INDUSTRIAL ATTENDANCE MANAGEMENT SYSTEM

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Industrial Attendance Management System

BY

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Abstract

Industrial attendance management system is a software application that is developed for Zimbabwe Power Company Bulawayo Power Station to allow employees to log in and out of the organisation and also calculate their overtime automatically. The problem that arose with the current system was the difficulty in handling employee clock in details manually. The developed system overcomes the problems that were associated with the current manual system such as too much bottlenecks. In-house development was chosen as the best alternative to introduce this system in the organisation. Feasibility analysis was carried out in terms of social, economic and technical aspects to see whether developing the system is a viable decision. Interviews, questionnaires, observations and document review were the information gathering methodologies that were used to identify the problems of the current system. Tools that were used in developing the system are Php, Dreamweaver and MySQL. Adaptive maintenance was chosen because it allows the system to adapt to environmental changes of the software and hardware. Implementation strategy used in implementing the system is the pilot changeover strategy since it is less risky compared to other changeover strategies. For the future recommendations, the system must be developed further for it to be used in all power stations and have a server for the system that will manage all power stations employee activities.

Declaration

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

Signature_____ Date _____

Approval

This dissertation entitled "INDUSTRIAL ATTENDANCE MANAGEMENT SYSTEM FOR ZIMBABWE POWER COMPANY BULAWAYO POWER STATION" by PRISCA MEMORY NYARI meets the regulations governing the award of the degree of BSC HONOURS INFORMATION SYSTEM of the Midlands State University, and is approved for its contribution to knowledge and literal presentation.

Supervisor   ………………………………………………….

Date   ………………………………………………….

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God bless you all

Dedication

It goes to my father who continuously contributed notably to my welfare and resources and whose inspiration is my source of motivation. May the Lord continue to bless him. Thank you for your overwhelming support.

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List of acronyms

ARR – Average Rate of Return

BPS – Bulawayo Power Station

CBA – Cost Benefit Analysis

C.E.O – Chief Executive Officer

DFD – Data Flow Diagram

GB – Gigabyte

GHz – Gigahertz

HP – Hewlett Packard

MySQL – Structured Query Language

NPV – Net Present Value

PHP – Personal Homepage

RAM – Random Access Memory

ROI – Return on Investment

SMART – Specific, Measurable, Attainable, Realistic and Time framed

ZESA – Zimbabwe Electricity Supply Authority

ZPC – Zimbabwe Power Company

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Chapter 1: Introduction

1.1 Introduction

Nowadays the world of business is always dynamic meaning that it is ever changing due to information technology systems as such organisations needs to implement these information systems in order for the organisation to remain very effective and efficient. As such ZIMBABWE POWER COMPANY BULAWAYO POWER STATION should adopt an online attendance management system. An electronic attendance management system automates and streamlines the login process of employees in an organisation. The project will focus on managing the entire login and log out flow process. The chapter will concentrate on the benefits that are brought by the proposed system and these merits should outweigh those of the existing system, conduct a study of the organisational background, and highlight the objectives of the proposed system and the reasons behind its development.

1.2 Background of the study

According to Alleyne (2015) a background study refers to a process of carrying out a mere review of some part of the organisation under study or being looked into in terms of existing adequate information which is around the problem trying to be solved.

The problems faced by ZIMBABWE POWER COMPANY BULAWAYO POWER STATION (ZPC BPS) involve a poor time in management system. Hence there is need of a computerised system in recording the time in of employees. The system will enable the company to run outstandingly and efficiently in order to upgrade with the dynamic changes in technology that are constantly changing for the better resulting on an electronic time in and time out attendance system. The existing system give employees the ability to record their time in at work using a manual system that is the employees have to queue in the gate while the loss control officer on duty at the gate records each employee's name and surname, station number and the department. This helps the proposed system to combine all the activities on a global scale in which employees enter time without wasting much of their time. Also employees record their time out at the station hence it takes time for them also to queue especially at half past four in the afternoon were most employees dismiss from the work station. It is also difficult to notice that an employee did not come to work.

1.2.1 Background of the organisation

According to Yago, Asai and Ito (2015), an organisational background states how and why was the business implemented, how the organisation must be run and setup, the land which it covers, ethics which the organisation bases on also including the community support and its relationship that it has with the organisation.

Zimbabwe Power Company is a subsidiary of Zimbabwe Electricity Supply Authority (ZESA). ZESA Holdings is a fully Government owned parastatal. It is responsible for the generation of electricity in Zimbabwe. ZPC was fully established in the 1996's as a driver too lure investors for ZESA in the generation of power and it became operational in 1999. The Act 13:19 of 2002 which involved electricity saw the birth of ZESA subsidiaries which resulted in ZPC being given the responsibility of generating power in the country. ZPC was authorised to own, operate, construct and maintain the generating power stations. ZPC consists of five power stations that is four thermal power station and one hydro power station with their capacities stated. These are in

1. Hwange - 920MW.
2. Harare - 100MW.
3. Munyati - 100MW.
4. Kariba - 1960MW.
5. Bulawayo - 90MW.

1.2.1.1 Bulawayo Power Station

Figure 1.1 Aerial view of Bulawayo Power Station.

The commissioning of the station occurred between 1948 and 1957. From 1948 up to 1960 the plant was connected to a local network within the Bulawayo area.

1.2.2 Organisational structure

Shtub and Karni (2010) explains saying a structure of an organisation provides a guideline on the activities that management function accordingly. These management processes include the determination of power, how responsibilities and roles are assigned, how the departments are coordinated, how activities controlled, conducted and the coordination of information involving the levels of management. It also identifies different processes that include allocation of tasks, integration of activities and monitoring of these activities with the aim of meeting the goals of the organisation.

