. Which have been identified and include functional requirements and non-functional requirements which are additional features that will enhance value

### 3.8.1  Functional requirements

These capture the anticipated behaviour of the system including services, tasks or functions. These include:

- ➢ Online completion, review and submission of employee appraisal forms.
- ➢ Online report generation to centrally locate appraisal information.
- ➢ Recommend training needs for employees.
- ➢ Enable automated appraisal filing for security and efficient work processes.
- ➢ Allow administrator to perform overall administration of the system including management of user accounts and system flow supervision
- ➢ Automatic scores calculation and grading on employee balanced scorecards.

➢      Automated determination of employee bonus multiple

## 3.8.1.1  Case diagram

Defines goal oriented interactions between external actors and the system under consideration. It clarifies the actions of actors on the system. It represents the actions users take to complete a task.
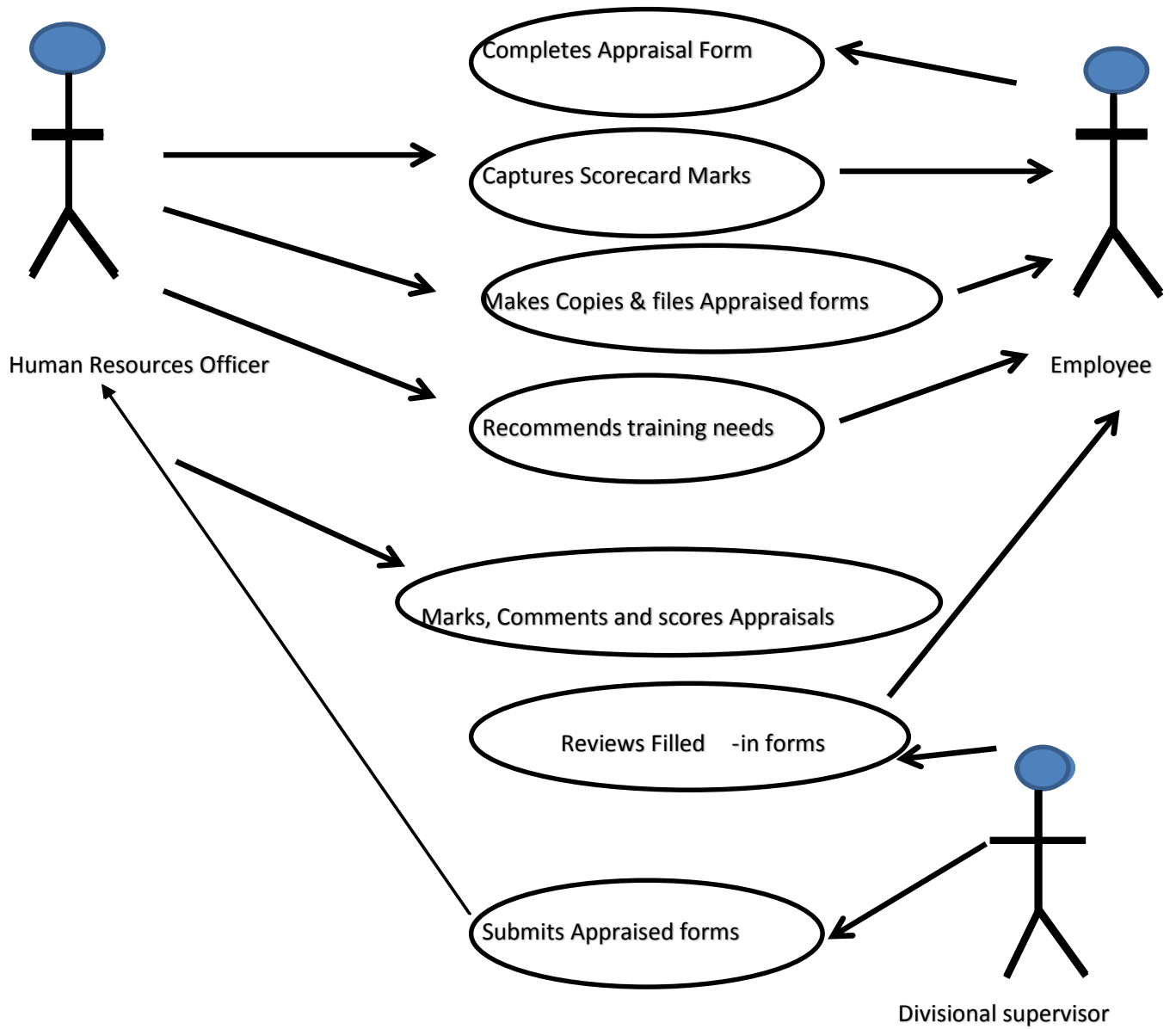
*Fig 3.4 Use Case Diagram*

**Key**

**Process**

**Actor**

**Communicator**

### 3.8.2 Non-functional requirements

These are those features that enhance usability and increase value of the system. These include:

➢ **Error handling**: validated, so random errors and input errors are avoided.

➢ **User interface**: easy to use graphical user interface.

➢ **Efficiency:** flexible online capabilities and automated form filling and report generation

➢ **Security:** the use of strong passwords ensures secure process and increases reliability of the system

➢ **Recovery capabilities**: system should have backup capabilities thus recovery can be done when required.

## 3.9  Conclusion

This chapter covered analysis of the current system which included data flow diagrams, activity diagrams and case diagrams. A robust evaluation of alternatives was carried out and in house development was chosen as the viable option. Functional and non-functional requirements clearly stated. The project can progress to system design.

# Chapter 4: Design Phase

## 4.1  Introduction

This phase places its focus on the designing of the proposed system based on findings produced during planning and systems analysis. It gives a consolidated outline of how the system is going to be developed, deployed and configured. Aspects of system, physical, architectural, interface, database and program design will also be explored in greater detail.

## 4.2  System Design

Emphasis is placed on how the system will work when rolled on and tries to meet the expected deliverables. The Zimra performance appraisal system will solve the problems inherent in the manual system and introduces online capabilities to the appraisal process chief among them online form filling, submission and automated score card computation, mark generation and performance reports generation among other key system deliverables. The following are the crucial features of an elegant system:

- **Effectiveness**: a good system should be easy to use while returning business value.
- **Reliability**: an elegant system returns user confidence by producing reliable reports and minimising errors. Availability should also be an integral part of the system.
- **Maintainability**: this is a key feature that allows improvements, corrections and alterations to be done on the system.
- **Efficiency**: a well-made system produces results in the time frame expected. The design will ensure timely reports.

### 4.2.1  System inputs
- Generic form template from human resources
- Filled in form by employee
- Primary grades by employee
- Supervisor's corrected form

➢ Balanced score card from human resources

➢ Key performance measure or indicator.

### 4.2.2  System Processes

➢ Form template generation by human resources

➢ Form filling by employee

➢ Initial form submission by employee to supervisor

➢ Assessing, correcting and form evaluation by supervisor

➢ Form submission by supervisor to human resources

➢ Makes assessments of the forms

➢ Marking, recording and storage of appraisal information

➢ Generating of final balance score card percentiles by human resources.

➢ Calculation of bonus multiple for employees

➢ Generating recommendations of training needs of employees by human resources.

➢ Return appraised form to employee

### 4.2.3  System outputs

➢ Recommendations on training needs of employees

➢ Appraised form and comments

➢ Bonus multiple allocations

➢ Appraisal information reports and performance record.

### 4.2.4  Context Diagram for the Proposed System

It shows the players within the system and how they interact with each other and the system.
The diagram below shows the context diagram for the proposed system.

Employee

Supervisor

Filled in appraisals

Employee performance record

Appraisal-details, comments and review

And-training-recommendations

Appraisal System

Reviewed appraisal record and bonus allocation

Balanced score cards, employee grades and training needs

Employee performance record

Human Resources
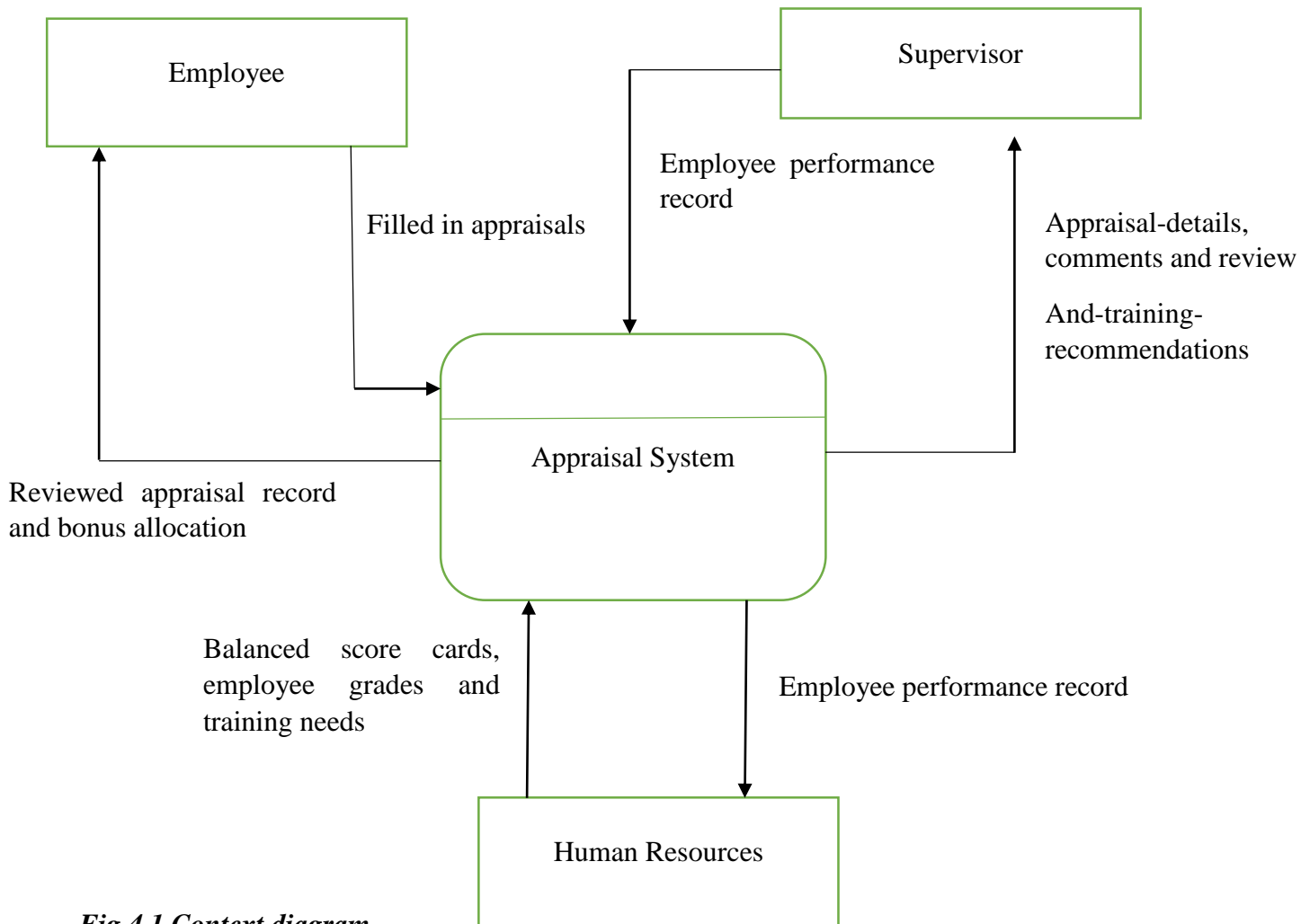
*Fig 4.1 Context diagram*

**Key**

Entities
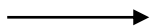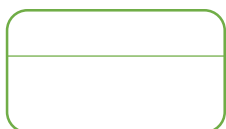
Data Flow

Process/ system

**4.2.5 Data Flow Diagram for the Proposed System**
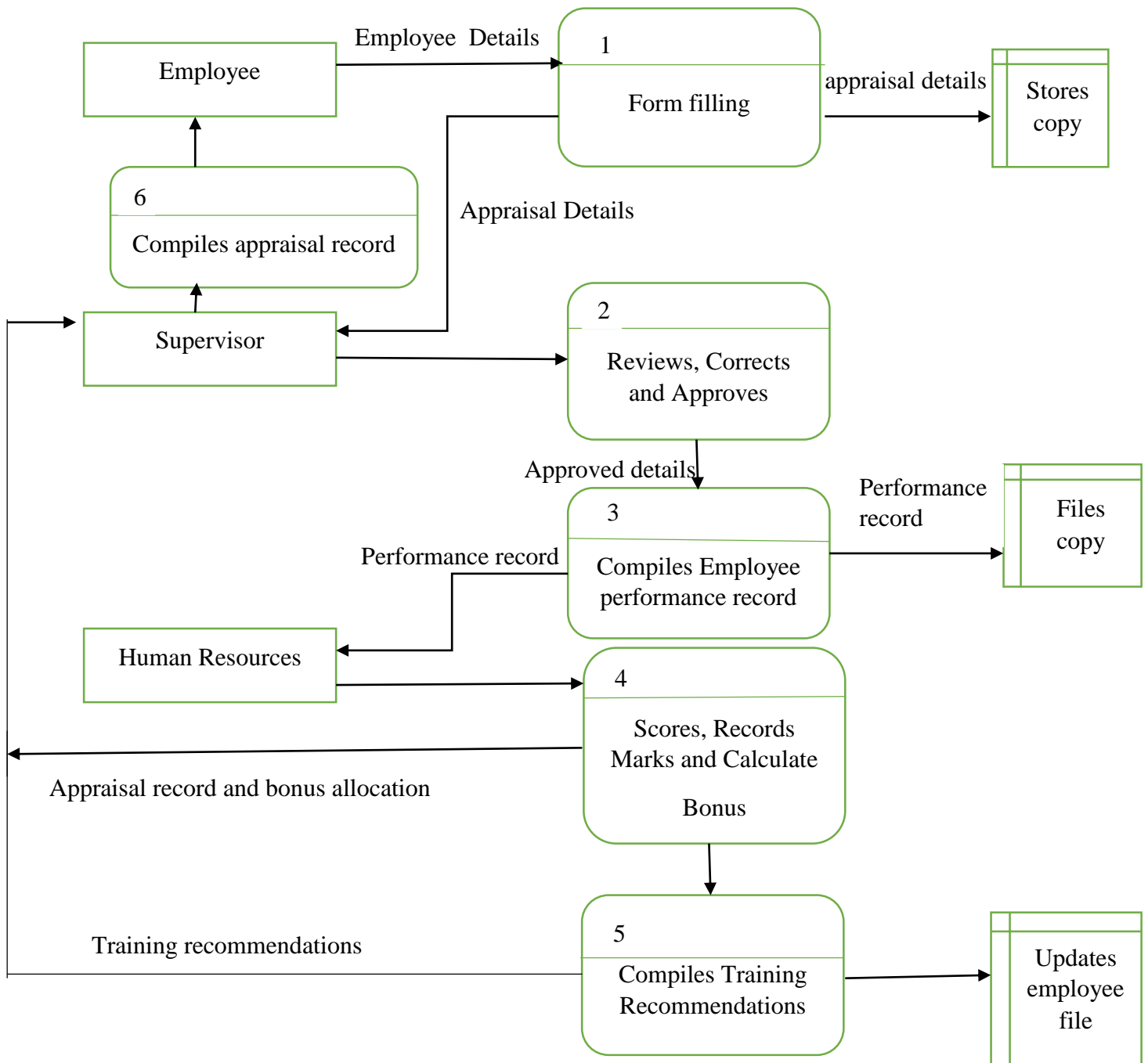


*Fig 3.3 Data flow diagram for the proposed system*

**Key**
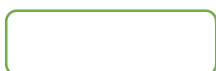
Process

Data store

→            Dataflow

## 4.3 Architectural Design

The Zimra performance appraisal system will exhibit online capabilities and adhering to a client server architecture. The server side contains both the apache server and the MYSQL DBMS on which the system runs and all correspondence to the client passes through a firewall within a domain network where password authentication protocols will be employed.
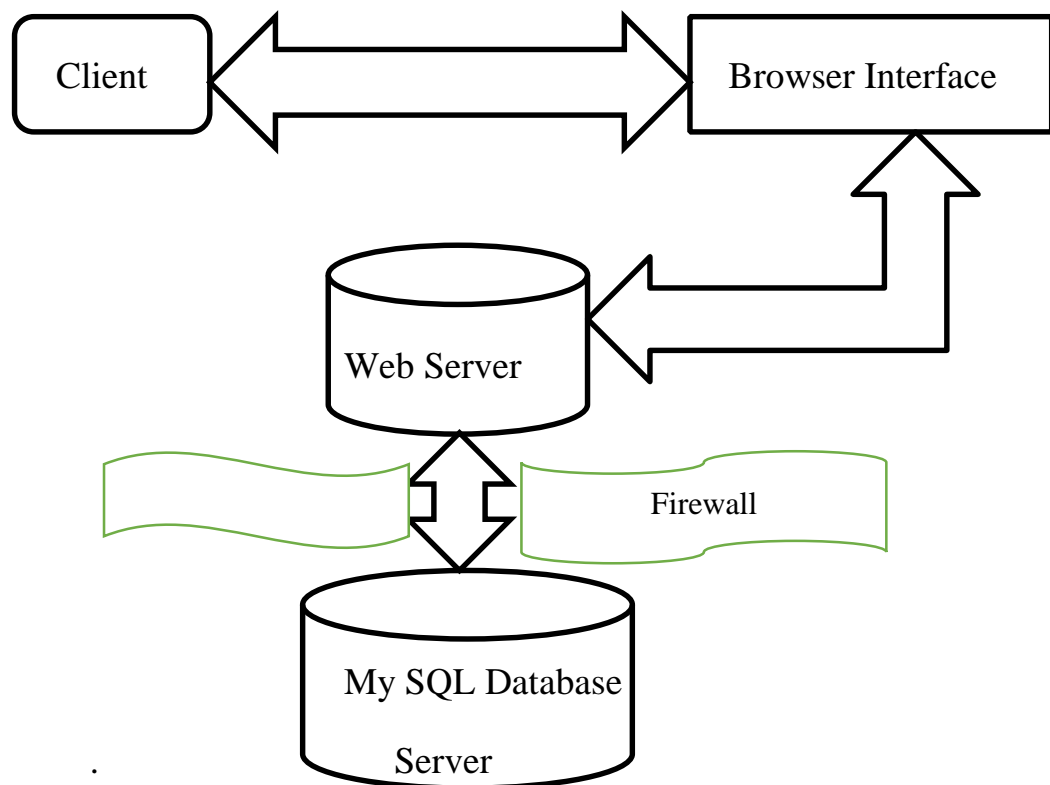