The organisational structure of Bulawayo Power Station which falls under ZPC is as follows:

```
                        ┌─────────────────┐
                        │   Head office   │
                        └────────┬────────┘
        ┌────────────┬───────────┼───────────┬─────────────┐
┌───────┴──┐  ┌──────┴───┐ ┌─────┴─────┐ ┌───┴────┐  ┌─────┴─────┐
│  KARIBA  │  │  HARARE  │ │ BULAWAYO  │ │ HWANGE │  │  MUNYATI  │
└──────────┘  └──────────┘ └─────┬─────┘ └────────┘  └───────────┘
```

FINANCE	HR	MAINTEINANCE	CHEMICAL SERVICES	LOSS CONTROL	OPERATIONS

MANTEINENCE

ENGINEER

SENIOR FOREPERSON MECHANICAL	MAINTENANCE ENGINEER	SYSTEMS ADMINISTRATOR WORKERS	FOREPERSON CIVILS AND SERVICES	SENIOR FOREPERSON ELECTRICAL, CONTROL AND INSTRUMENTATION
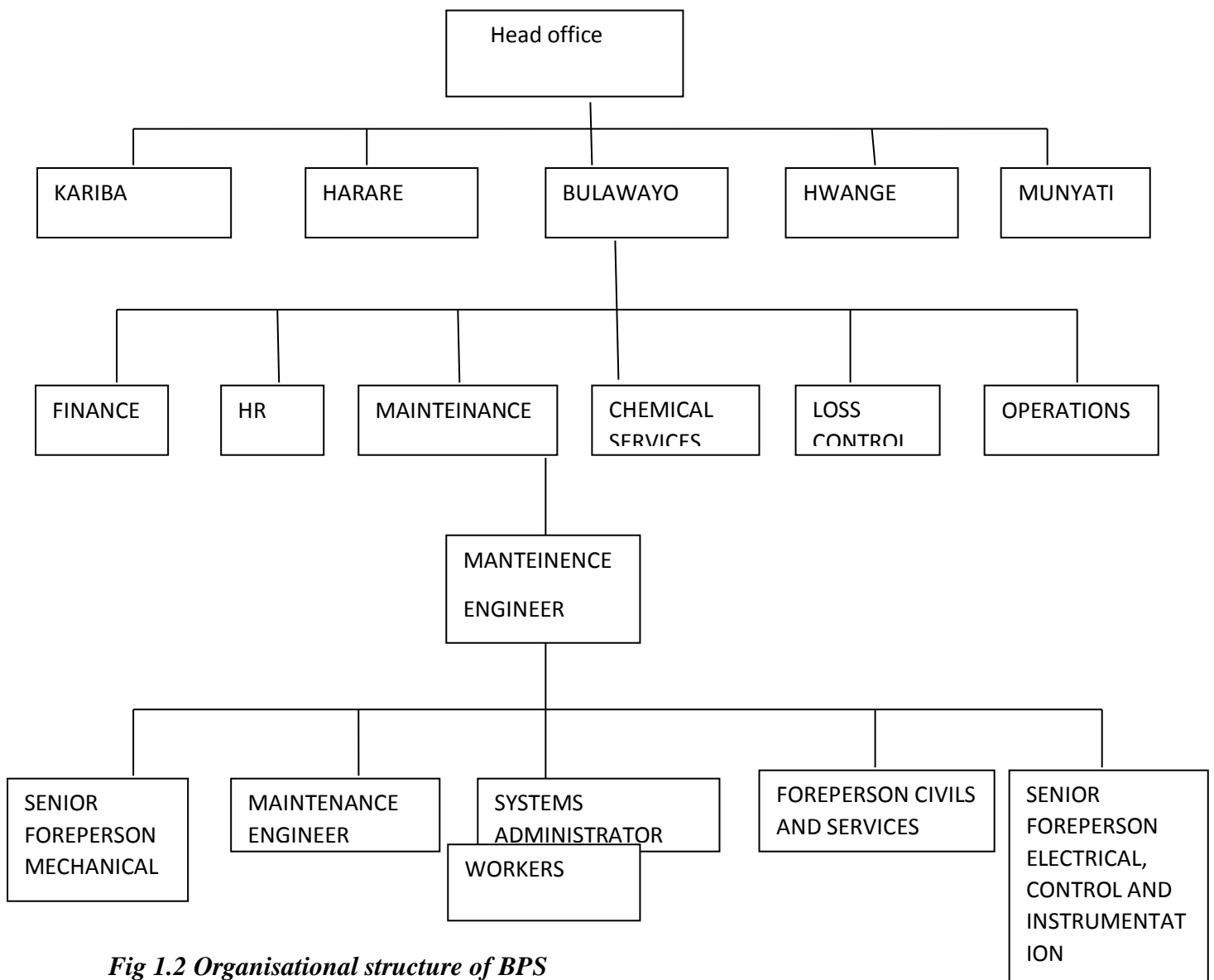
Fig 1.2 Organisational structure of BPS

1.2.3 Vision

King, Case and Avery (2012) states that a vision is known as a description which is inspirational in terms of what an organisation foresees, expects and wishes to have accomplished in the midterm or near future according to. Also it is described as a picture of how the organisation wishes to be known for and what it wants to become. He continues to say that in most organisations it is used as a clear guide which helps in selecting current and future methods of running the organisation hence guiding the organisational management to make sound decisions in line with the organisational vision.

Zimbabwe Power Company vision is "To be a leading supplier of energy and any related services in the region."

1.2.4 Mission

Every organisation has got a mission statement. Shtub and Karni (2010) say that a mission statement is a document that is written which highlights the businesses focus and its main aim that usually is not changed over a period of time. A mission also states and explains the organisational reason for existence.

Zimbabwe Power Company's mission states "To be the supplier of energy and generate electricity related products through the use of environmentally friendly technologies."

1.3 Problem definition

Problems being faced by ZPC Bulawayo power station due to the current manual time in attendance system are explained further. The existing system is not flexible because early in the morning workers usually come maybe ten minutes early before the start time and for one loss control officer to write each and every employee that enters the premises at the same time takes some time resulting in employees being late whilst they are waiting to clock in at the gate. It is a tedious process to constantly write the name of the worker, surname, station number and the department of the employee as they enter the station everyday in the morning and sometimes also visitors thus resulting in plenty of time that is wasted unnecessarily and because of this some of the employees might just pass because of the congestion at the gate and the loss control officer may not notice because they may be busy login employees as such employees may not have the patience to wait a little longer and be part of the process as they will be in a hurry to and start work for the day. More paper work is carried out since visitors have their own log book, human resources department have its own and the other departments use the same book hence each book does not last and having many books is done to enable easy tracking in the future. This usually results in loss of data because the records are maintained manually. Paper work is prone to a high risk of due to the fact that it is a difficult process storing them for a longer period of time without them being lost or damaged. Hence the loss of data which is valuable may occur due to these conditions and the lack of proper security of the data.

1.4 Aim

The system's aim is developing a system that is a tracking management system and web based using Php in order to enable easy recording of time in by employees and also time out of the employees

1.5 Objectives

Objectives refers to what the organisation aims at achieving or what it wants to attain using the system being developed and these objectives are supposed to be measurable, specific, realistic, time framed and attainable (**SMART**) according to Shtub and Karni (2010). The objectives of the attendance management system are:

1) Implementing a system that allows employees and visitors to clock in and clock out of the work station
2) To implement a system that calculates overtime hours and overtime amount of employees
3) To help in easy tracking of records.
4) To enable easy generating of reports.
5) To enable in identifying absent employees.

1.6 Instruments and methods

PHP

PHP is a software program used for developing web applications according to (Zandstra 2013). It is an open source software hence it is easy to get help for the developers. It is easy to develop. Thus the application can be made publicly available.

MySQL

Shelly and Rosenblatt (2012) say that MySQL refer to a language that is mostly used for developing databases; it is structured. It's also referred as a database management system which is relational. MySQL is a language compatible with most of the operating systems for example windows 7, windows XP and windows 10 among other operating systems. The structured query language which is a property of MySQL is easy to understand and support for users is always available anytime due to the many users and developers. It is also protected meaning it offers security for the data because of the encryption of passwords which result in the reduction of hackers and intruders.

Apache

According to Zandstra (2013) apache is software that is a web server. It is compatible with almost every operating system and hardware. It is open source software therefore technical support is readily available.

Methods

These are the data collection techniques that are going to be used when gathering data.

Interviews

This refers to a form of a conversation where the interviewer asks questions the interviewee in order to gain information. Interviews can be formal or informal, structured or unstructured. They can be conducted one to one or in groups, face to face or by telephone, Skype or email.

Questionnaires

These are a research technique that consists of a series of questions. It is also known as set of printed or written questions with a choice of answers, usually devised for the purposes of a survey or statistical study.

Focus groups

This is a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs and attitudes towards a product or a service, concept, advertisement, idea or packaging. Questions are asked in a group setting where participants are free to talk with other group members.

1.7 Justification

It enables employees in entering their details that is employee station number, name, surname and other details thus simplifying the process hence resulting in an efficient and effective workflow. It results in a quick clock in attendance process that is faster and it is not time consuming.

The attendance management system provides an effective and efficient method of logging in to employees. It is a very efficient process due to the fact that it is easier to keep records of all the employee login details without misplacing them or losing the records. Accuracy is also increased since the validity of data is ensured because errors are minimised because of the automatic system. Attendance system provides accurate time in and time out details because the employee data entries are not done manually

The system ensures that the organisation stays in line and keeps up with the changes in the world of IT and adapting to the changes easily since the real time environment is dynamic that is, it is ever changing.

Convenience is achieved because the system allows employees not to bypass the process. It provides an interactive platform hence being user friendly as such employees can learn to use within a short space of time through the use of training sessions that enable to equip employees with the required knowledge and technical skills.

Manual data entry process is minimised if not eliminated by the system because the system is computerised and there is a reduction in paperwork. A number of details of employees can be entered once at a time. The system is quite capable to enter data at peak hours when employees come to work and the dismissal time.

1.8 Conclusion

The first chapter has identified that the system will greatly be of paramount importance in helping the users of the system. Efficiency and effectiveness is going to be brought by the proposed system because of the objectives that are SMART. The objectives identified solve the current problems that are being encountered because of the existing system.

Chapter 2: Planning phase

2.1 Introduction

The planning phase aims at mapping a way in which the project will be conducted. According to Youssef (2011), he says that planning involves the process which determines the most perfect or accurate time in which the project will take place and also identifying or determining all the different processes that are conducted at a certain time. The planning chapter is of paramount importance and forms a very important part when conducting a project because this is where one carries out an analysis on the project thus determining its economic feasibility, social feasibility, operational feasibility and technical feasibility. Also analysis of stakeholders, analysis of risk will be conducted.

2.2 Business value

McDonald (2013) states that a business value of the organisation identifies benefits of the proposed system which are going to be brought by and added into the organisation and the business values are categorised into different categories which are going to be discussed further below.

Managerial value

McDonald (2013) continues to say that managerial value results in the best quality services that will be provided to the valued employees of the organisation. The system which is being developed will provide room for it to be easy to be edited and improved in the years to come for it to continue meeting the dynamic technological changes. Managerial value ensures that security in the operation of the business is also increased in order to ensure that all users that are not authorised to gain access to the system are blocked. Only authorised users will have the authority to access the system.

Organisational value

Zimbabwe Power Company will be able to attract more investors thus ensuring that their main goal of powering Zimbabwe into the future is met hence resulting in more efficient decisions being made thus also ensuring the organisational integrity in turn.

Employee knowledge

Motivation is of importance to employees in an organisation. Worker morale will be increased because there will be no need to write down ones credentials as they enters the

work premises. Manual data entry will be minimised if not eliminated hence resulting in a reduced workload. Information that is accurate about the attendance of the employees and their overtime statistics will be obtained easily hence making the work easier to conduct. Improved productivity will be the end result because of efficiency, effectiveness and time saving that will be the end result from the implementation of the system.

Customer value

Efficiency in conducting work is going to be brought by the new system. Clients who come to offer their services their time will be saved because of not waiting for so long at the gate so that they get approval from the human resources manager.

Societal value

The system will make sure that the society is well abreast with the technological changes. The society in general will advance in terms of technology hence this will make sure that information technology is taught from the grade zero students in order for them to grow up well acquainted with technology for change.

Supplier value

Those who supply services to the organisation will see a drastic change in the way in which the new system operates. The system will have a records of suppliers hence there will b no time wasted trying to get approval from the human resources department, instead the human resources department will notify the loss control officer so that they know that there is a supplier on the way.