*Fig 4.2 architectural design diagram*

## 4.4 Physical Design

This stage is concerned with the interaction between hardware and software of the proposed system, compatibility issues associated with the integration with existing systems as well as

the actual connection to the existing local area network on the network structure. The diagram below shows the physical design of the proposed system.
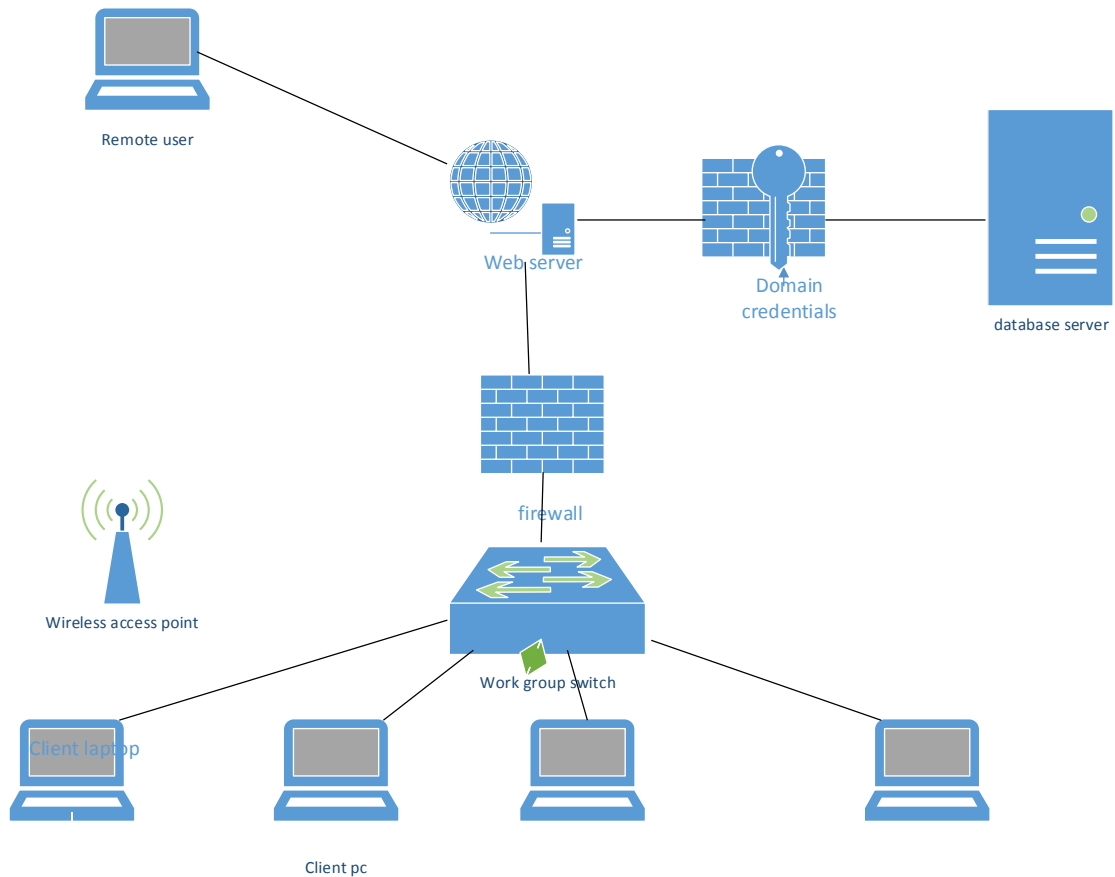


*Fig 4.3 physical design*

## 4.5  Database Design

Database design is concerned with how data storage and data repositories are constructed, the cornerstone to which the functionality bases as well its structure and capability to meet system requirements while returning data integrity and consistency as prescribed by the three level architecture design. The design will also ensure minimised redundancy and normalisation techniques will be applied throughout the design. Referential and semantic integrity should be employed and different specialised views of the same data will be presented to users depending on their access levels.  This can be clearly be shown in the three tier architecture below.
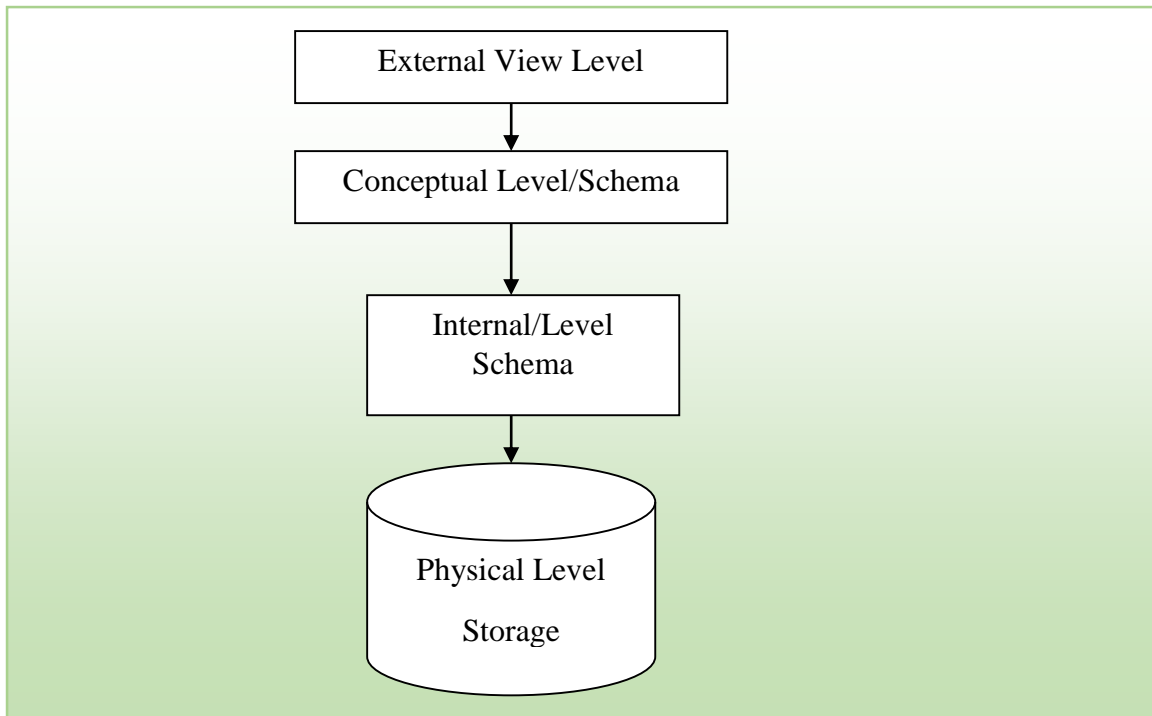
*Fig 4.4 three level database architecture*

- ➤ **The external view** presents users with different customised views of the same data.
- ➤ **The conceptual level** specifies the entities and attributes of the system as well as specifying integrity constraints
- ➤ **The internal level** specifies storage locations and structures. The physical level resembles the actual storage repository.

### 4.5.1   Entity Relationship Diagram

The ERD and the extended entity relationship diagrams will form the data dictionary that that represents the schema and objects of the database. Meta data essential for report generation should also be clearly defined. The entity relationship diagram below shows the relationships that exist among tables and entities and how the interact to enhance effective dataflow for system functionality.
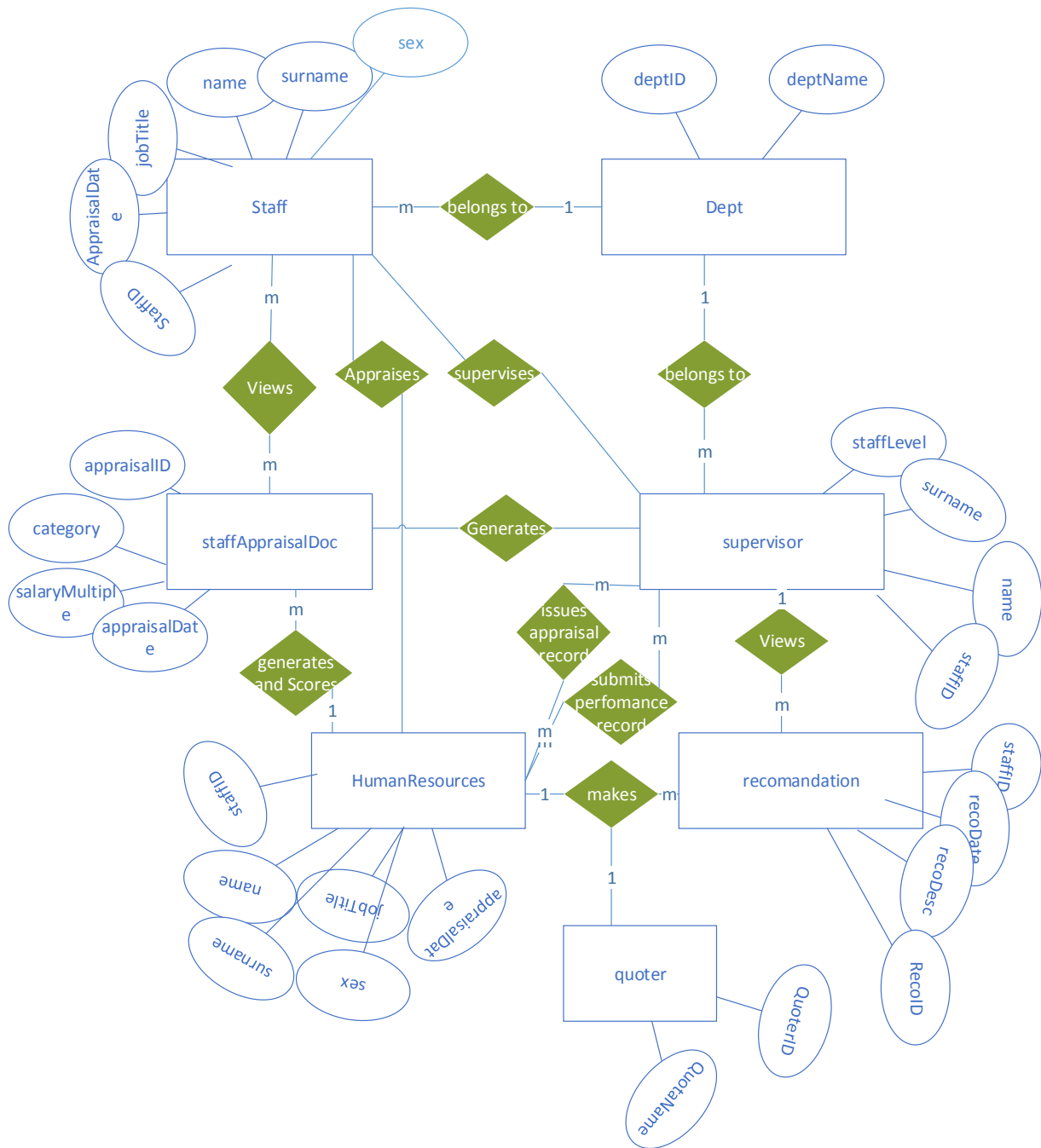
**Fig 4.4 entity relationship diagram**

An effective way of show how entities are related is the use of the extended entity relationship diagram. It presents entity types as primitive objects and refinements can be done within structures of these entity types (Eitan Gurari, Winter, 2009) The diagram below shows the entity relationship diagram for the system.
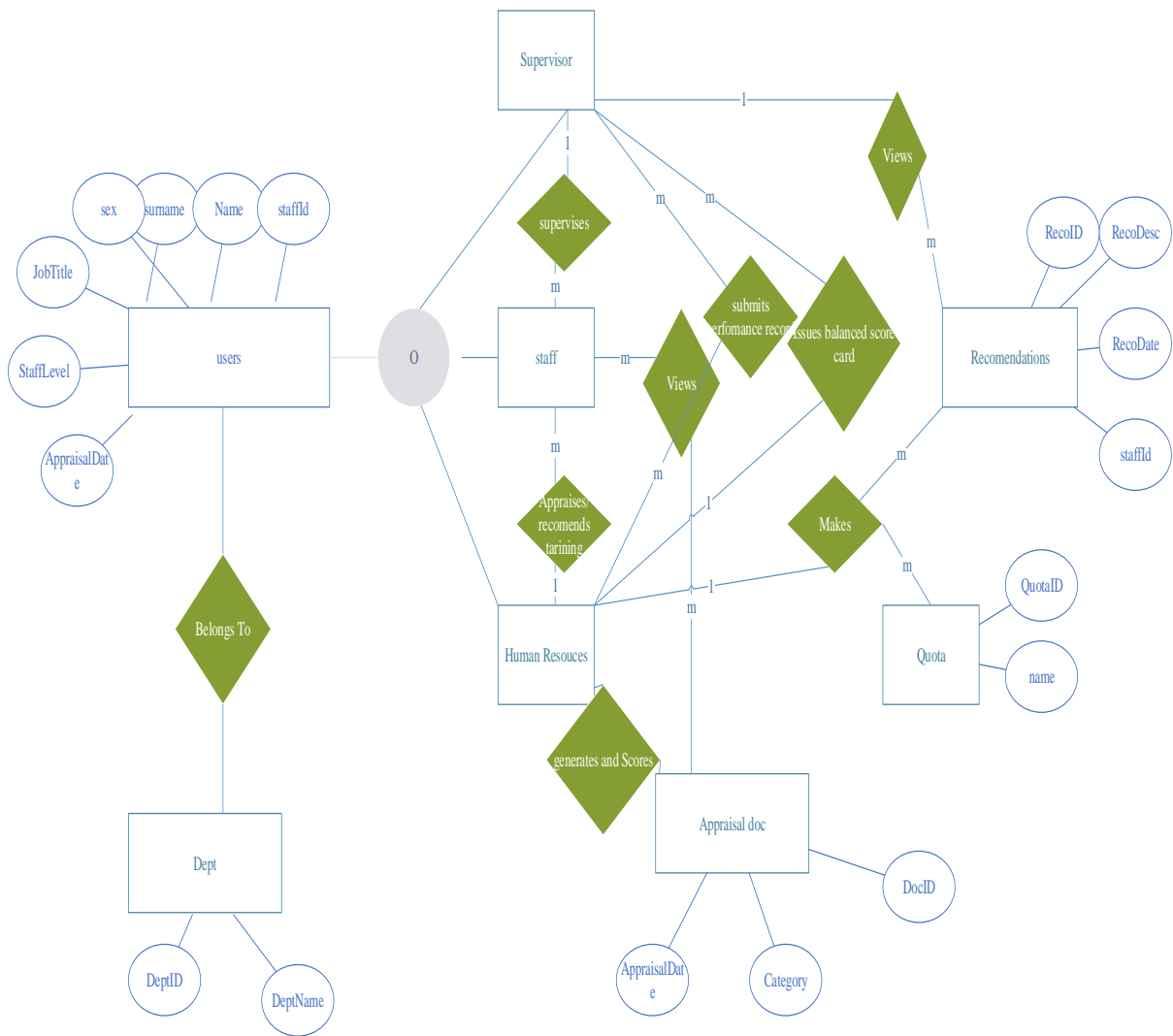
*Fig 4.5 extended entity relationship diagram*

## 4.6   Program Design

This deal with identifying various dependences of the system and the associated interactions among system modules and the related database and applications. (Lampson, 1996).

### 4.6.1   Package Diagram

They provide a way to visualise dependencies between parts of the system and are used to determine compilation order. (Lampson, 1996). The diagram below shows the package diagram for the appraisal system.

appraisal docement generation

appraisal doc

docID<PK>
states perfomance measures()

scoring and perfomance confirmation

Human Resources

docID<PK>
staffID<FK>

states perfomance measures()
appraise doc()
caculates bonus()

appraisal filling and submission

staff

docID<PK>
staffID<FK>

states perfomance measures()
fill doc()
submit()

supervision and review

supervisor

docID<PK>
staffID<FK>

states perfomance measures()
updates doc()
submit()

KEY

PackageName

ClassName

attributes
operation

— — — — dependancy — — —

*Fig 4.6 Package Diagram*

## 4.6.2   Class Diagram

Represents the user's interaction with the system and interactions among elements of the system as well as the architecture of the designed system with classes and interfaces and sets of attributes and their operations and how they are related. (Y Kiyoki, 2009)

**Human Resources**

staffID :int    <PK>
name : varchar(50)
detID: int <FK>
surname:varchar(50)
staffLevel :int

Scores appraisals()
manages appraisals()
generates perfomance
measure()
produce reports()
backs up data()

**supervisor**

staffID :int    <PK>
name : varchar(50)
detID: int <FK>
surname:varchar(50)
staffLevel :int

Reviews Appraisals()
manages training schedule()
manages perfomance
measures()

**Appraisal Doc**

docID :int    <PK>
category : varchar(50)
detID: int <FK>
staffID: int <FK>

states perfomance
measures()

**Staff**

staffID :int    <PK>
name : varchar(50)
detID: int <FK>
surname:varchar(50)
staffLevel :int

fills in apprasal()
checks apprarasal staus()
implements
recomandations()

submits perfomance rocord of staff

recomends training needs of staff

Reviews

generates and
update
perfomance
measures

fills in and check appraisal status

submits appraisal

issues appraisal record

issues and implements training needs recomantation

**Key**

**Entity Name**

attribute name

operations

relationship

*Fig 4.7 class diagram*

### 4.6.3   Sequence Diagram

This illustrations objects and actors that participate part in an association. The sequence diagram represents the movement of time as seen by the objects. It also show the interaction between participating objects (Martin.R.C, 1998).
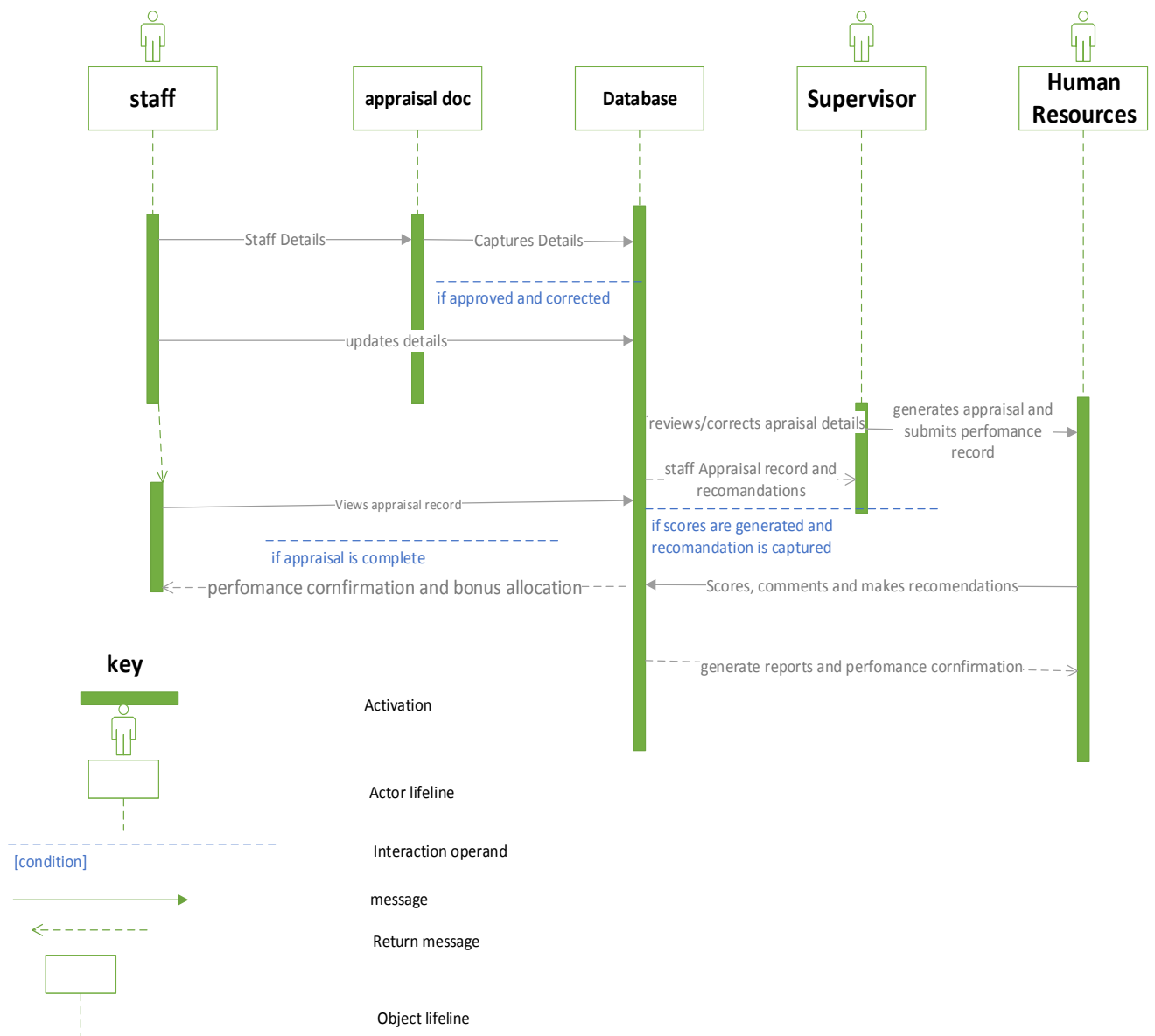
*Fig 4.8 sequence diagram*

## 4.7   Interface design

Defines how the users of the system will interact with the system as well as inputs and outputs of the system. It also determines which type of interface is to be used. For the Zimra appraisal system a graphical user interface will save to interlink the customised view of users and the system.