Channel partner value

Channel partner value will be achieved by the organisation because of this new system. This will allow the organisation to offer this service on behalf of other organisations hence increasing their business value in the industry.

Shareholder value

Shareholder value will be increased due to the fact that their investment will be utilised in terms of productivity. Efficiency and effectiveness will in turn result to increased productivity. Employees will no longer waste production time at the gate whilst waiting to clock in.

2.3 Feasibility analysis

According to Wolfe (2018) feasibility analysis aims and focuses on fulfilling the systems aim and objective and identifying the benefits and limitations of the proposed system which will be uncovered by the research which will be conducted by the developer. Also a forecast on the tools, equipment and machinery required in order for the system to be developed successfully is very important. It aims at identifying if the proposed project is of real value or not. They continue to state that is the project really SMART that is are the objectives going to be met in a specified timeframe and is the project feasible smart and are the objectives really attainable or is it just a waste of time and resources.

2.3.1 Technical feasibility

Technical feasibility refers to identifying if the technical aspects involved in the development of the project are available or not. Orsmond and Cohn (2015) say that its aim or goal is analysing the available resources technically that is both the hardware and software that is required in the system development. Also the technical expertise is evaluated to see if it is feasible enough and will help in the successful development of the system. It also focuses on identifying whether the required resources needed for the system to be a success are of the exact quality needed in order to make sure that the need of the organisation is met.

2.3.1.1 Hardware specifications

These are the hardware tools that are needed in the development of the proposed system for the organisation. The technical aspects of hardware that are required in the successful development and implementation of the system are found in **table 2.1** below:-

Table 2.1 Hardware specifications

Device	Specifications
3 laptops	For installing the programming language and documentation
1 printer	HP115, 8 GB RAM, 64bit computing, core i5, 2,9 GHz processor
Network cables	For the internet

2.3.1.2 Software specifications

Software specifications refer to the different software's that are going to be required during the development of the software. On **table 2.2** there are purposes of each software required for the development of the proposed system.

Table 2.2 Software specifications

Purpose	software
Operating system	Windows 8
Documentation	Microsoft Office
Database creation	MySQL
Writing code	php
Software and computer security	Antivirus

2.3.1.3 Technical expertise

According to Orsmond and Cohn (2015), technical expertise is the knowhow of software and hardware aspects by the users of the system. The system developer must be acquitted with the necessary expertise and software technical aspects that are going to be used meet certain requirements. The end user of the system being developed that is the employee should have the knowledge and expertise about using computers. The top management must also be equipped with the expertise of how the system operates.

2.3.2 Economic feasibility

Economic feasibility sums up the costs which are going to be incurred during development of the system. it includes carrying out an analysis that is in depth which is future based and depending on the activities that are going to be conducted and these should not overuse the resources available says (Wolfe 2018). If the available resources, tools, equipment are of higher value than the project cost then the project is viewed as economically feasible enough to be implemented. It also includes comparing the costs, benefit and profits that are going to be provided by the successful development of the system.

2.3.2.1 Benefits

Kleynhans (2016) say that the word benefit refers to the advantages and gains that are got by the organisation in the successful implementation of the system proposed. These benefits are what make the proposed system to be economically feasible. The benefits are categorised into tangible and intangible benefits.

2.3.2.1.1 Tangible benefits

Tangible advantages refer to the merits which are physical in nature says (Kleynhans 2016) and these include:-

➤ Reduction in the time spent when an employee is clocking in and clocking out at the organisation workplace.

➤ Elimination of the manual system which consumes a lot of paperwork.

➤ Reduced of time wastage.

2.3.2.1.2 Intangible benefits

These advantages cannot be seen by the physical eye because they are not physical in nature meaning that they cannot be touched, (Kleynhans 2016). Intangible merits are the opposite of tangible benefits and these include:-

➤ Fast and simple layered and consistent routines improve worker morale hence increasing efficiency and productivity

➤ Job satisfaction is improved as hectic tasks are eliminated from the current system

➤ Back up facility ensures that there is no loss of data hence giving room for reference in the future

➤ Security since data will not be accessed by unauthorised users

2.3.2.2 Costs

Kleynhans (2016) state that costs is the amount or value given to each and every resource or activity that will be incurred in the development of the system. When developing the system, there are cost incurred and these include maintenance, development and operational costs. These costs are incurred when the project has recently started in its first phase.

2.3.2.2.1 Tangible costs

They are identified and estimated according to their value. They include:-

- Incurred expenses in the system development process.
- Conducted staff training sessions
- Maintenance expenses
- Expenses that were incurred when acquiring software and hardware tools.

2.3.2.2.2 Intangible costs

They are not measured in terms of monetary value.

- The delays in starting other activities results in loss of time.
- Costs are usually incurred during the transition process that is moving from the old system to a new system being developed

2.3.2.2.3 Development cost

These are expenses that are met during the whole development of the system that is from the start to the end.

Table 2.3 development costs

Item	Cost estimated
Software	100
Hardware	600
Labour and training sessions	1 000
unexpected expenses	500
Total	**2 200**

2.3.2.3 Cost benefit analysis (CBA)

Brent (2017) says that a Cost Benefit Analysis roughly estimates the benefits and limitations that can be encountered during the project. These include the activities which enable the comparison of the total sum over total gains. The table below that is **table 2.4** identifies the CBA.