### 4.7.1　User interface

Macromedia Dreamweaver will be used to develop a comprehensive interface that enhances system-user interaction with easy to use menus while returning desired functionality. Errors in the system, locks and database storage details will be hidden from the users so that consistency is returned. Customised error messages and a help platform will continually assist users throughout the use. Manuals will be presented to users for reference.

### 4.7.2　Menu Design

The system will have a generic home page for all system users where they login. The system will use a security control mechanism in which users will only access objects to which they have access to, and only sees customised views of operations to which they are permitted to. The system will have three basic user groups, general staff, supervisors and human resources. The system admin is the user with human resources privileges and they perform all backups and user maintainace. The diagram below shows the interface structure of the system.
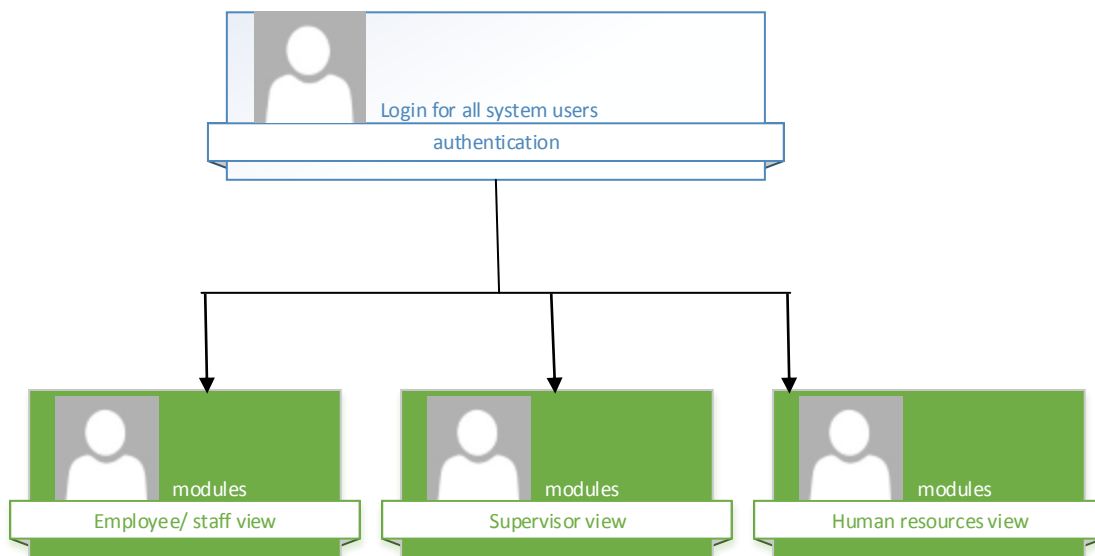


*Fig 4.9 Interface Structure*

### 4.7.2.1　Staff View

This shows the modules and objects to which the staff has access to. The diagram below shows what the general staff does and sees upon login.
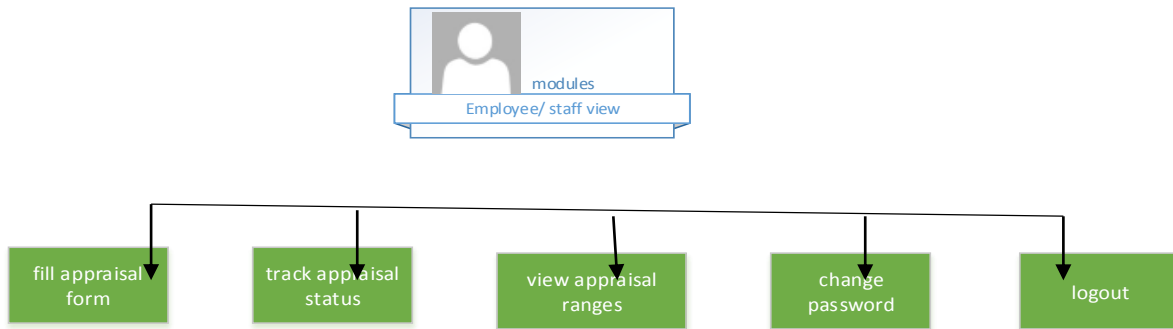
*Fig 4.10 staff view*

### 4.7.2.2 Supervisors View

This shows the modules accesses by the divisional supervisors
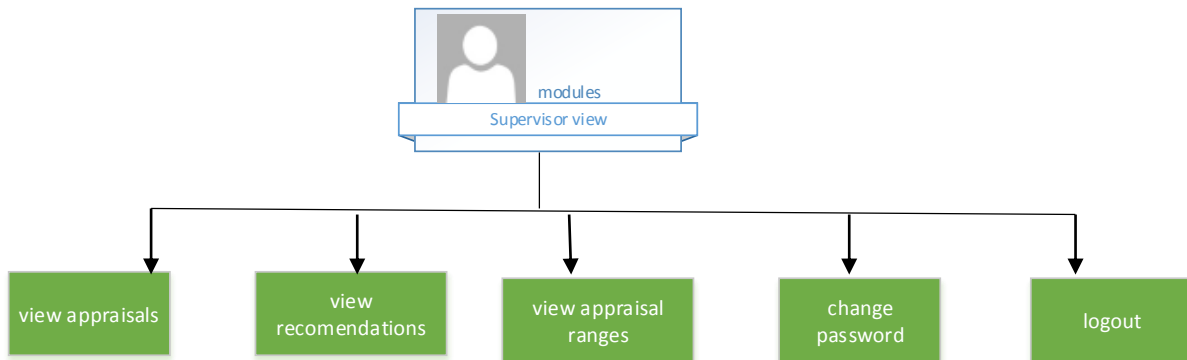


*Fig 4.11 Supervisor View*

### 4.7.2.3 Human Resources View

The Human resources module is the ultimate administrator of the system. Oversees the whole user security and maintenance. This is the module that oversees the appraisal flow of activities and data. They also assign system privileges to other system users. The diagram below shows the human resources or admin view.
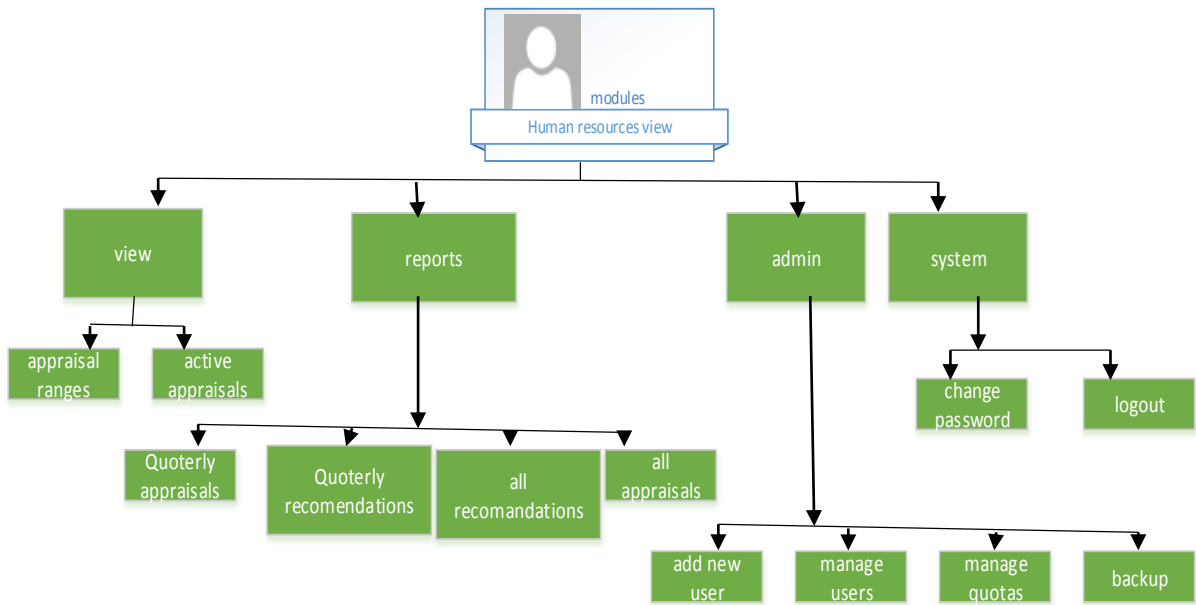
*Fig 4.12 human resources view*

### 4.7.3   Form Design

This is the interactive interface that allows users to perform particular operations.

### 4.7.3.1   User Authentication Form

This will represent that part of the system that deals with user security maintenance module and is where system access levels and protocols are observed.



*Fig 4.12 login form*

#### 4.7.3.2   Registration Input

This will show the employee details as well as creation of username and password.



*Fig4.13 Registration Input*

#### 4.7.3.3   Appraisal Form Job Knowledge measure
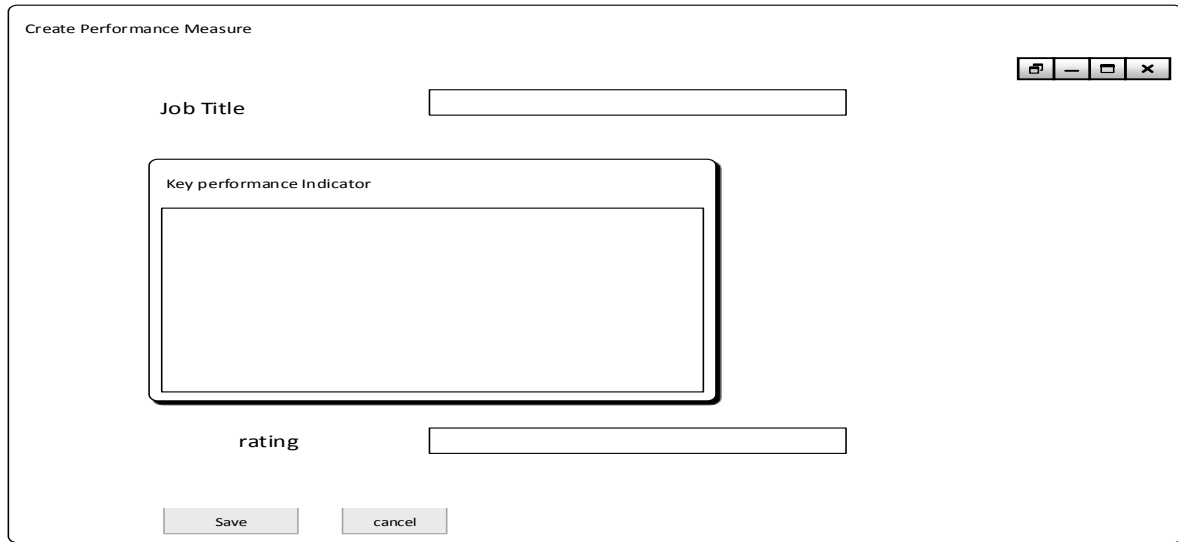
This is a part of the appraisal form that specifies the job knowledge key performance measure.

| Job knowledge Objectives | Measure | Target | Appraiser's Comments |
|---|---|---|---|
|  |  |  |  |
| **adherence to work requirements** | How well does the employee know the expected deliverables as per job title | Ability to adjust to changes in requirements within the designation mandates |  |
| **Quality of work** | Deliverables vs. expected deliverables. | Ability to meet expected quality standards |  |

*Fig 4.14 performance measures*

### 4.7.3.4   Creation of performance measure

This will be an admin form to which the human resources adds performance measure and key performance indicators.
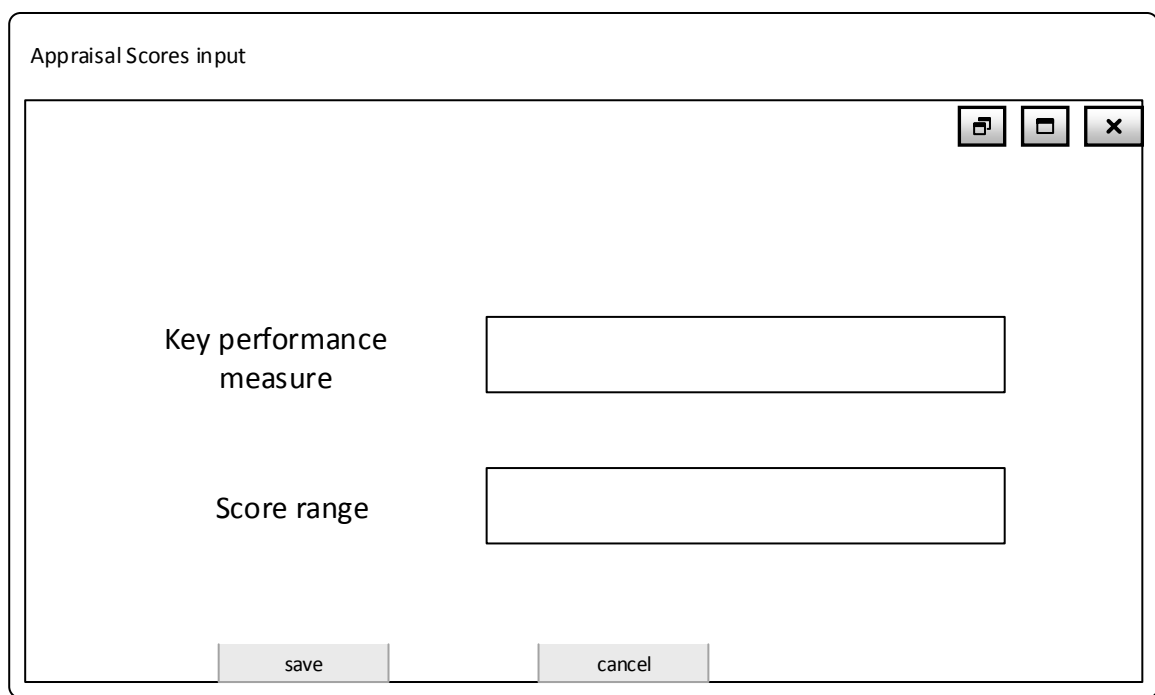


*Fig 4.15 performance measure creation*

### 4.7.3.5   Appraisal scores generation

This will show the sub scores that each performance measure will contribute to the final score.



*Fig 4.16 scores generation*

### 4.7.4  Output and reports

This will show the output interfaces and reports as will be generated by the system.

### 4.7.4.1  Training Recommendations

| Division | |
|---|---|
| Employee name | |

| Value Area | Recommendations |
|---|---|
| Job Knowledge | |
| Quality of Work | |
| Productivity | |
| Dependability | |
| Learning and growth | |

*Fig4.15 recommendations*

### 4.7.4.2  Score Report

| Division | |
|---|---|
| Employee name | |

| Value Area | Overall Score |
|---|---|
| Job Knowledge | |
| Quality of Work | |
| Productivity | |
| Dependability | |
| Learning and growth | |
| Salary multiple | |

*Fig4.16 scores*

### 4.7.4.3   Employee Information

This form displays the employee personal details as created by administrator.



*Fig 4.17 employee details*

## 4.8   Conclusion

The major highlights of the design phase were bringing out how the new system will operate as well as defining development, configuration and implementation details. A logical design, physical and database designs were also clarified. A clarity was also given on how the interfaces will be presented and user customised views well defined. Now that the design has been successful and clearly defined, the logical design can be implemented to produce the operational system. The next stage is the implementation phase.

# Chapter Five: Implementation Phase

## 5.1 Introduction

This chapter deals with the actual conversion of the design logical solution into a functional system that can be installed. It also involves system testing and identification of errors and repetitive corrections to errors. The three main stages of implementation phase are coding, testing and installation.

## 5.2 Coding

This refers to the actual building of the system according to design specifications. It deals with converting the logical design into computer instructions that are executable. PHP, MYSQL and HTML were the main languages used for the coding of the appraisal system and micro media Dreamweaver was used for interface design.

### 5.2.1 Pseudo code

**Creating new user**

Check database connection string

If connected then validate fields

Check if the data already exists

If not, then save new user

Else abandon update and exit

**User authentication**

Check database connection

If connection is established then check supplied credentials

If correct log user to system menus

Else return logging error and exit

**Appraisal form submission**

Check database connection and check if quota is created

If both return true the display form

Save user details

Else return stage error and exit

**Form review**

Select user

If form is submitted make reviews

Submit form for scoring

Else request form and exit

**Scoring and appraisal**

If form is reviewed the score and appraise

Calculate bonus allocation and make recommendations

Return to supervisor

Else request pending appraisals and exit

**Employee tracking**

Log in then check appraisal status

If available print copy else

Check status with supervisor

**Reports generation**

Query the database

If it returns a true value

Observe output

Else

Produce error message

Exit

## 5.3 Testing

(Wilson (2009)) defines it as finding variances between the anticipated behaviour indicated by scheme models and the practical performance of the effected system. (Dr Dobbs (2009)) It refers

to the operation of the system with real data to demonstrate that a product satisfies its requirements and to identify specific differences between actual and expected results. Test data is generated that is used for continuous testing. Senior members of staff and selected managerial staff participated during this stage.
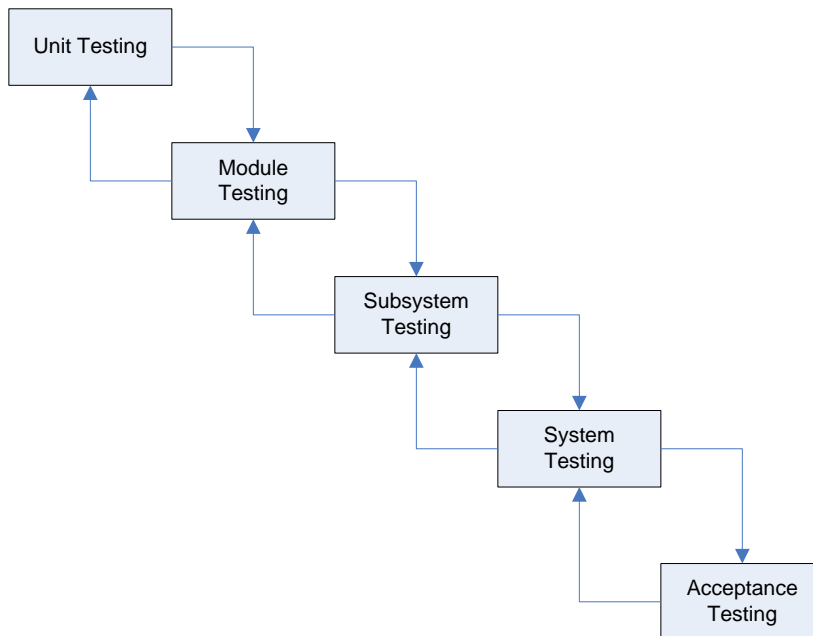
### 5.3.1 Stages in Testing



*Fig 5.1 stages in system testing*

### 5.3.1.1 Unit Testing

(Paul Hamill, 2004) defines unit testing as testing distinct units of code to see if they execute tasks as per expectation. The units are usually atomic with simple input and output parameters. Unit testing can be subdivided into two main types.

#### 5.3.1.1.1 Black Box Testing

(Tilo Linz, 2014) Internal logic of the software is not looked into while testing. The software or software components to be tested are considered as a `black box' and extra functionality and implementation details are hidden from the tester. Input boxes and text boxes were tested and only a selected group of staff participated.

### 5.3.1.1.2  White Box Testing

(Linz, 2014) Expenditures inner physical and analytical properties of the program for verification. This is primarily code based testing that looks at extra testing criteria. Focus was on the internal functionality of a unit and facilitated handling and identifying errors.

### 5.3.1.2  Module Testing

(Corey slender, 2011) This is the process of evaluating application software modules based on their performance against design specifications. Thus modules were distinctly tested to measure independency.

### 5.3.1.3  Subsystem Testing

(Siron, 2011) Tests a collection of modules that have been incorporated into a system. Minimal sub-system interface mismatches were observed indicating a successful interface design. Various modules were tested together to determine extent of collaboration and all system user representatives were involved.

### 5.3.1.4  System Testing

(Alsmadi, 2012) Functional testing or system testing is carried out once all the components of the system have been tested in isolation showing a good degree of reliability. Tests were carried out on more than one interacting modules to ensure collaboration according to design specifications. After integration, retests were performed and desirable results were obtained as per requirements.

### 5.3.1.5  Acceptance Testing

(Gambling, 2013). Acceptance testing was conducted as the final method. Here the system was tested in the presence of users, managers and assistants mainly with their data to verify the functionality of the system. This process enabled the revealing of errors and other inconsistencies that were hidden prior to acceptance testing. Acceptance testing also revealed if the system's performance was up to or below expected efficiency and it was determined that the system works as per expectation.

### 5.3.1.6  Installation Testing

( McKay, 2008) Installation tests are the focus point for many different forms of testing. Installation testing involves the testing of the final product to see whether the system is compatible with the present hardware and software available and the environment it is

operating. This was successfully completed as various hardware and servers were tested for efficiency.

### 5.3.2 Validation

(Parker, 2013) It is concerned with construction of the right system and assessing its conformity organizational objectives. This process is an effective process if real data is used to test the system and real working environment is simulated. This process ensured that data integrity was reached since only permitted format and date types were allowed during data capture.

#### 5.3.2.1 Character Validation

This insures that data entered into the system is in correct format. The screen shot below shows the error message when the user enters wrong name format on the name input box.
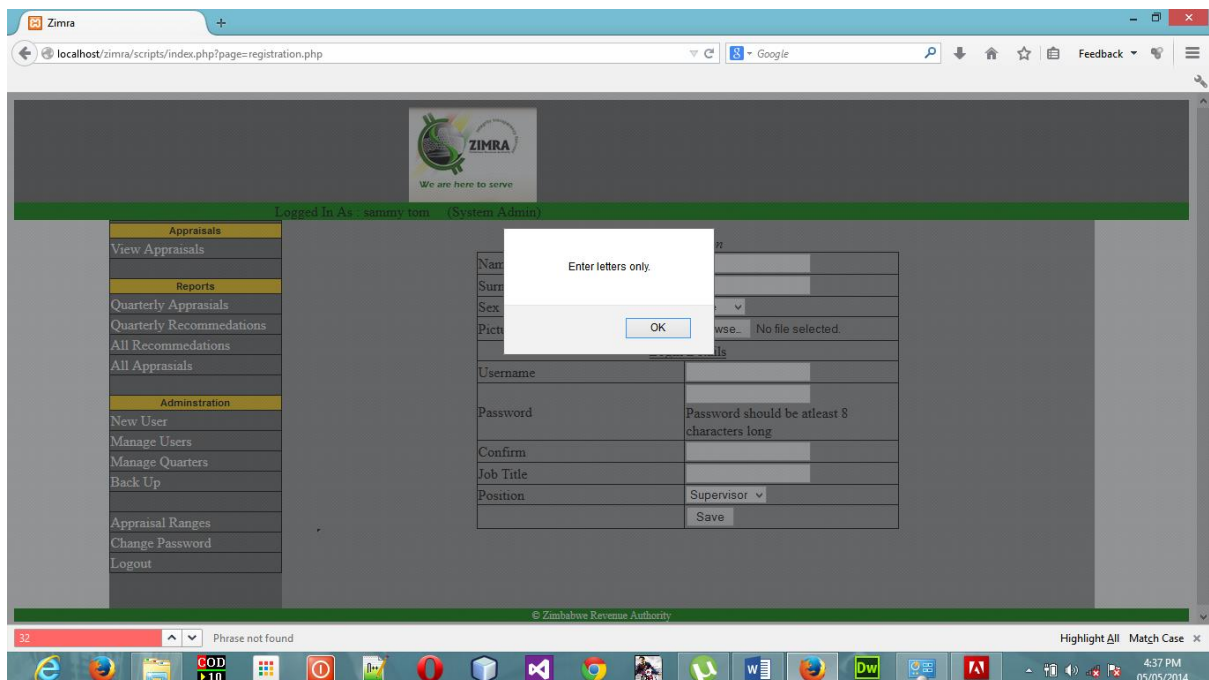


*Fig 5.2 character validation*

#### 5.3.2.2 User Input Validation

User input validation ensure that integrity is maintained. It restricts data input parameters and prevents update of details with missing information. The shot below was taken from the admin create user form in the user maintenance module.
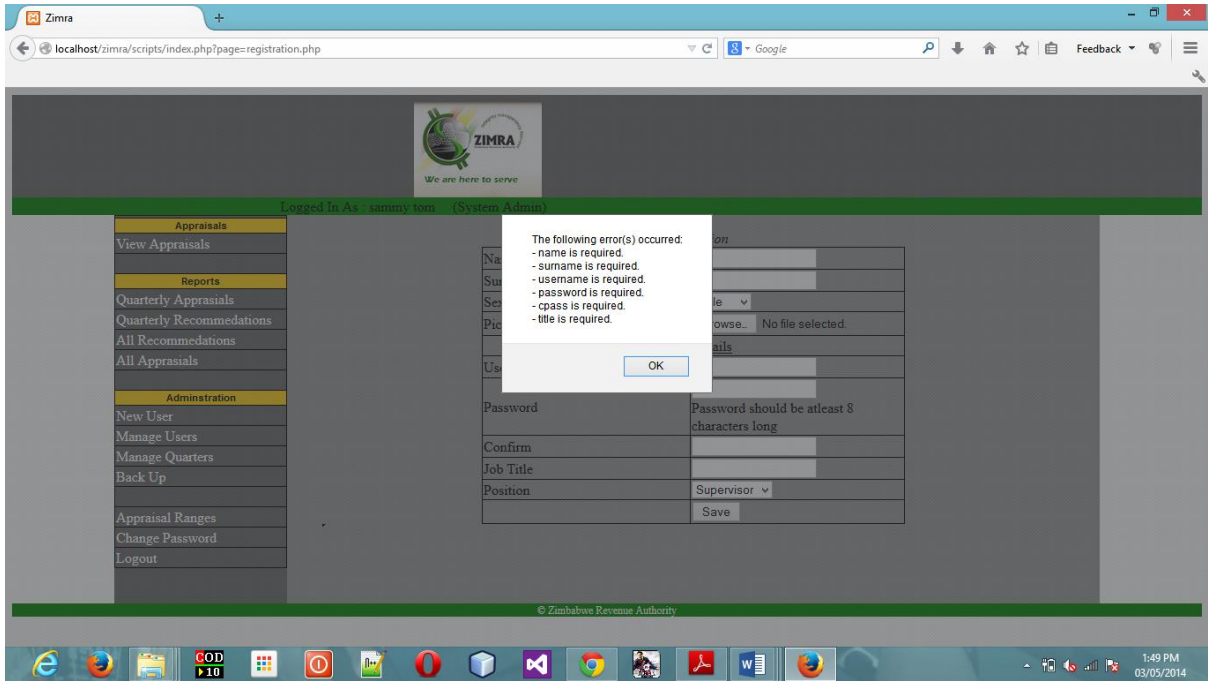
*Fig 5.3 input validation, missing fields*

As part of security validation, for any created user, the admin verifies the password. If the confirm field is not filled the following error occurs.
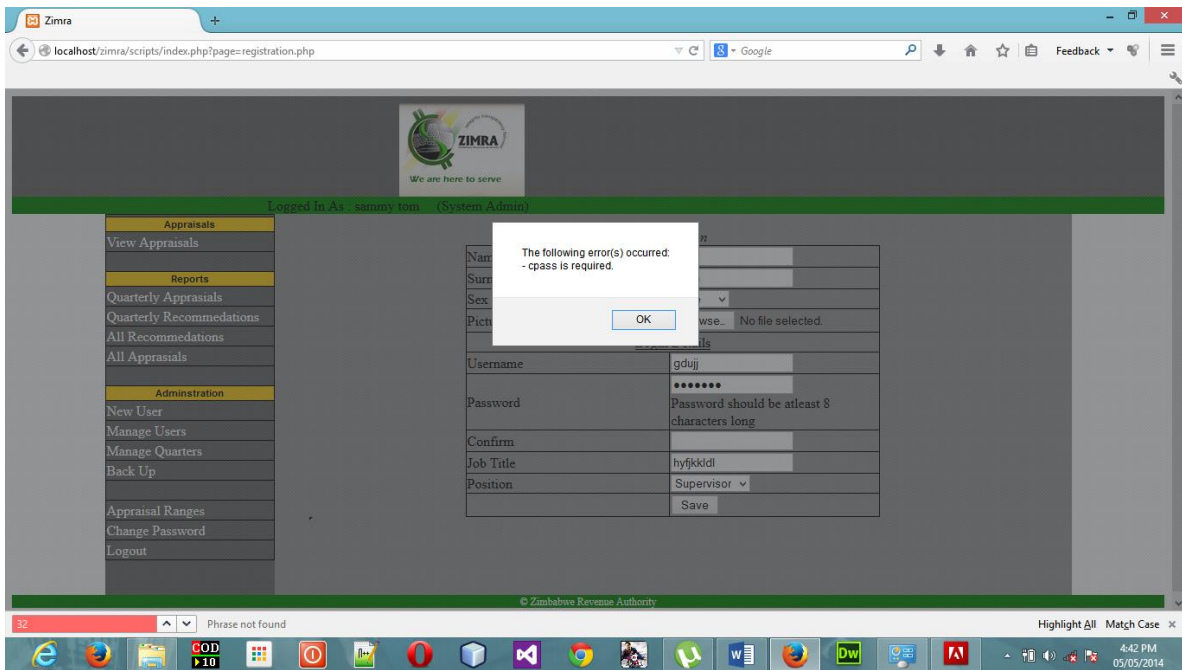


**Fig 5.4 password confirmation**

### 5.3.2.3 Alpha and beta test

As part of the validation testing, beta and alpha test were also carried out. Involved the release of the software to users. The alpha release, returned bad bugs and back to the project team. Successful completion of the alpha stage proceeds the tests to beta stage, which integrates modifications imposed by the alpha phase, and the tests are carried out by an even larger audience, before the absolute release is instituted for all users.

### 5.3.3 Verification

(Roy, 2010) It observes if the primary objectives have been met as well as verifying if the data input subscribes to integrity requirements. Verification ensures that the system is built right. Various printouts were produced to verify if entered data is correct. As a security measure, every user should have a non-shared username and password to access system resources. If by any reason these credentials are not met and error message is produced as shown below.
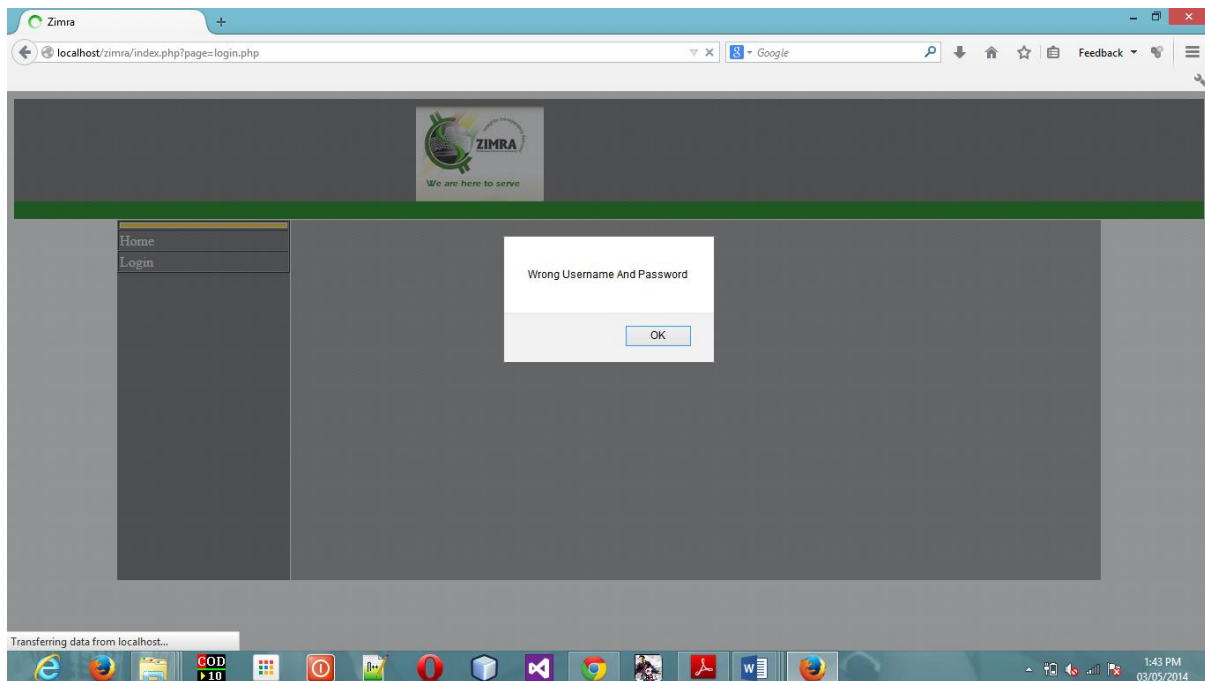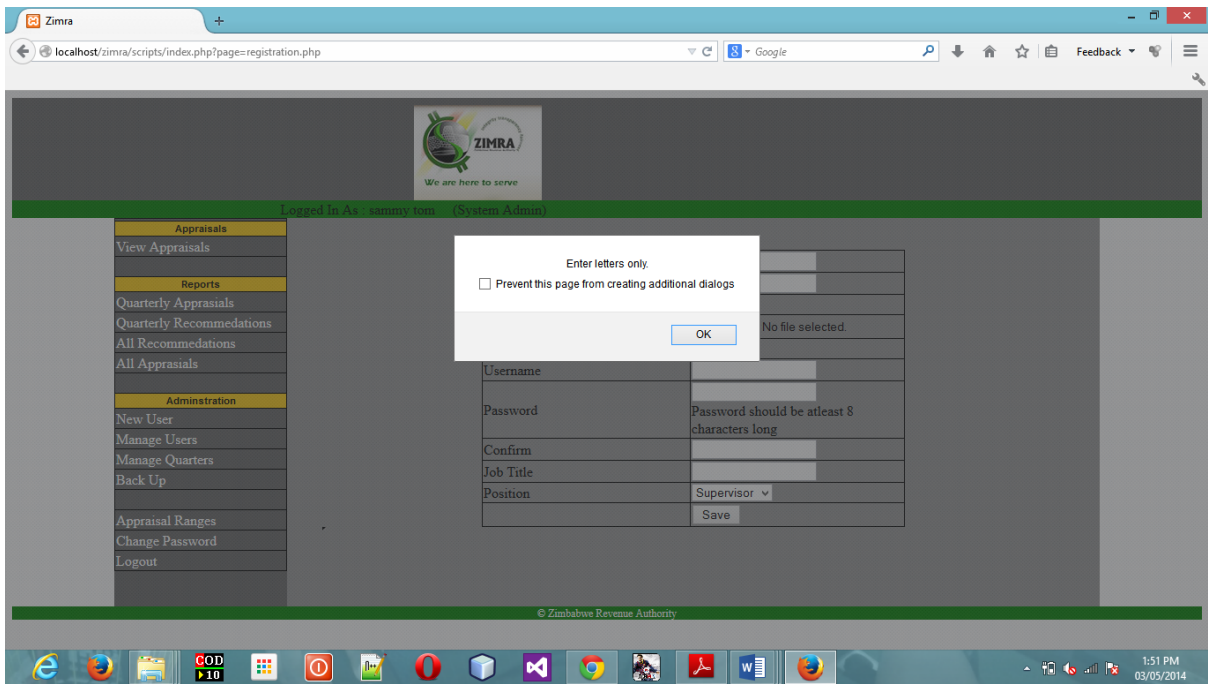


*Fig5.5 log on failure*

*Fig 5.6 input verification, textbox validation*

### 5.3.4   Data consistence verification

This ensures that conditions are met before next stages can be executed. For example user can not submit a form for a quota not yet created or before the previous has been appraised as shown below.
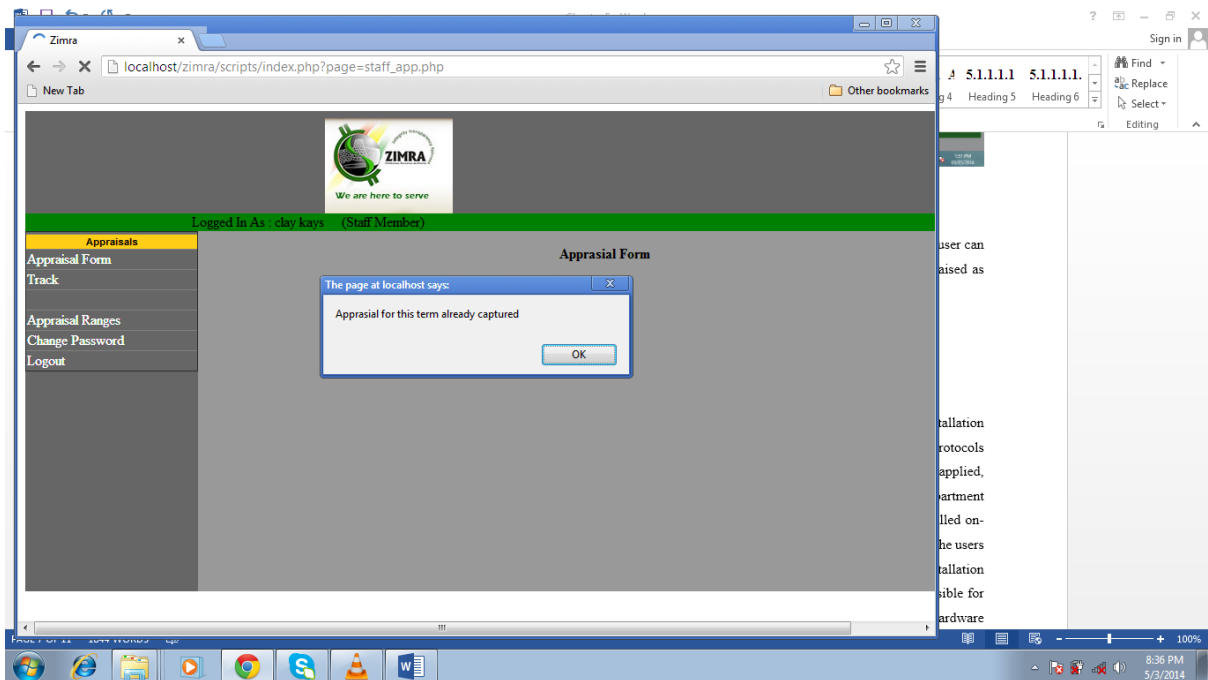


*Fig5.7data consistency verification*

## 5.4 Installation

(David J Parker, (2013)) These are the procedures and process that are involved in the installation of a software or system on any platform of any sort. Concerns the procedures and protocols relating to the installation of the system on site. Issues as the conversion method to be applied, site or location of installation are highlighted as well as the training of users and IT department support personnel. The online performance appraisal system will be installed on-site at Zimra Head office as was earlier stated. The user training will take place where the users are placed into user levels according to their level of access and use of the system. Installation procedures will be well documented and left with the IT staff as they will be responsible for day to day maintenance and support. Installation will include software and hardware configurations on site.