Table 2.4 cost benefit analysis

	Year 1 $	Year 2 $	Year 3 $
Benefits			
Tangible benefits			
Stationary	150	50	40
Storage space	100	40	30
Intangible benefits			
Worker morale (motivation)	400	200	1500
Information availability	150	150	150
Reduction in errors	200	100	100
Quality of decisions made	200	250	270
Total benefits	**1200**	**790**	**2090**
Expenses (costs)			
Tangible costs			
Development process costs	_	_	_
Setup expenses	150	_	_
Operation expenses	200	250	250
Insurance	_	150	100
Intangible costs			
Operation commencement delay	100	20	20
Total costs	**(450)**	**(420)**	**(370)**
Net benefit / (costs)	**750**	**370**	**1720**

2.3.2.4 Return on investment (ROI)

According to Kleynhans (2016), Return on Investment (ROI) is responsible for measuring the total performance of a project to enable evaluation and analysis of all the available alternatives to make an appropriate. ROI is determined by the sum of all the benefits that is attained by adding all the benefits and by dividing them by the sum with the capital total expense. The Return of Investment percentage identifies the profitability of the project and it is also referred to as the Average Rate of Return (ARR). The project is feasible enough if the return of investment is high. It is calculated as follows:

1st year

Return of Investment = (total benefits – total expenses) x 100

$$\text{Total expenses}$$

$$= \frac{(1\ 200 - 750) * 100}{1\ 850}$$

$$= \underline{24\%}$$

2nd year

ROI = (total benefits – total costs) * 100

$$= \frac{(790 - 420) * 100}{420}$$

$$= \underline{88\%}$$

3rd year

ROI = (total benefits – total costs) * 100

$$\text{Total costs}$$

$$= \frac{(2\ 090 - 370) * 100}{370}$$

$$= \underline{100\%}$$

2.3.2.6 Net present value (NPV)

According to Wolfe (2018), NPV is defined as the method that evaluates if the current total value of cash flow in the future years will be of higher increased value in comparison to the start up expenses of the system. The total NPV of the project being developed in two years to come is attained as follows:

Net Present Value = total benefits – total expenses

$$(1 + r)\, n$$

        r = interest rate (10%)

        n = number of years estimated

NPV = 790 – 420

     (1+0.1)2

  = 80.6%

The result means that the net present value of the system will be of higher value than the total start up costs hence the project is feasible in terms of economical value.

2.3.3 Social feasibility

Social feasibility refers to the assessment of the results of the project being developed that are brought to all the immediate stake holders for example management of the organisation (McDonald 2013). This determines or ensures that either system proposed will be greatly accepted by clients. Social feasibility also identifies how stakeholders are differently affected either negative or positively by the proposed system. Research that was done highlighted the positives such as how users will accept the system as they require a new user friendly system.

2.3.4 Operational feasibility

Brent (2017) states that operational feasibility aims at finding if the system proposed will successfully be developed from the start till its inception. Its objective is to find out if the users will accept or deny the system being developed or how they view it. Its aim is to fulfil the user expectations that come especially from employees and the management. Operational feasibility also measures and identifies how the system will overcome the limitations being faced within the organisation. It also makes sure that the existing has got an operational advantage in terms of the user interface compared to the existing system.

2.4 Risk analysis

Risk analysis refers to the process of finding out any possibilities of errors that may arise during the system development according to (Brent 2017). Therefore it is of paramount importance to conduct risk analysis when developing a system in an organisation. These are risks below that were identified and the counter measures were also found out to ensure successful implementation without any hiccups.

2.4.1 Technical risk

This occurs when the project fails to meet needs which employees and the top management need. This can be caused by limitations such as the lack of resources and equipment needed in general.

Mitigation strategy – the system developer can indulge use from the start until completion of the project. Users can directly air their opinions and expectations regarding the system being developed.

2.4.2 Stakeholder risk

Stakeholder usually occurs when the system objectives do not meet with stakeholder needs. Different types of stakeholders include investors, top management, employees, government and clients. Investors usually do not want projects which over use the budget as expected and they may end the project if it does so or pull out the investment.

Mitigation strategy – the developer need to always work in line with the goal and aim of the system. There is also need to work with the available budget and resources in order to make sure that they do not overspend.

2.4.3 Economic risk

The issue of cash shortages that is being encountered in the Zimbabwean economy is a great risk in terms of fear of investment. The cash shortages are a great disadvantage because only fewer investors can take a chance. This may result in shortage of funds and it may hinder the development of the system.

Mitigation strategies – the need for contingency planning will be conducted and the developer has put in place ways of acquiring more funds.

2.5 Stakeholder analysis

According to Wolfe (2018), stakeholder analysis refers to an activity of determining the users of the system and its effects to the users. These effects can be either positive or negative thus having an effect on users directly or indirectly. The process conducts an analysis on users to find out how they will respond to the new system. Is used to evaluate or analyse how the stakeholders will react to the proposed system. The user's views and evaluations can be used to conduct alterations. Stakeholder analysis ensures that stakeholder requests are taken into consideration and make sure that the system fulfils the needs of all stakeholders so that it is successfully implemented thus the importance of working hand in hand with the users in the development of the system. The following are the stakeholders of the project:

Employees: uncertainty by most employees usually causes them not to accept change that is the result of the proposed system. The development of the system can cause employees to be unsecure in terms of their jobs. This is so because they will feel that their jobs are in danger because of the system and it has come replace them. Ensuring that employees accept change is of paramount importance hence conducting training sessions should be done so that employees are informed on how the new system will work and how it will make their jobs easier.

Management: Bulawayo power station management thought about giving the proposed system a try and see if it is really going to benefit the organisation. The proposed system will bring about an easy way of logging in to the system when employees arrive at work hence making it easier on keeping a database on the employee's attendance. Employee workload would be reduced hence it will be easier to carry out work by the loss control officer thus motivating employees. It was identified that the project would help in generating overtime hours of each employee and also helping in identifying absent and late workers.

Suppliers: the suppliers viewed the system as feasible operational because it allows them to come and offer their services without wasting much time at the entrance writing their address of work. The suppliers viewed the implementation of the system as a great and noble idea that will smoothen the flaw of services provided by the organisation.

Stakeholder analysis came with a conclusion that most users agreed to the continued development of the system since it had more benefits than limitations.