### 5.4.1 Installation Guide

➢ Install XAMPP the web server.
➢ Copy the Zimra folder contents in HTDOCS folder on the server.
➢ Import the Zimra.SQL database with tables from the HTDOCS folder
➢ Type the URL http://localhost/zimra/index.php
➢  Initially it will open the login page which has been set as the default landing page.

### 5.4.2 Conversion

This is an important stage that deals with the replacing the current system with the new system. It often involves creation of operational environment and user training. It is very critical to have users on board during this stage as it sets stage for acceptance or rejection of the system.

#### 5.4.2.1 System change over strategies

System changeover migrates the existing system to the novel system. It is observed under direct, pilot, parallel and phased change over.

##### 5.4.2.1.1 Direct change over

(Forsyth, 2010) defines direct change over as instant migration from old system to new system and the new system immediately becomes fully functional.

###### 5.4.2.1.1.1 Advantages

➢ Streamlines redundant processes and data
➢ Relatively inexpensive to setup and implement

### 5.4.2.1.1.2 Disadvantages

➢ During system installation system availability is unknown

➢ Risky since failure in the new system brings down the whole system

➢ Concurrent use and training may slow down production

### 5.4.2.1.2 Parallel Change Over

(Campbell, 2013) Involve both the old and the new system working together for a certain time.

Data is captured on both systems and results of output are compared.

### 5.4.2.1.2.1 Advantages

➢ Users can refer to old system

➢ Not stressful for users since results can be obtained in the old system

➢ Hectic deadlines can be met by  fulfilling the use of the old system

➢ More time to study the new system

### 5.4.2.1.2.2 Disadvantages

➢ Redundant processes and data is maximum

➢ Costly to maintain two systems performing the same tasks

➢ Time consuming as staff transact on two ends

### 5.4.2.1.3 Pilot change over

The new system is rolled out only in selected sites, branches or locations. Results and conclusions from these stations are made for the entire organisation.

### 5.4.2.1.3.1 Advantages

➢ Minimises risks associated with failed system

➢ Cheaper than parallel

➢ Deliverables can be compared between sites still using old system and those using the new system

### 5.4.2.1.3.2 Disadvantages

➢ The test site face disadvantages of direct change over

➢ It is an overall estimation and results of one site may fail to be inherent in another.

**5.4.2.1.4  Phased Change Over**

The new system is implemented in phases or modules.

**5.4.2.1.4.1  Advantages**

- ➢ Less errors if change is module oriented
- ➢ Less costly since modules are tested separately

**5.4.2.1.4.2  Disadvantages**

- ➢ Implementation details are usually unclear for users.
- ➢ More robust training is required if users are to master use of one new module whilst still working on the old system
- ➢ Change over period takes more time

**5.4.2.1.5  Decision**

Despite inherent disadvantage in parallel change over, it has been chosen for its reliability and consistence.

## 5.5  Maintenance

(Rech, 2011)The primary goal of maintenance is keeping the system operational capacity at acceptable levels which adheres to design specifications and standards. System maintenance is an ongoing process that involves upgrades and institution of improvements to ensure that the systems revolves with changes in requirements over time. This process was vital since it allowed enhanced monitoring and tracking of objectives.

**5.5.1  System review**

Maintenance work shall be carried out every two months and various members of staff shall be selected for continuous testing and assessments. It is believed that this process will stir development and effective feedback on system functionality. The diagram below shows the steps in system maintenance.
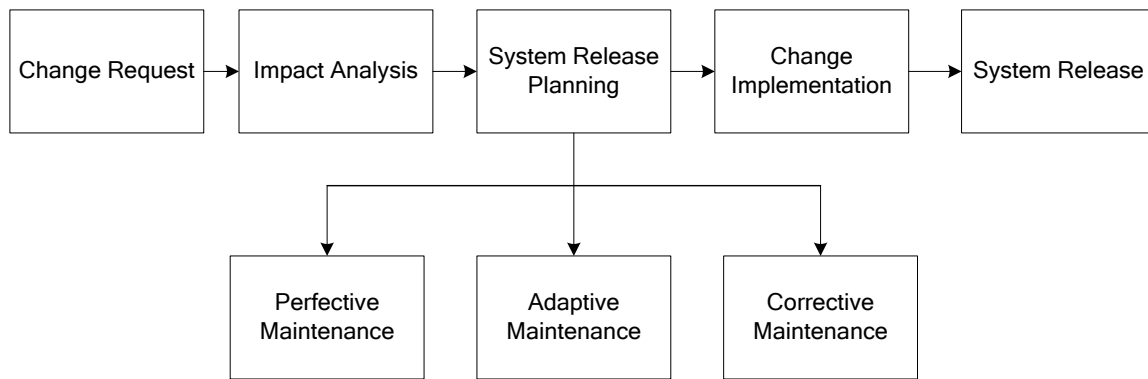
*Fig 5.6 structured maintenance*

### 5.5.2   Corrective Maintenance

(Bath;  McKay, (2008))This type of maintenance testing focuses on the time taken or effort used to diagnose and fix defects. It has all to do with maintaining and returning the functionality already in place. Issues of verification and validation issues came into place.  All fixes were done.

### 5.5.3   Adaptive Maintenance

(Bath;  McKay, (2008))This form of maintenance testing measures the effort required to adapt a system to a new or changed environment. Adaptive changes might include new hardware platforms, changes to environment and requirements. This process is continuous and a documentation report has been prepared to track changes.

### 5.5.4   Perfective Maintenance

(Saleh, (2009))Defined perfective maintenance as a process of tracking changes and improving missing functional requirements. This is an ongoing process that usually comes as users get to gain a greater understanding of the system and wants additions to be instituted.

### 5.5.5   Preventive Maintenance

This process put in place mechanisms to prevent threats keep the system running. These include disaster recovery techniques and backups. Measures have already been put in place to ensure preventive procedures are observed

### 5.5.5.1   Disaster Recovery and Backup

A dump server has already been put in place to accommodate backups and recovery. The offline backup server will act as a storage repository where the incremental backup dumps data. The

system will also be installed on the server that will act as a mini data warehouse to assist data mining and work as an alternative if total system failure occurs and will be located offsite.

## 5.6   System Evaluation

The objectives initially set earlier in the documentation have been met. The following objectives as stated earlier have been fulfilled by the performance appraisal system.

- ➢ To develop a system that centrally locates the performance appraisal information.

- ➢ To capture and process balanced scorecard percentile scores.

- ➢ To heighten security of the appraisal process through the application of robust password and access rights procedures.

- ➢ To enable tracking of appraisals in formulating suggestions to the management for strategic planning.

- ➢ To provide training needs of employees based on appraisal information.

- ➢ To provide an offline backup storage facility for the human resources department.

- ➢ To provide a data repository storage platform for feedback analysis and data mining.

### 5.6.1   Limitations and Constraints

The system was developed with limited time and financial resources. Some of the difficulties faced includes:

- ➢ **Time resources:** the time between stating of objectives and actual beginning work on the system and delivery of the system was very short and often extended into the researcher's free time.

- ➢ **Financial constraints**: the financial resources required to carry out the research proved too high and often proved to be greater than the originally budgeted for.

- ➢ **Resistance to change:** analysis phase showed that users are reluctant to have the composite profiles of their appraisal record automated as they feared demotions and layouts thus reluctant to effectively participate.

- ➢ **Technicalities:** the technical expertise that was required with respect to the actual design given the time resources available proved to be huddle.

### 5.6.2 Recommendations

- ➢ Three year plan in consultation with developer and vigorous training of local support technicians.

- ➢ Continuous user training and maintenance

- ➢ Observation of security protocols which includes non-shared username and passwords

- ➢ Continual backup and observation of recovery procedures set up

- ➢ Institution of information system strategies and aligning it to organisational strategy to ensure future policies supports the use of the appraisal system

## 5.7 Conclusion

This chapter covered the implementation aspects of the system design process. It looked at coding, testing, installation, maintenance and system evaluation. It revisited the design requirements and objectives and it was concluded that the objectives have been met. The user manuals follow in the appendix.

# BIBLIOGRAPHY

1. Dennis.A & Wixon.B.W (1997), **Systems Analysis and Design**,

2. Dutoit. H. A**, (2008), Object-oriented software engineering Using UML**, Prentice Hall, India.

3. French C.S.  (1986), **Computer Studies**,

4. http://zimra.co.zw/home/about    Accessed 20/02/2014

5. Robert Schuthesis & Mary Summer,( 1990) **Management Information Systems**, 'The Managers' view',

6) Cashman.S (2001) **systems analysis and design,** Prentice Hall ,USA

7). Holstein's .J.A (2002) **Handbook of Interview Research.**

9) Gurari.E and Winter, (2009), **Introduction to databases,** USA. Retrieved from www.cse.ohio-state.edu

10) Lampson.B and Abadi.M,(1996), **Analysis and Caching of Dependencies**, ACM Press, international conference, London

12) Tokuda.T and Kiyoki.Y, (2008), "**information modelling and knowledge**"

13) Zobel.R (2004). **Algorithms in Writing for Computer Science** (second edition). Springer

14) Wilson.G.V and Dobbs, (2009), **automated software testing**, second edition, USA

15)  Ruema.R, (2013), **back born testing**, packet publishing

16) Saleh.K.A , (2009), **software engineering**,

17) Lince.T, (2014), **software testing foundations**, Rocky Nook

18) Slender.C, (2011), **Art of testing**, **3Rd edition**, John Willy and sons

19) Siron.E (2011), **Microsoft V cluster design**, packet publishing

20) Alsmadi.I, (2012**),** Advanced Automated Software Testing**,** IGI Global

21) Gampling.B,(2013), User Acceptance Testing ,  BCS Learning & Development Limited

22) Parker.J.D, (2013), Microsoft Visio 2013 Business Process Diagramming andValidation, Packt Publishing

23)  Roy.C.J,  (2010),  Verification  and  Validation  in  Scientific  Computing,  Cambridge University, Cambridge

24) Forsyth.P, (2010), Managing Change, Kogan Page

25)  Rech.J, (2011),  Evolution and Maintenance of Software Models, IGI Global

26)  Bath.G; McKay.J, (2008) The Software Test Engineer's Handbook, Rocky Nook

27) Saleh.K, (2009), Software Engineering , J. Ross Publishin

# Appendix A: User Manual

After successful installing and configuring all necessary settings, open browser and type http://localhost/zimra/index.php the URL. This will start the system and leads to the generic home page as shown below.
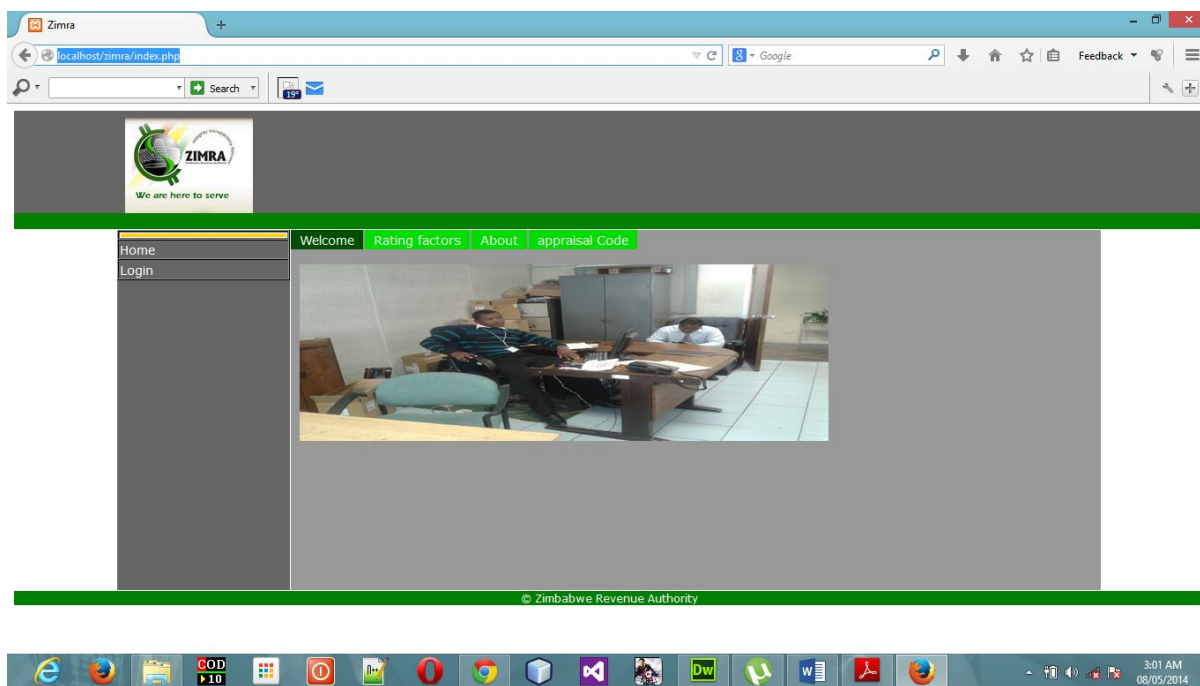


*Fig 6.1 the home page*

On the home page the user can view the welcome messages, the about the system and most importantly appraisal code that governs the appraisal process. Of special note are the rating factors which allows the user to read the full descriptions of what performance indicators entail and what is expected of them for evaluation.

To access system resources the user needs to click log in and supply valid credentials as a security measure. The user name and passwords will be supplied by the administrator of the system.
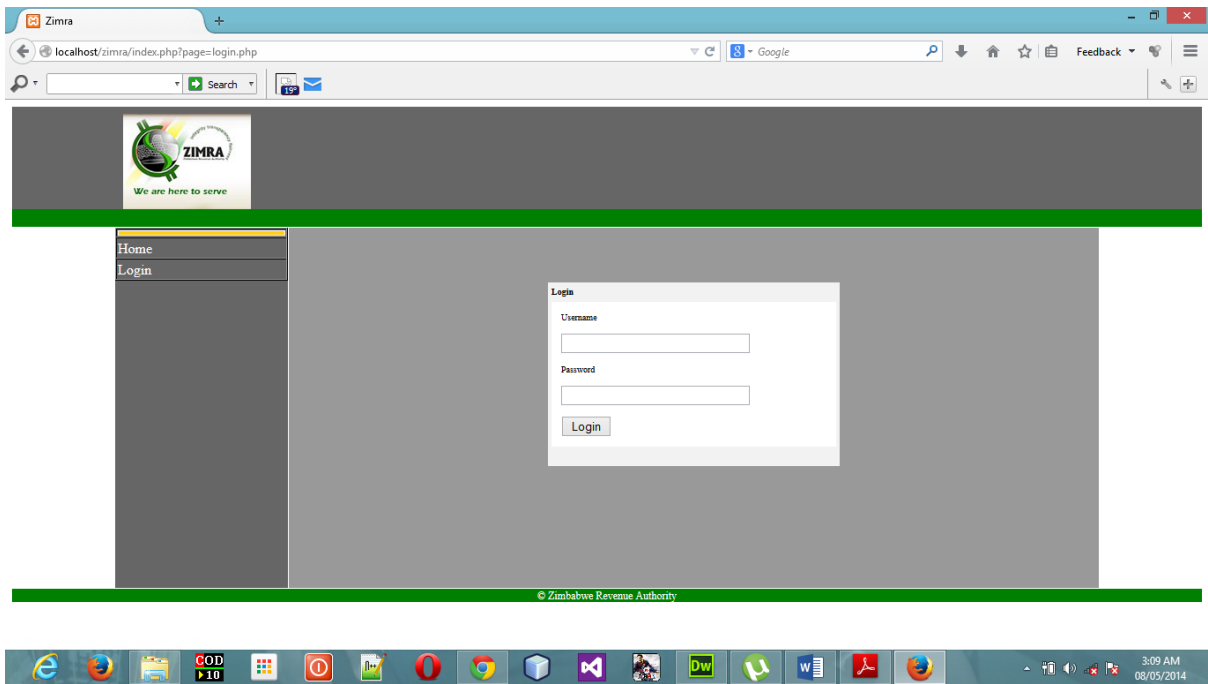
*Fig 6.2 log in page*

If the user supplies true log in credentials, they are lead to their user customised view depending on their system access level or else an error message is displayed as shown below.
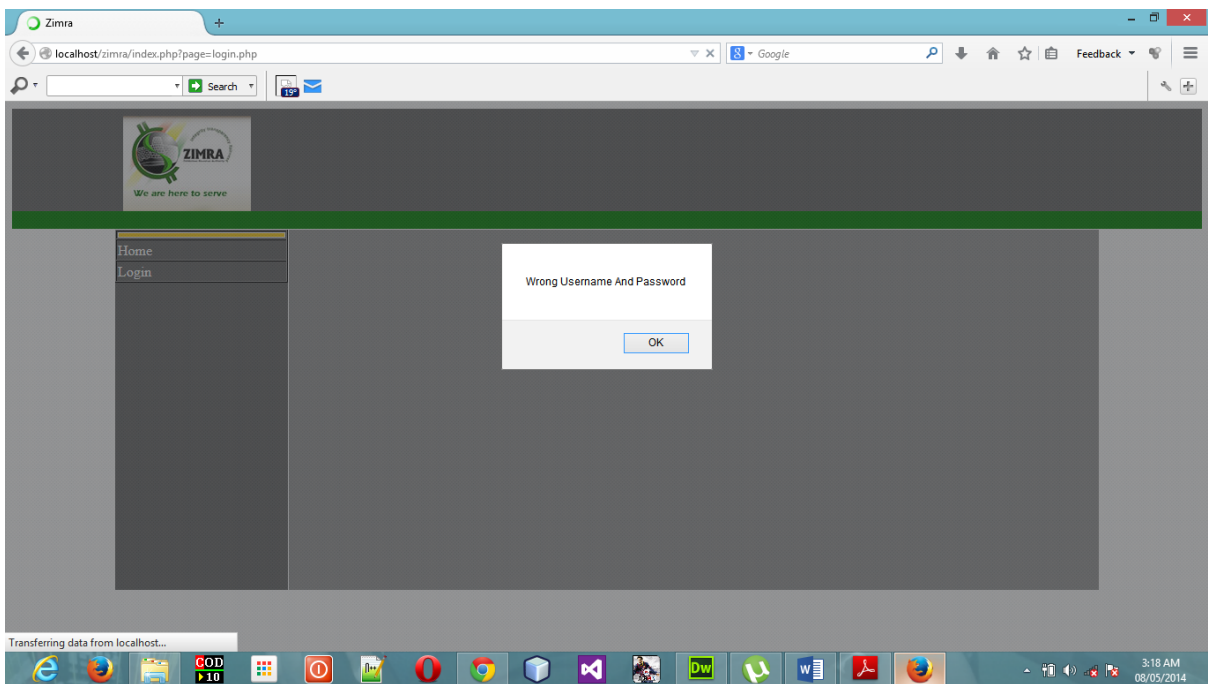


*Fig 6.3 wrong log in credentials*

If the use continually get the error message they can contact the administrator to have their passwords reset.