2.6 Work plan

A work plan is the process that facilitates the identification of different phases on how the system will be developed and also determining the time that will be taken to complete the project according to (Youssef 2011). The electronic attendance system will be developed with the use of waterfall model. The waterfall model has distinct phases and each phase has its own deliverables thus it has well defined stages which give room for departmental control and also easy to plan. The diagram below identifies stages involved in the waterfall model:
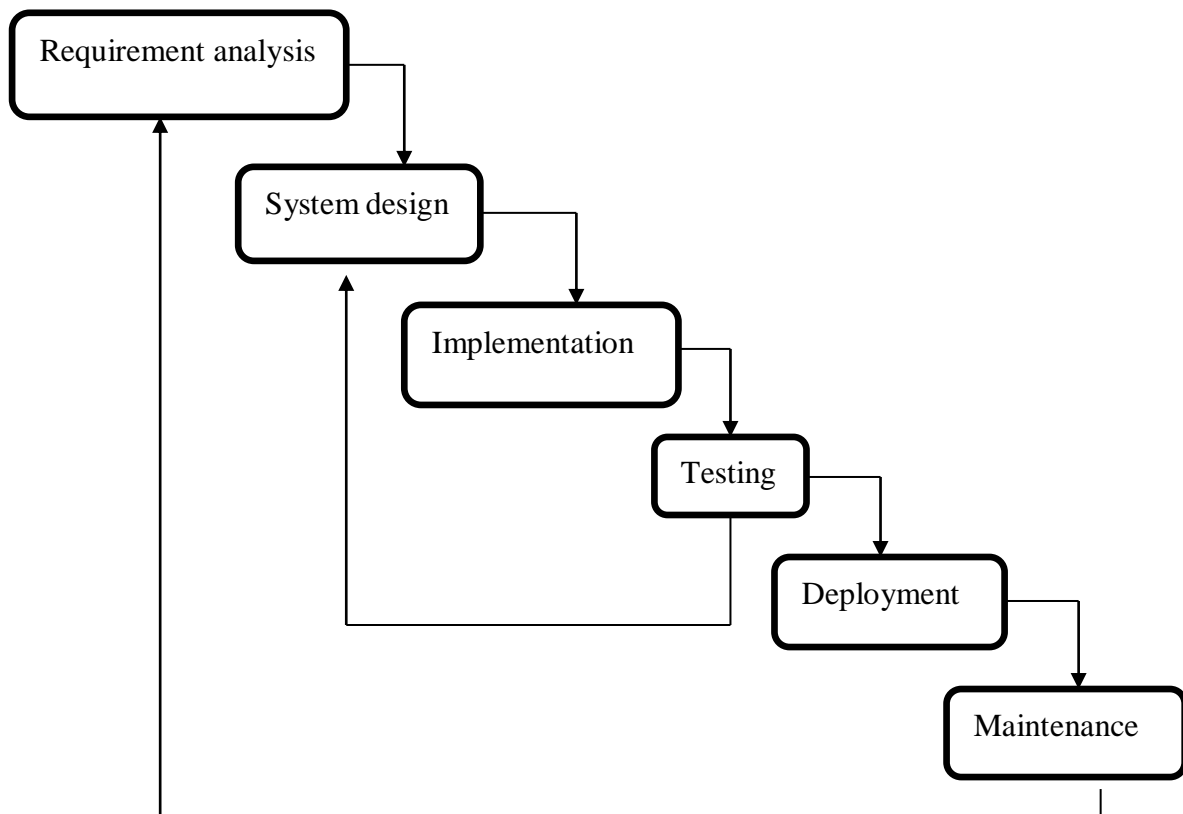

Fig 2.1 Waterfall model

Source: waterfall model- Wikipedia

The above waterfall model phases are usually

- ➢ Planning
- ➢ Analysis
- ➢ Design
- ➢ Implementation
- ➢ Maintenance

The time schedule drafted below identifies how the project will be completed as per the activities and processes as shown by **table 2.5** below:

Table 2.5 time schedule

Phase	Start	End	Duration (weeks)
Project Proposal	27 June 2017	4 July 2017	1
Introduction	20 August 2017	27 August 2017	1
Planning	28 August 2017	4 October 2017	1
Analysis	1 March 2018	14 March 2018	2
Design	15 March 2018	22 March 2018	1
Implementation	23 March 2018	04 April 2018	2
1st draft	05 April 2018	Ongoing	1 +++
Final documentation	10 April 2018	Ongoing	1+++

A Gantt chart shows how the phases are linear as shown in the following diagram:-

Duration (weeks)	1	2	3	4	5	6	7	8	9	10	11
Proposal of the project	■										
Introduction		■									
Planning			■								
Analysis				■	■						
Design						■					
Implementation							■	■			
1st draft									■		
Final documentation										■	■
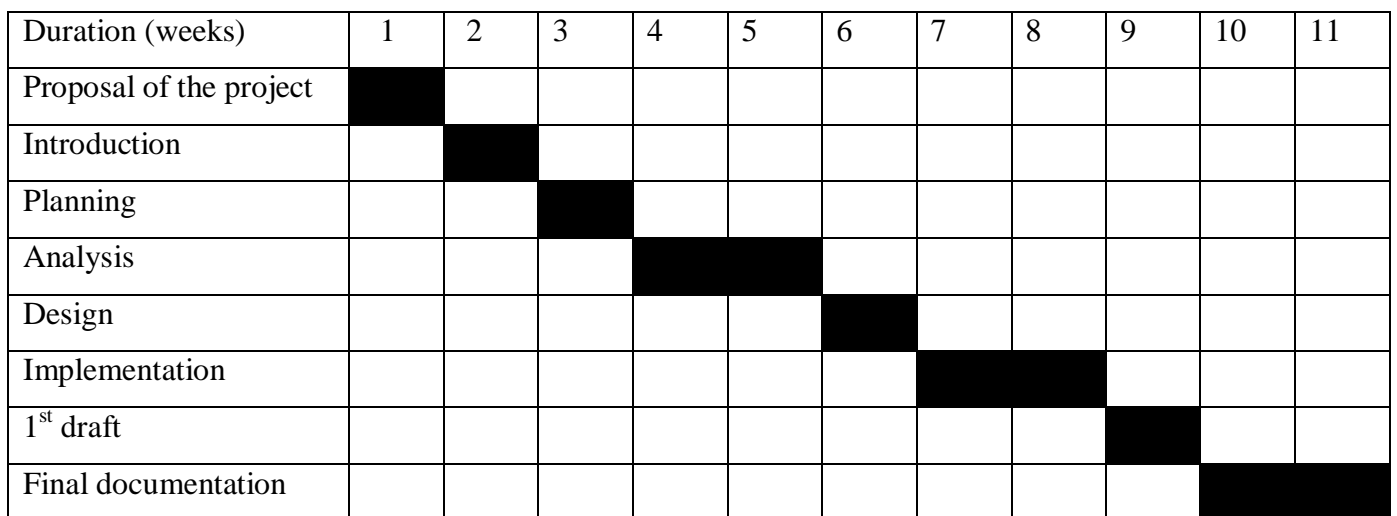
Fig 2.2 Gantt chart