## Employee view

Upon successful log in the general staff are led to the page shown below.
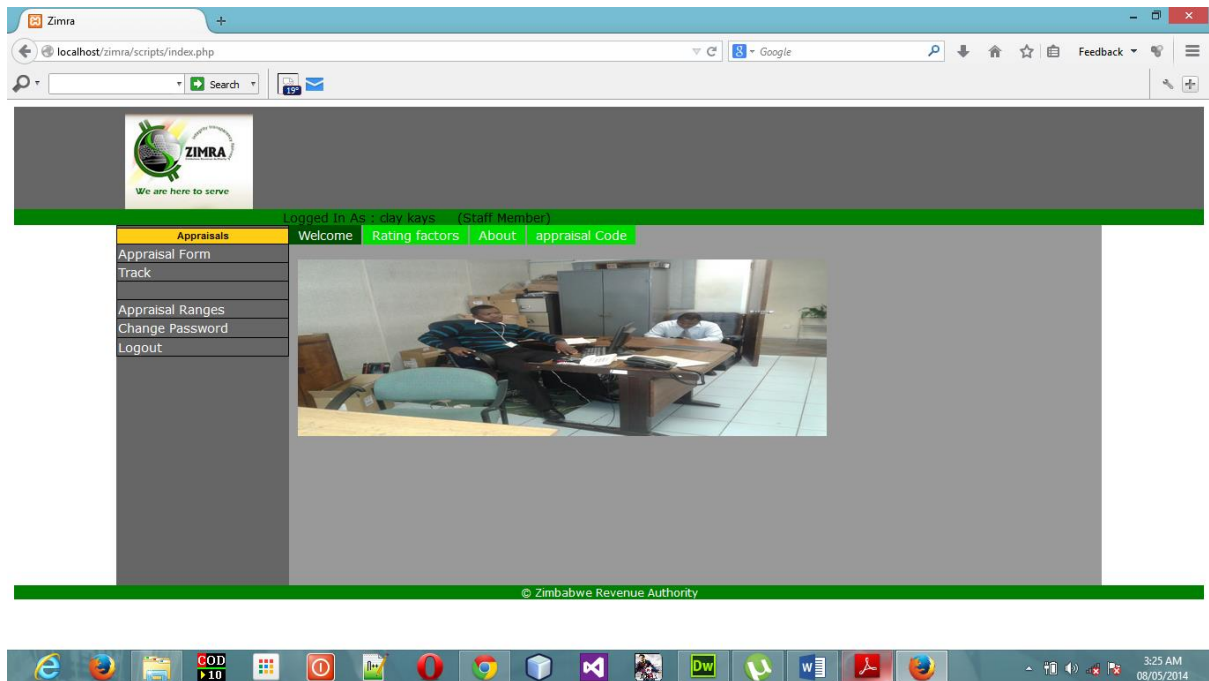


*Fig6.4 employee view*

This form allows staff to complete the appraisal form and submit it to supervisor. *Appraisal ranges* checks the sub score range for performance indicators to assist for filling. Clicking on *appraisal form* displays the appraisal form template as shown below.
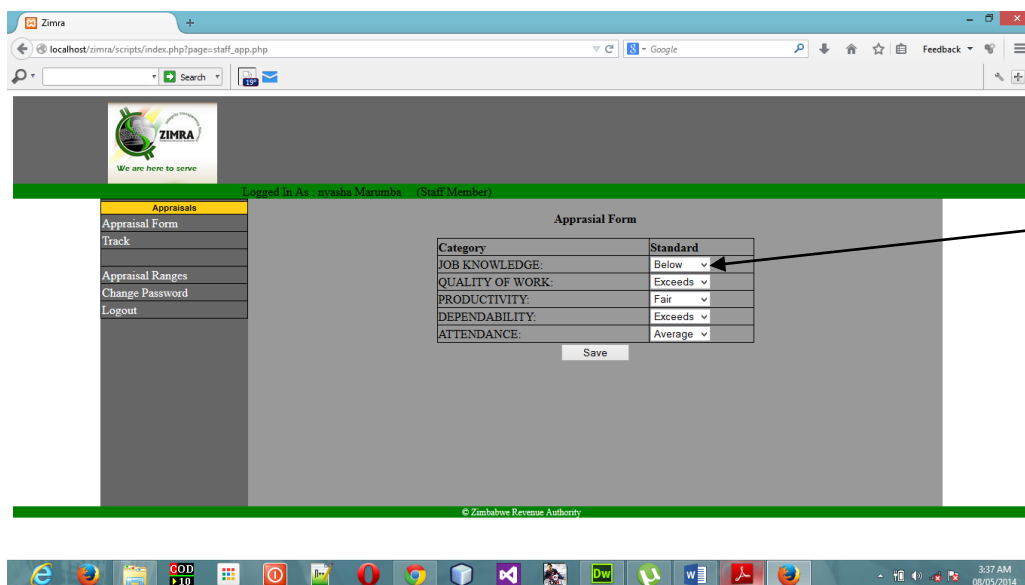


*Fig 6.5 appraisal form*

Employees can view what each standard means on the appraisal ranges as shown below:
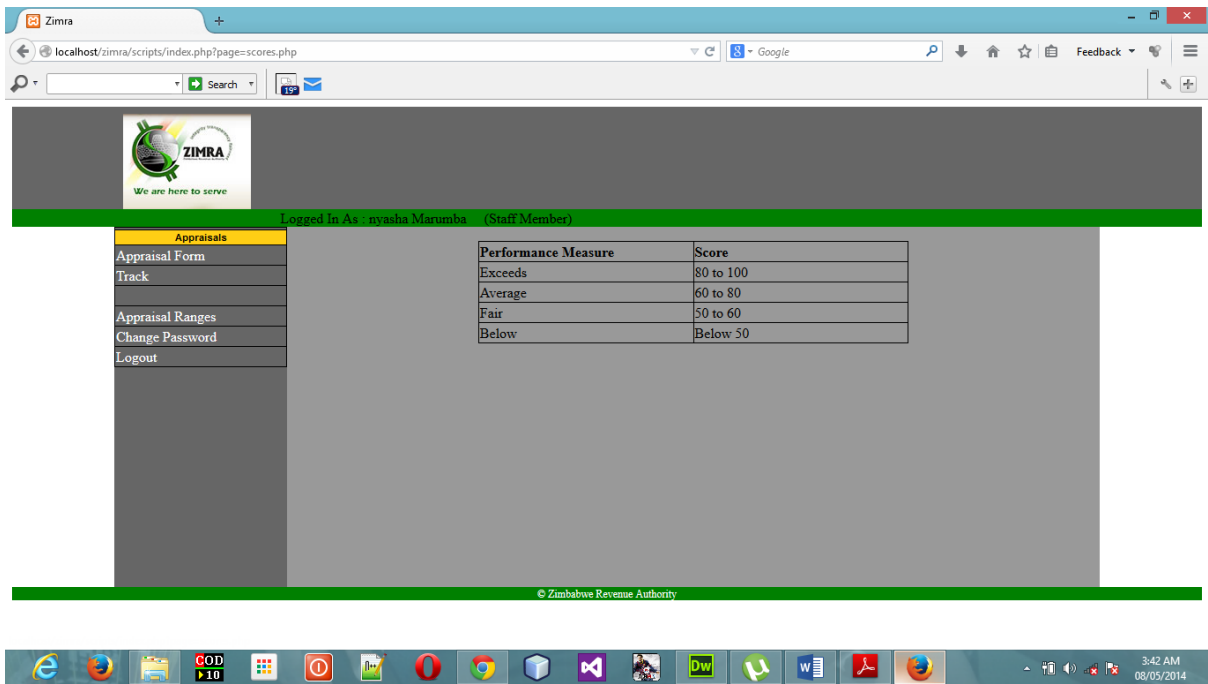
**Fig 6.6 appraisal ranges**

If the employee tries to refill or resubmit the appraisal form for the second time in the same quota the following informative message appears.
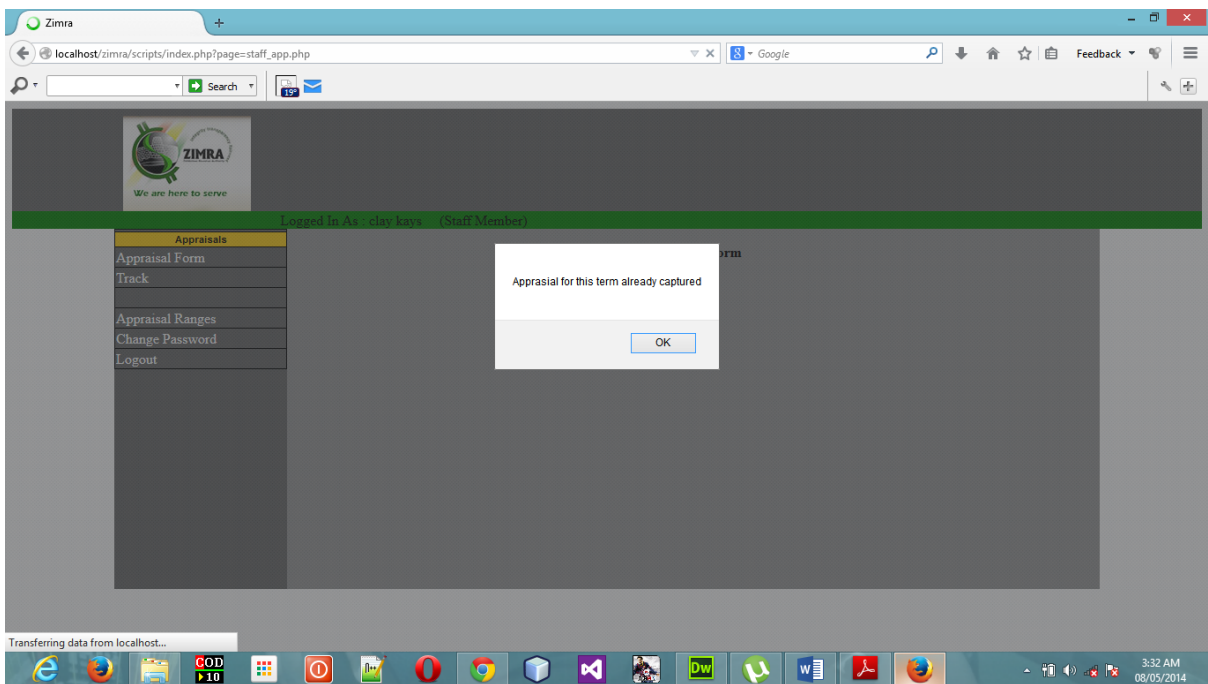


**Fig 6.7 consistence check message**

The employee can track appraisal status as shown below.
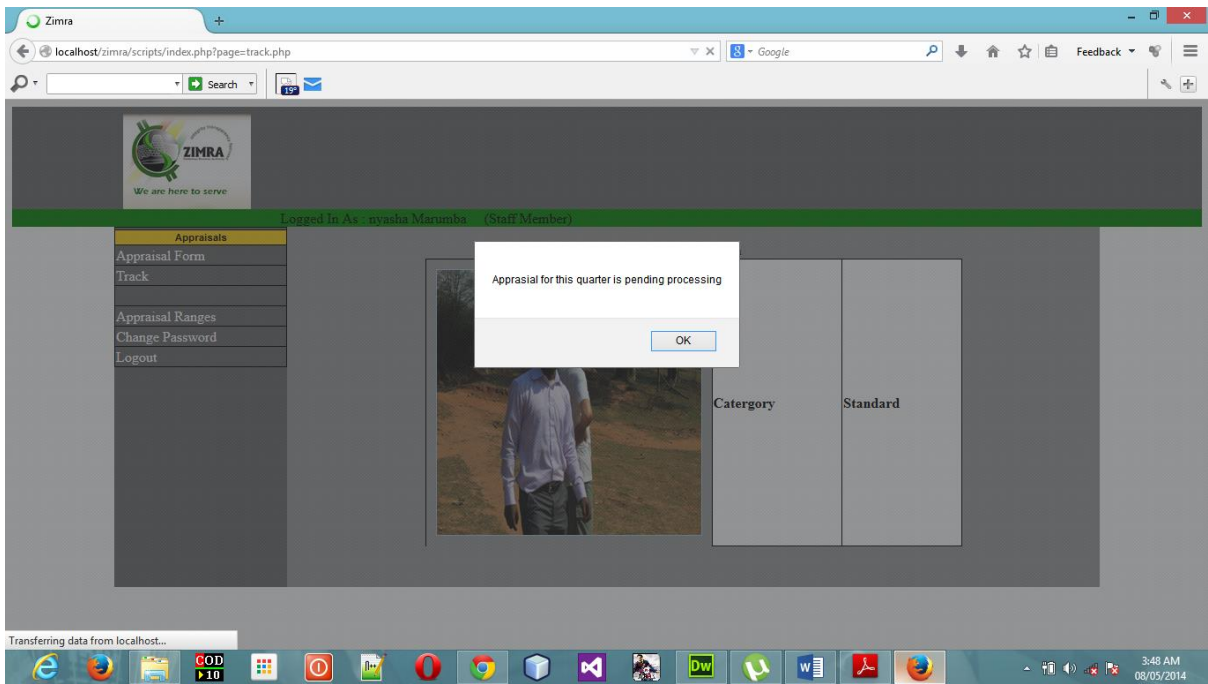
*Fig 6.8 appraisal status pending*

If the process is complete the get back the appraised form with bonus allocation for the quota as shown below.
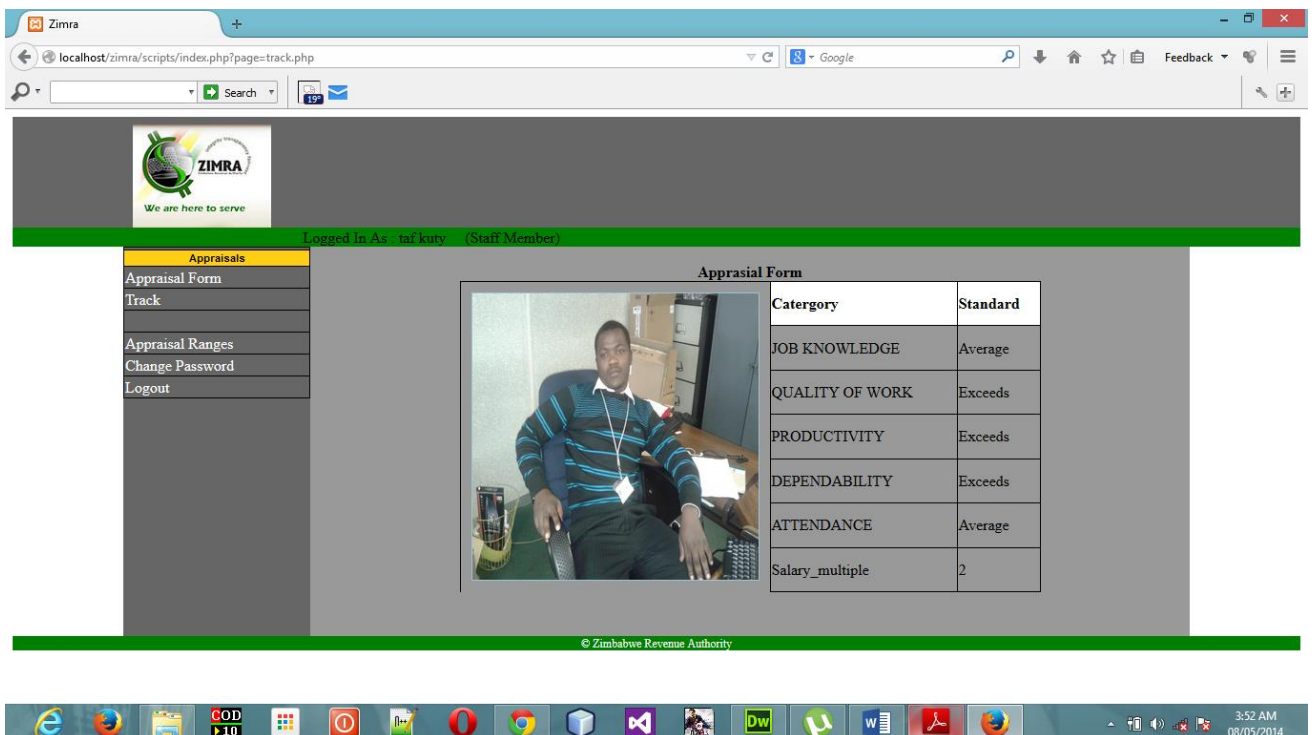


*Fig 6.9 appraised form*

The employees are required to change their password upon logging in for the first time. The shot below shows the change password form.
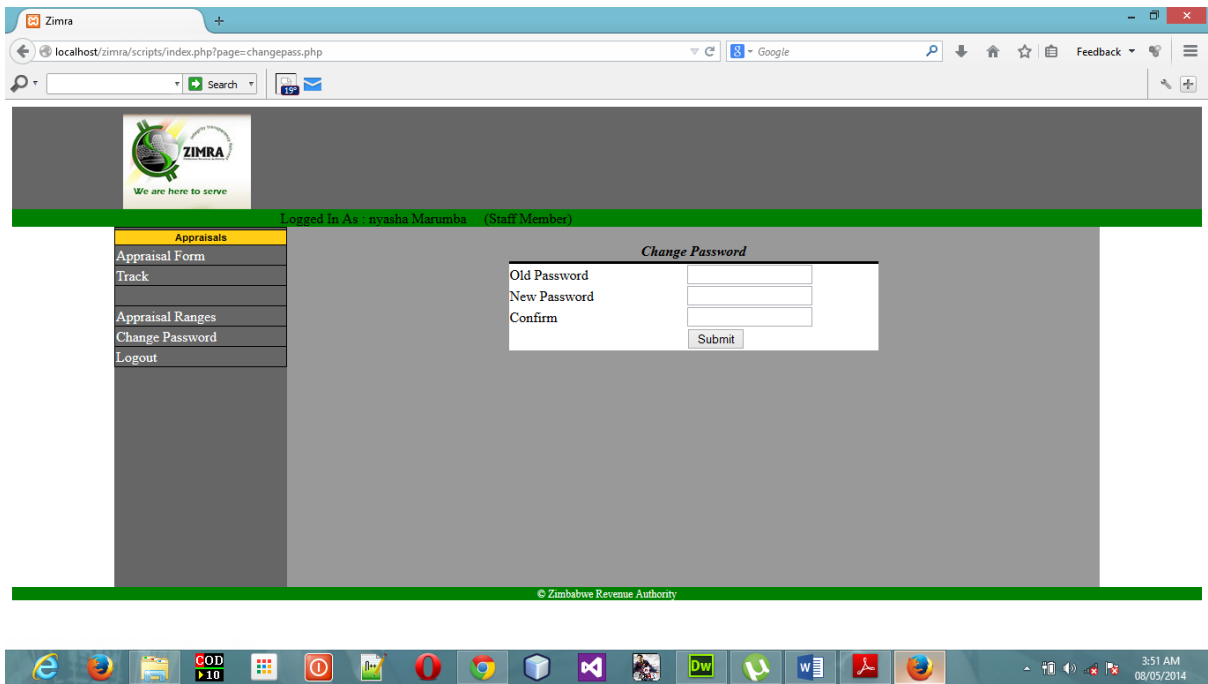
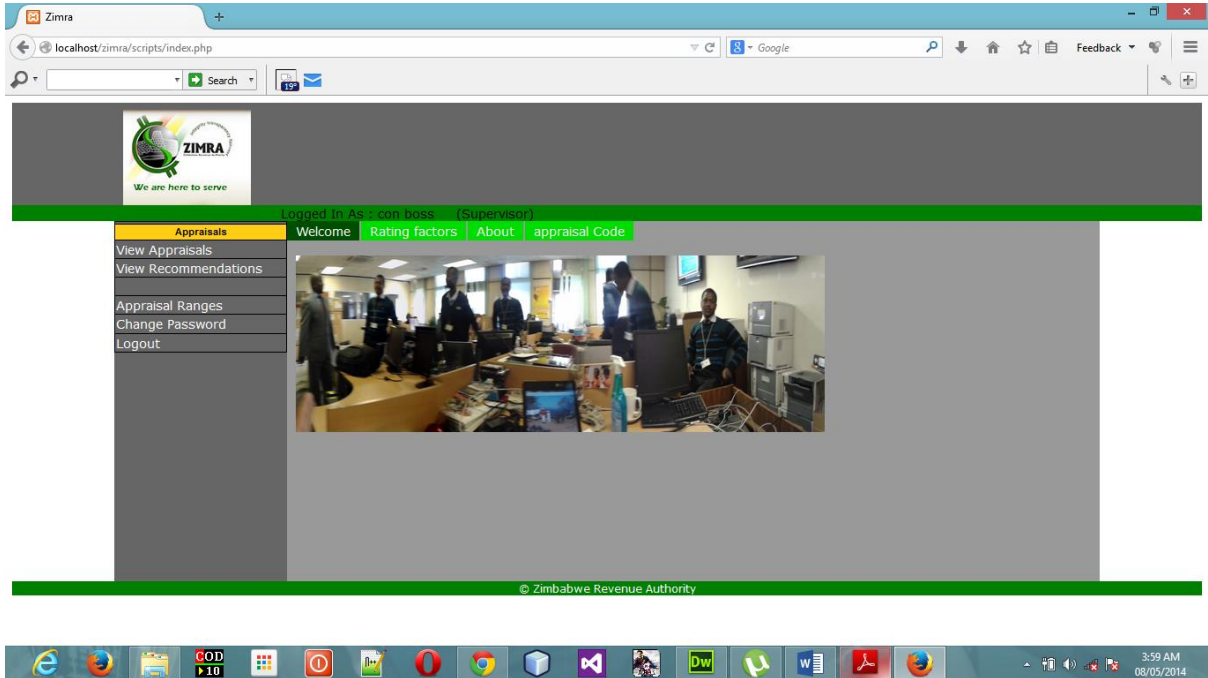*Fig 6.10 change password form*

## Supervisor view



*Fig 6.11 supervisor view*

This user can also view appraisal ranges but his main task is to approve and make amendments on submitted forms and submit the performance record to human resources for awards and

training recommendations capture. They also view recommendations which they implement with their subordinates.
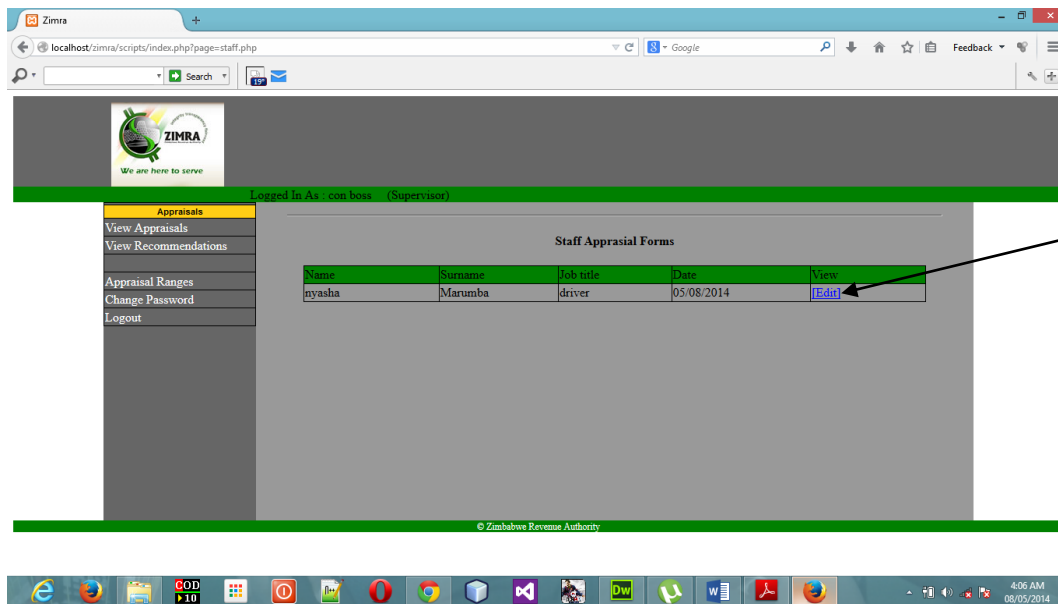


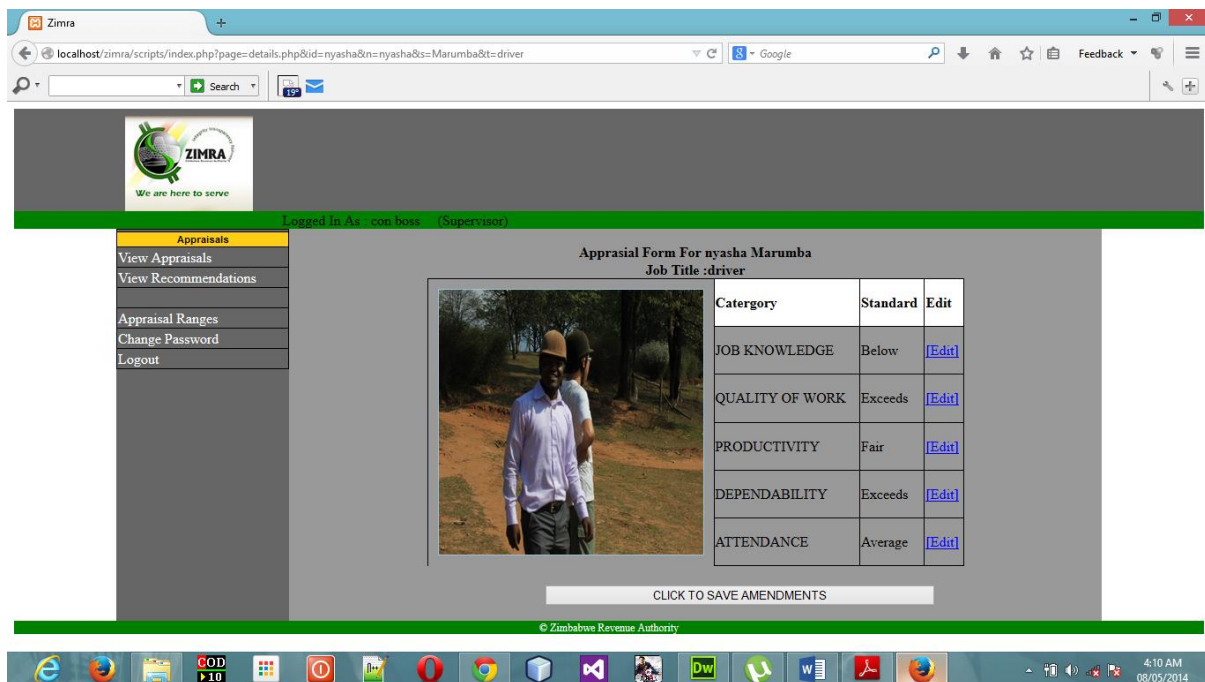*Fig 6.12 appraisals pending processing*



*Fig 6.13 approval and amendments form*

The user supervisor can make amends on standard for every performance measure before they re-submit the performance record to HR for processing. Upon clicking edit, the shot below pops up that allows them to re-score the performance indicator.
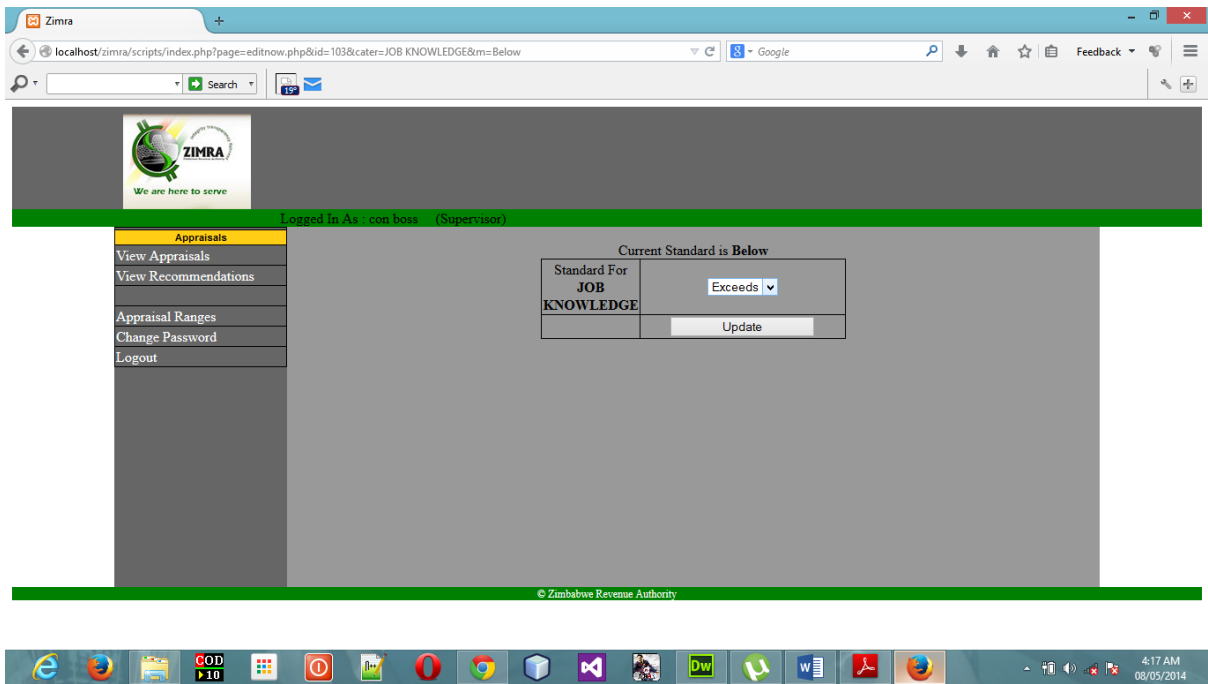
*Fig 6.14 updating performance indicator score*

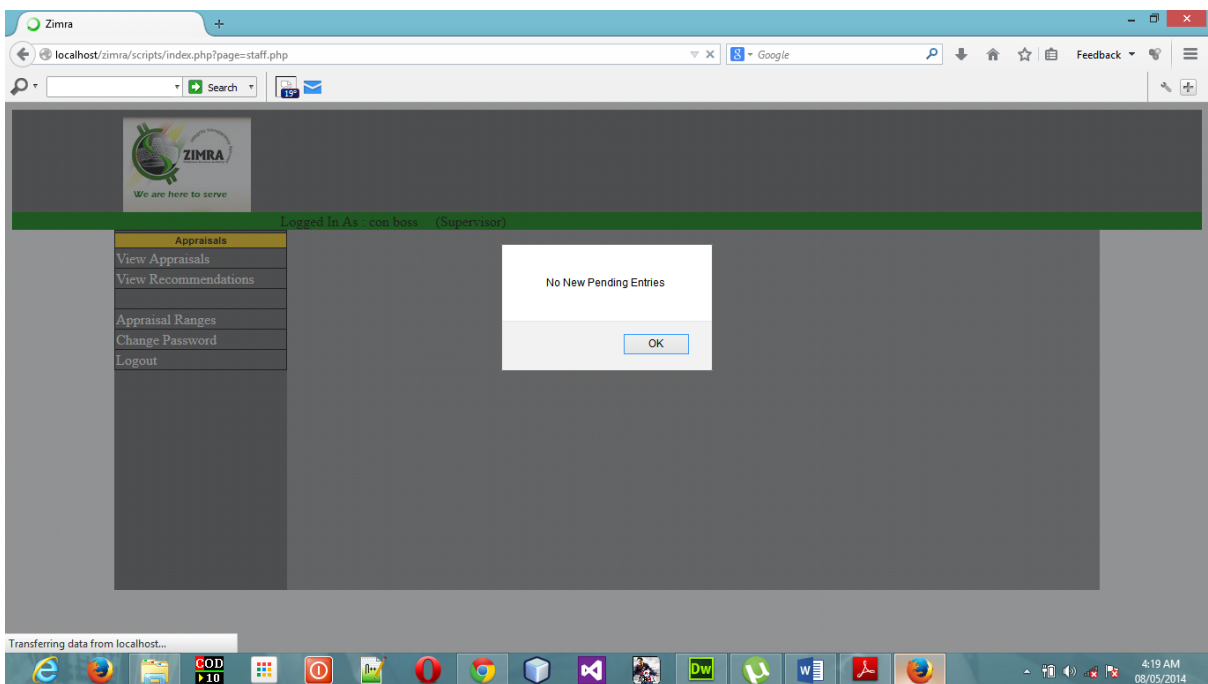The message below is displayed if they are no records pending approval



*Fig 6.15 no pending records found*

When the process is complete, the supervisor can view the training recommendations for employees as shown on the shot below:
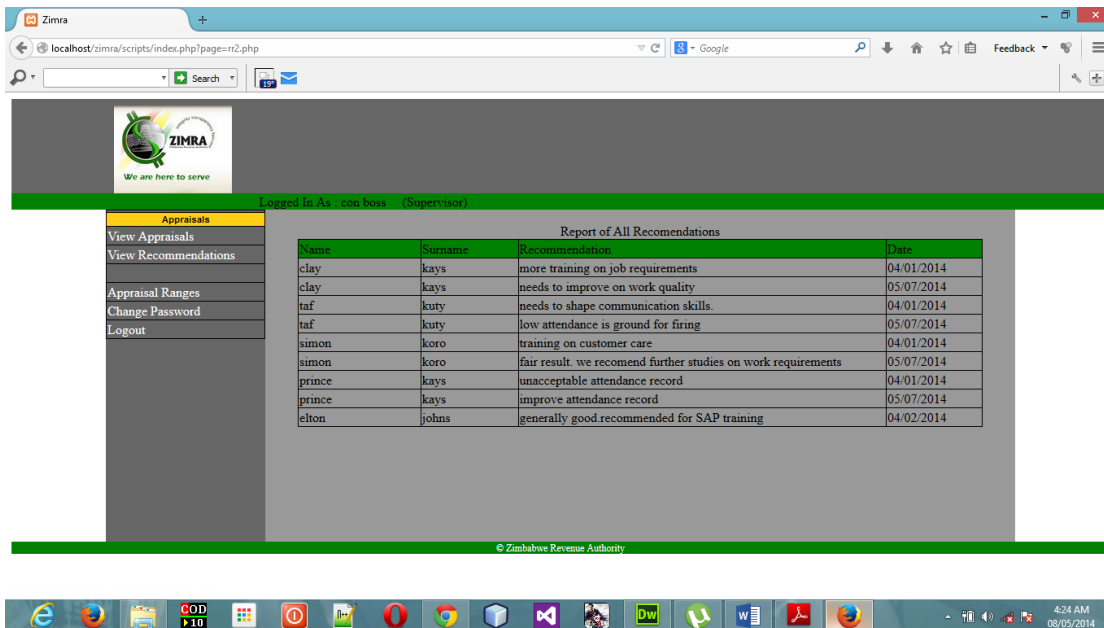
*Fig 6.16 recommendations report*
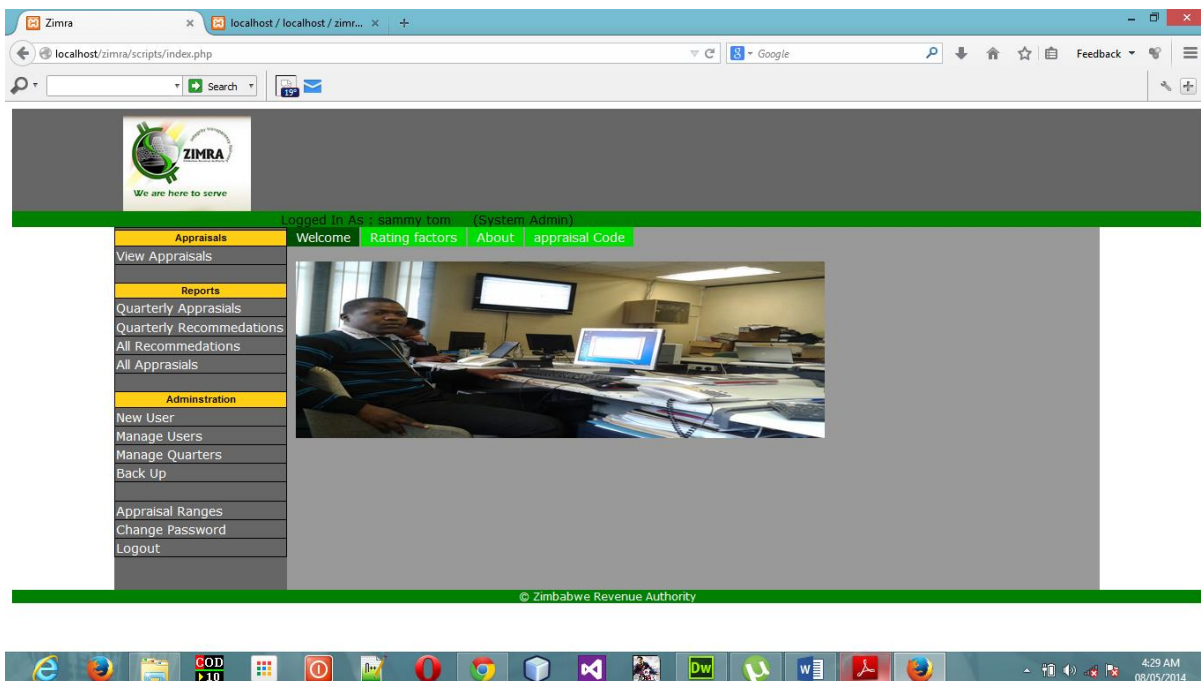
**Human resources view**



*Fig 6.17 HR view*

The user HR is ultimate admin user. They view appraisal reports, complete the appraisal process by calculating salary multiple in awarding performers as well as managing user and creating backups for the system.