KEY

■ Number of weeks

2.7 Conclusion

The above second chapter of the project conducted an analysis on the business value of ZPC BPS. Other activities that were carried out in this chapter were feasibility analysis which aided in seeing whether the project being conducted is economic, social, technical and operational feasible to continue. Creation of a work plan was done to identify the software development model which was chosen by the developer and deduct a time plan. Risk analysis was also conducted in order to identify the possibilities of any uncertainties and come up with counter solutions. The next chapter is going to be the analysis phase according to the waterfall model.

Chapter 3: Analysis phase

3.1 Introduction

Chapter three according to waterfall model is known as the analysis phase and it focuses mainly on the existing system in order to enable in identifying the limitations, (Youssef 2011). The limitations were drawn from the gathering of information through the use of different techniques which included interviews, observations and questionnaires. A context and data flow diagram of the existing system will be drawn up in order for the developer to get an understanding of the flow of data of the current system. This will also help the developer to conduct a requirement analysis that will enable in identifying the functionalities of the system being developed.

3.2 Information gathering methodologies

These are techniques used to gather information according to (Eid 2015). For one to gain an in-depth knowledge of the existing system and come up with its limitations there is need to conduct research. The developer carried out all the different gathering methodologies in order to gain the correct information and they were:

- Interviews
- Observations
- Questionnaires

3.2.1 Interviews

Eid (2015) states that it refers to the process whereby the interviewee that is the one asking questions asks the respondents a series of questions in a conversation manner setting with the aim of getting information from the questions being asked. Interviews are classified into structured and unstructured interviews.

Structured interviews

- Questions are asked by the interviewee in an orderly manner and must not deviate from the line of questions.
- The interview questions are well planned in advance prior to the day of the interview
- The set of asked questions are uniform

Unstructured interviews

> Unstructured interviews are also referred to an interview that is not formal

> It is the opposite of structured interviews

> They include questions that are open ended and they are usually asked in a manner that is random

Group interviews

> The interviewee asks questions to a group of people not individually.

> The people being interviewed must be grouped and asked as a group and that's what the interviewee did.

Interview used

After an in depth analysis and evaluation of the interview methods, structured interview was decided upon by the developer. A sample of ten employees was interviewed and these employees were selected randomly across all the departments since all of the employees use the current system. These types of interviews and interview questions were planned prior before the day of the interview in order to ensure that the interviewee did not ask unnecessary questions. Structured interviews are all similar and they are close to accurateness though they have got their own limitations. Most employees showed concern regarding the current system and they were not satisfied with it.

Benefits

> They were very close to accurateness because some of the questions did not require explanations only on word that is either a yes or a no

> Some of the interviewees were able to highlight their concerns and speak their minds due to the fact that it was a group interview.

> A better understanding of the current system was gained by the developer since they were in a position to keeping asking until they felt that they have got all the answers they require.

> Flexibility was a result because the person conducting the interviews could also add their questions which they felt that they should also ask hence helping the developer in analysing and evaluating the current system

> Group interviews gave room to each and every employee to participate in the process because of the group interviews thus they were very time consuming.

- The process of analysing and evaluating the results obtained was very easy because it required less effort to summarise the results which included a one word answer that is a yes or a no
- Biased information was limited because first hand information was obtained by the developer

Limitations

- Some of the employees did not collaborate and they were very reluctant to participate
- It was expensive due to constant meetings were being conducted most of the time by the interviewee so that they could obtain the necessary.
- The developer required some skills needed when conducting an interview in some cases so that one knows what to do in some situations for example when the respondent is bored.
- Good communication skills were required by the developer to ensure that they acquire the information in a correct way without boring the interviewees.

Results obtained

Structured interviews aided the interviewer to get important information of the existing system. Most of the users of the existing system showed concern about the ineffectiveness of the system being used. They raised concern about the need of acquiring a new system that is user friendly. The current ordering system was also time consuming because employees had to spend more time at the gate for them to clock in at morning due to long queues since all workers will be coming to work.

3.2.2 Observations

According to Eid (2015), observation refers to an inspection, the monitoring or the viewing which one conducts a certain activity sing surveillance cameras or watching. The types of observations which were conducted involved participatory and non-participatory observations.

Participatory observations

A participatory observations occurs or refers to the process whereby the one conducting the observation becomes part of a group being monitored hence limiting the chances of acquiring biased information says (Linman 2011). This includes the total participation of the one conducting the observation to be part of every activity that must be monitored on a daily basis

for some short period of time. The developer was able to take a closer look at ZPC BPS for a few days. The aim of the observation was to identify how the employees clock in and clock out, how the clock in process is conducted and how long does it take for each employee to clock in manually, how they track their employee overtime records and how the loss control officer manages to cope when there are many employees clocking in especially at peak hours. The observer was in a position to acquire the details that were needed.

Non participatory observations

It is referred to as a direct observation. Eid (2015) says that a non-participatory observation refers to the process were an observer closely monitors the activities without having any interaction with the employees being observed. Room for interaction is allowed but it's limited. Also the people being observed must not know anything. The one monitoring the activities views the activities from a distance without anyone getting suspicious of the activities taking place and records the findings. Direct monitoring aided the observer to obtain profound and an understanding of the clock in system at ZPC Bulawayo.

Type of observation used

The developer decided to use non participatory observations. The developer closely monitored the process of employees clocking in at the work station without making the employees un secure or notice an unfamiliar behaviour. This was conducted the whole week in order to try and find the correct information and the behaviour of employees.