**Appraisals**



*Fig 6.18 appraisals*

Upon clicking view, if the appraisal has not yet been processed the following page shows:



*Fig 6.19 recommendations capture*

This form captures recommendations. Bonus allocation is automatically calculated when recommendation is captured.

If the selected view has already have a recommendation captured the following page shows.
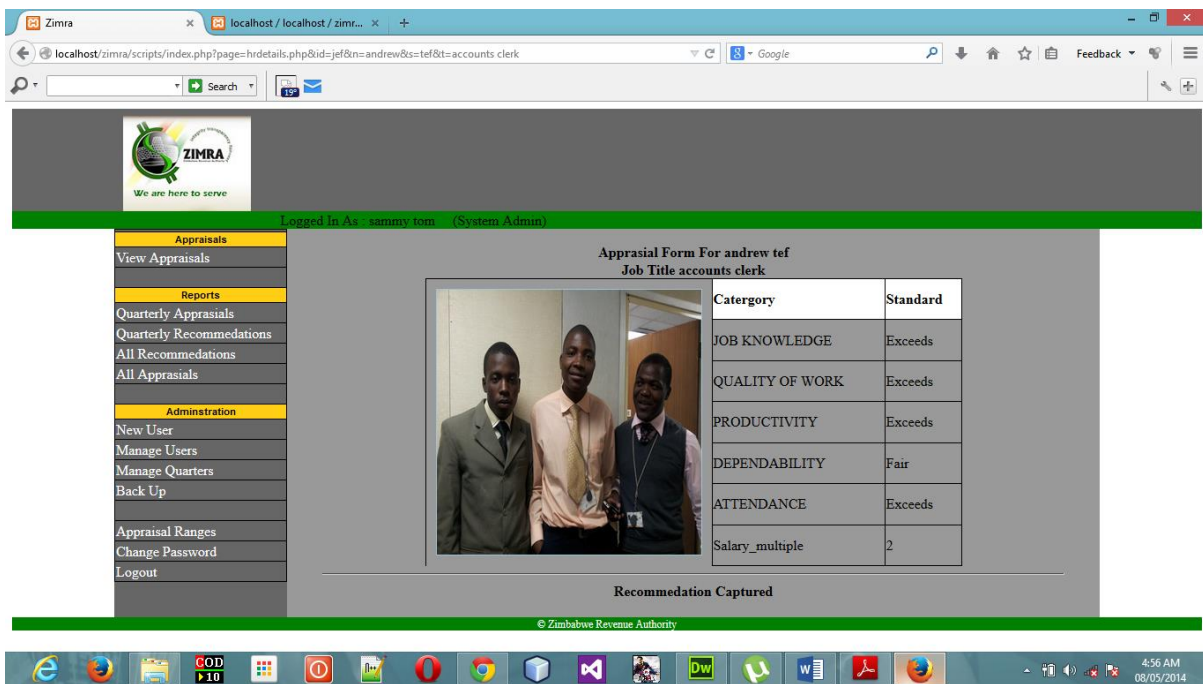


*Fig 6.20 captured recommendations*

# Reports

The user HR also views reports of quarterly appraisals, and recommendations. Below is the shot of quarterly appraisals for a selected staff.
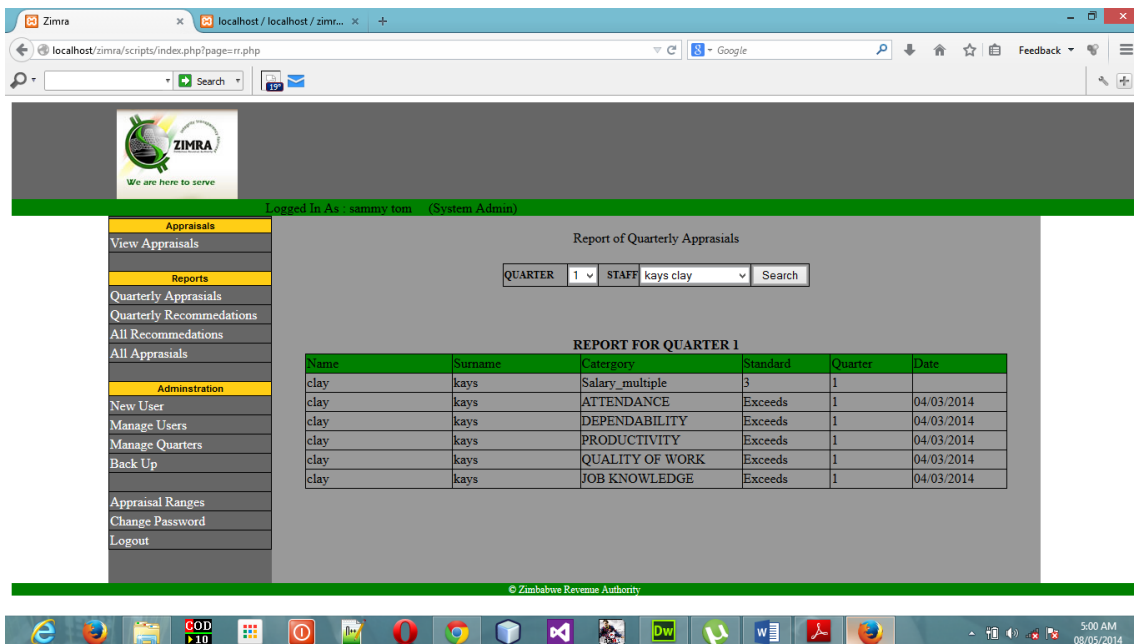


*Fig 6.21 quarterly appraisal report*

The report for quarterly recommendations.
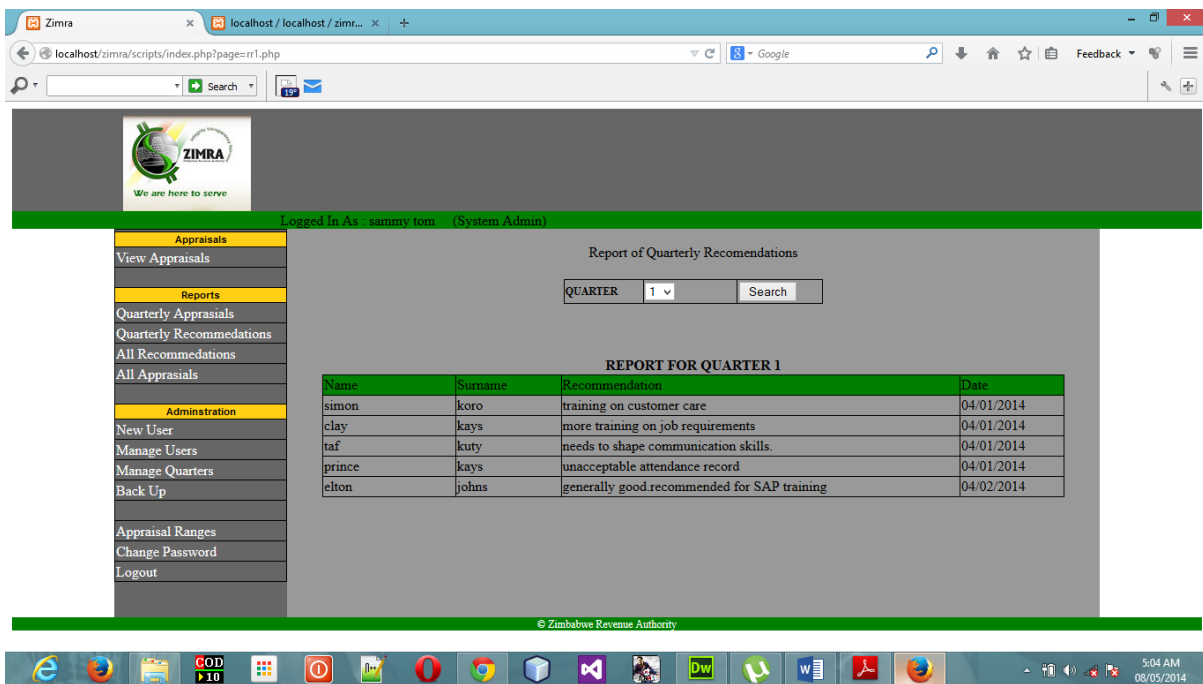


*Fig 6.22 quarterly recommendations*

# User maintenance and admin

New user is created by clicking the *new user* tab and the page below shows.
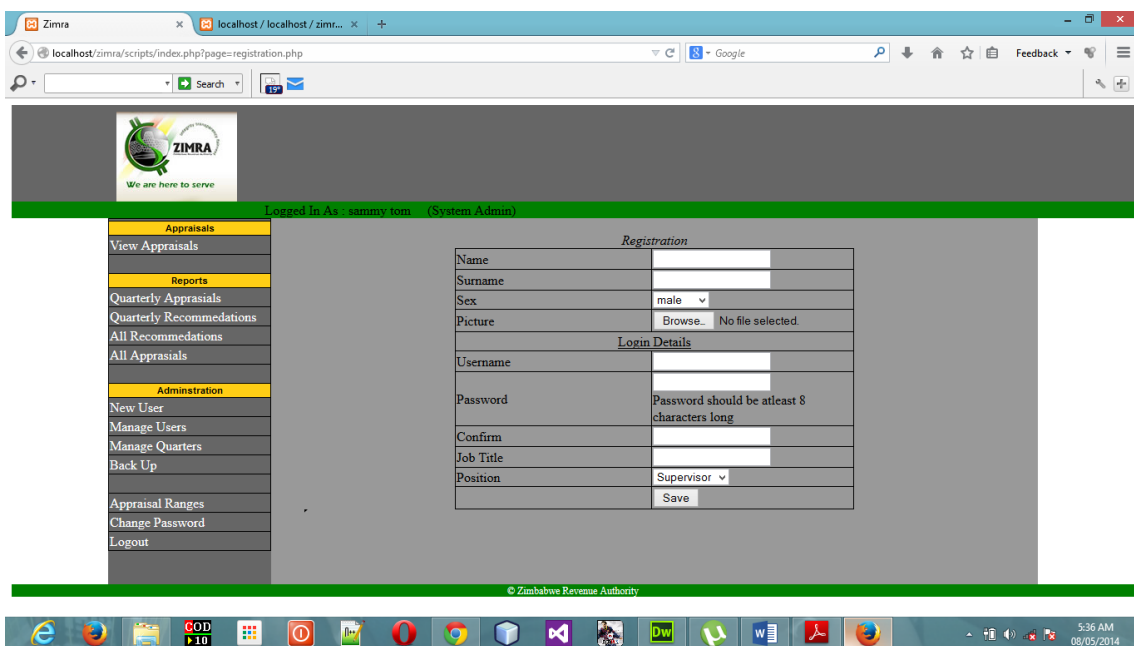


*Fig 6.23 create new user*

The window below shows user management. This is where user profiles are edited and password reset is done.



*Fig 6.24 user management and maintenance*

# Appendix B: Interview Questions

**Interview Script for Management**

1. How would you basically describe the appraisal process?

2. What would you highlight as the key processes in the appraisal process?

3. May you kindly list the objectives of the appraisal process

4. What kinds of Information do you use from your appraisal processes?

5. Can you identify all the unavailable reports that are essential?

6. Do the information reports available adhere to the required formats? If not, what would be your recommendations?

7. Does the available system offer timely reports? Are they reliable?

8. To what extend do u think the current information flow support your work objectives?

9. How do the reports affect your line of work and how do you use them?

10. Do you have all resources you need to effectives carry out your duties and what are they?

**Interview Script for Operational workforce**

1. What are sentiments concerning the upgrade of your Appraisal process from manual to an automated online system.

2. Please outline the key tasks that you perform.

3. What do you think are the critical processes in the appraisal process and why?

4. Do you have any documentation for your expected line of duties?

5. Do the available resources allow you to maximise efficiency in doing your work?

6. What are your aspirations concerning the new system and would you want it to function?

7. What areas of the appraisal process would you deem as being not very critical?

8. How often do you fill-in appraisals per year.

9. What are the key functional areas of your job that you feel are integral to be highlighted during appraisal. ?

10. Are the information requirements, processes and outputs clearly defined in the manual for tasks that you carry out?

## APPENDIX C: Observations Form

**Date:**

……………………………………………………………………………………………

**Time:**

……………………………………………………………………………………………

**Department under Investigation**

……………………………………………………………………………………………

| Observation | Note/Summary | Recommendation/Action |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Appendix D: Code Snippet

## Main admin code

```php
<?php
 $check=mysql_query("select    *    from    staff    where    user='$_REQUEST[id]'    and
term='$_SESSION[term]' and catergory='Salary_multiple'") or die(mysql_error());

 $check1=mysql_query("select sum(mark) AS a from staff where user='$_REQUEST[id]' and
term='$_SESSION[term]'") or die(mysql_error());

while($row = mysql_fetch_array($check1)){

            $m=$row['a']/5;

  }

  $grd=grade($m);

  if(mysql_num_rows($check)==0){

        mysql_query("INSERT INTO staff(user,catergory,mark,stage,term)

VALUES

('$_GET[id]','Salary_multiple','$grd','2','$_SESSION[term]')") or die (mysql_error());

        }

$qry= mysql_query("select * from users,staff where user=username and user='$_GET[id]' and
stage='2' and term='$_SESSION[term]'   ")or die(mysql_error());


?>


<center><strong><?php echo"Apprasial  Form  For  $_GET[n]  $_GET[s]<br>Job    Title
$_GET[t]

";?></strong><table  width="609"  border="1"    align="center"  style="border:1px  solid
#000000">

 <tr>



 <tr bgcolor="#FFFFFF">

  <td><strong>Catergory</strong></td>

  <td><strong>Standard</strong></td>
```

```php
</tr>
<?php
while($row = mysql_fetch_array($qry)){
        $va= getvalue($row['mark']);
                echo "<tr><td>{$row['catergory']}</td><td>$va</td></tr>";



    }
    if(isset($_POST['save'])){
mysql_query("INSERT INTO reco(user,reco,date,term)
VALUES
('$_GET[id]','$_POST[reco]','$date','$_SESSION[term]')") or die (mysql_error());
                                            echo("<SCRIPT
LANGUAGE='JavaScript'> window.alert('Recomandation captured')
            location='index.php?page=hrstaff.php'
                </SCRIPT>");   }
        ?>


</table><hr><?php
$t=mysql_query("select * from reco where term='$_SESSION[term]' and user='$_GET[id]'")
or die(mysql_error());
if(mysql_num_rows($t)==1){
echo"<strong>Recommedation Captured</strong>"; }else{
?><table width="54%" border="0" >
 <tr align="center"><form action="" method="post"
  <td>Recommedations</td><td>
    <textarea name="reco" id="reco"></textarea></td>
 </tr>  <tr align="center">
   <td> </td><td><input type="submit" name="save" value="            Save
"></td>
 </tr>
```

</table></form>

</center><?php } ?>

## Functions code

```php
<?php
$date = date('m/d/Y');
$time = date('m/d/Y - H:m:s');

 function getConnection() {
  mysql_connect("localhost", "root", "lizzy");
  mysql_select_db("zimra");
 }
 function getpic(){
        $qry= mysql_query("select  *  from  users,staff  where  user=username  and
user='$_GET[id]'")or die(mysql_error());
 while($row = mysql_fetch_array($qry)){
        $a=$row['account'] ;
  }
  return $a;}
  function getpic1(){
        $qry= mysql_query("select  *  from  users,staff  where  user=username  and
user='$_SESSION[username]'")or die(mysql_error());
 while($row = mysql_fetch_array($qry)){
        $a=$row['account'] ;
 }
  return $a;}
 function pinda($cat,$std){
            global $date;
mysql_query("INSERT INTO staff(user,catergory,mark,stage,term,date)
```

```
VALUES
('$_SESSION[username]','$cat','$std','1','$_SESSION[term]','$date')") or die (mysql_error());
        return true;
         }
 function grade($a){

if ($a>=80){
        $risk="3";
        }

        if ($a>=60 AND $a<=79){
        $risk="2";
        }
        if ($a>=50 AND $a<=59){
        $risk="0.5";
        }

        if ($a<=49){
        $risk="1";
        }
        return $risk;
         } function getvalue($a){

if ($a==80){
        $risk="Exceeds";
        }

        elseif ($a==60){
        $risk="Average";
        }
```

```php
        elseif ($a==50){

        $risk="Fair";

        }


        elseif ($a==0){

        $risk="Below";

        }

        else{$risk=$a;}

        return $risk;

         }

         function changa($a){


if ($a==3){

        $risk="Exceeds";

        }


        elseif ($a==2){

        $risk="Average";

        }

        elseif ($a==0.5){

        $risk="Fair";

        }


        elseif ($a==1){

        $risk="Below";

        }

        else{$risk=$a;}

        return $risk;

         }

                function base($data) {
```

```php
    return rtrim(strtr(base64_encode($data), '+/', '-_'), '=');
}
  /* numeric, decimal passes */
function number($variable) {
        return is_numeric($variable);
}


/* digits only, no dots */
function wholenumber($element) {
        return !preg_match ("/[^0-9]/", $element);
}


  function ifexisits($table,$column,$value){
                $db = getConnection();
        $rs1 = mysql_query("select * from $table where $column = '$value'");
 $rw = mysql_num_rows($rs1);
 return $rw;
        }


  function days($date,$date2){
                $start = strtotime($date);
$end = strtotime($date2);


$days_between = ceil(abs($start - $end) / 86400);
return $days_between;
                }


                function deleteRecords($table, $field, $value){
                        $db = getConnection();
```

```php
        $sql = "DELETE FROM $table WHERE $field = '$value'";

        //echo $sql;

        mysql_query($sql)or die (mysql_error());


}


function updateRecords($table, $field, $value){

        $db = getConnection();

        $sql = "update set $table WHERE $field = '$value'";

        //echo $sql;

        mysql_query($sql)or die (mysql_error());


}
//deleteRecords('final','id',2)




        <?php
}
//msg('jfkjaj');
function link1($link){

        ?>

                <script language="javascript">

                        location = '<?php echo $link;?>';

                </script>

        <?php

}

                //link('index.php')


function clean($str) {
```

```php
$str = @trim($str);
if (get_magic_quotes_gpc()) {
    $str = stripslashes($str);
}
$db = getConnection();
$new=mysql_real_escape_string($str);
$remove[] = "'";
$remove[] = '"';
$remove[] = "-"; // just as another example

$word = str_replace($remove, "", $new);
return $new;
}
//echo clean("hjd''"kfd");
```

**?>**