Benefits

➢ Observation proved to be useful because it helped in answering the unanswered questions which were part of the interview questions especially disadvantages of the existing system

➢ obtaining biased information was limited since not even a single employee was aware of the process

➢ observations helped the observer to get answers from activities which were difficult for employees to explain during interview sessions

➢ observations proved to be less costly than interviews because there was no need to acquire a lot of resources

➢ Necessary and important data was acquired since the developer was involved in the observation process.

<u>Limitations</u>

- For the successful observation analysis, the developer had to observe for a longer period thus being very time consuming
- some of the activities that were being carried out were difficult to analyse and evaluate hence personal commitment by the observer was required for it to be successful
- if the targeted group by any chance noticed the activities that were taking place, chances of the respondents acting otherwise is very high and this might have led to inappropriate information being obtained.

Results obtained

The developer found out that every morning there were long queues when employees reported for work and wanted to clock in. Some employees passed by the queue without clocking in due to the long queues. The response of the users to the system was very poor and this highlighted that the existing system was not very efficient and effective.

3.2.3 Document review

Another method of data gathering which was used is document review. The developer took a closer look and analysed important documents of the organisation which they use to record clock in times due to the fact they use an attendance system which is manual. The developer was in a position to evaluate employee clock in time, employee clock out time, employee overtime, current reports, employee absenteeism rate and recorded past and current employee attendance which were closely analysed.

<u>Benefits</u>

- the developer was able to gather first-hand information because sources such as reports were being used and as such there was no bias
- it was less costly because of the use of the organisations past and current reports and records

<u>Limitations</u>

- the process to evaluate the reports and come to a decision was very hard because of the many books and records

- other documents and reports where not found hence the difficulties were encountered when trying to validate the available information and trends

Document review findings

- The process of coming up with an analysis of the overtime statistics was a hard process to conduct since the existing system is a manual one; as such it was not easy to track the database of the employees and that of overtime statistics.
- Standardised and systematic processes were not available, clock in and clock out records were not recorded in a pattern manner as such this resulted in difficulties of coming up with a report or conclusion.
- Loopholes in the clock in system were found out since the existing attendance management process did not have a smooth flow of processes.
- A review conducted by the developer on available documents helped in coming with a good evaluation because of the credibility of the records being used and this made it easier to create a Data Flow Diagram (DFD) of the existing system.

3.2.4 Questionnaires

According to Linman (2011), a questionnaire is a technique also used to gather data and here the respondents are given questions on sheets of paper and they have to answer on the spaces available and they are supposed to submit them before the due date stated. Questionnaires can also include one word answers such as yes or no and open questions which may need an explanation. Different types of questionnaire were used and these are as follows:

- format questionnaire
- closed format questionnaire

Open format questionnaire

Open format questionnaires are referred to as open ended questionnaires since they allow respondents to freely highlight their opinions and explanation in their own manner. The respondent is able to respond in their own way and according to their understanding.

Closed format questionnaires

Linman (2011) says that closed format questionnaires refer to a technique that includes questions which do not allow respondents to explain in detail and they are limited to a yes or a no or true or false.

Type of questionnaire used

The developer decided to use closed format questionnaires. The developer obtained data which most of it showed that the employees were not happy with the system. The system was being under rated. They aided the developer to get the required data and the process of analysing the data was easy due to the fact that the answers were limited to one word answers were users ticked the correct answer.

Benefits

- ➢ It was a bit easier to analyse the questionnaires due to the use of the closed technique which did not allow users to elaborate further.
- ➢ Anonymity helped respondents in freely answering questions and as such there was no bias.
- ➢ Time to respond to the questionnaires was given to the respondents hence they were able to respond correctly expressing their views.
- ➢ The process was not hard as there was no need for interview skills needed required
- ➢ There was no time wasted in evaluating the questionnaires and coming up with a report or a conclusion.

Limitations

- ➢ Other questionnaires were partly answered hence it was difficult to come up with statistics when evaluating the data.
- ➢ Omissions to other questions were identified due to the lack of clarity in some questions.
- ➢ An interpretation of other questions was not what the developer intended asking hence results were not correct.
- ➢ It was a long process to analyse the data that was obtained and come up with conclusions.
- ➢ Other questionnaires were not submitted back and others were torn apart or spoiled hence making it difficult to evaluate the data on them.

Results obtained

The developer was able to acquire data which was difficult to get through interviews hence anonymity helped in a great way. Respondents freely expressed themselves due to anonymity thus resulting in data about the disadvantages of the existing system being obtained. Respondents also showed concerned about the time wasted with the existing system.

The developer was able to acquire the data which was very important and necessary in the development of the DFD and the context diagram.

3.3 Analysis of the current system

Zimbabwe Power Company is currently using a manual system in all the power stations and these are Harare power station, Hwange power station, Munyati power station and Bulawayo power station when employees are clocking in. If an employee arrives at the entrance the loss control officer requests for an organisational ID. The loss control officer then checks the department were the employee works under on the ID of the employee. The loss control officer then looks for the book written the department name. Each department has its own book where employees record their clock in times. After the employee records his/her clock in time, it is then accounted for and recorded by the loss control officer. The employee then clock outs when they leave the organisation stating their time of departure. Visitors also produce their national IDs when they visit the organisation and they leave it at the entrance with the loss control officer. The loss control officer then notifies the department where the visitor is looking for and then clock outs when they leave the organisation.

3.4 Process analysis

Grossmann and Rinderle-Ma (2015) process analysis refers to the methods which are being conducted by the system developers and these processes are the ones which determine how the system will operate. It also determines how the data will flow in the system including identifying the activities conducted. The processes of the current system include:

Inputs

- ➢ Employee details
- ➢ Employee station number
- ➢ Visitor details

Processes

- ➢ Clock in time
- ➢ Overtime processing
- ➢ Employee tracking
- ➢ Clock out time

Output

- ➢ Employee register
- ➢ Visitor register

3.4.1 Activity diagram of the current system

An activity diagram is a diagram which represents a linear or chronological way in which activities are conducted in the system according to Shelly and Rosenblatt (2012). It helps the programmer to refer to the current system and come up with new and easier way of conducting activities. It is easier to study how the existing system operates. The diagram below represents an activity diagram of the existing system.
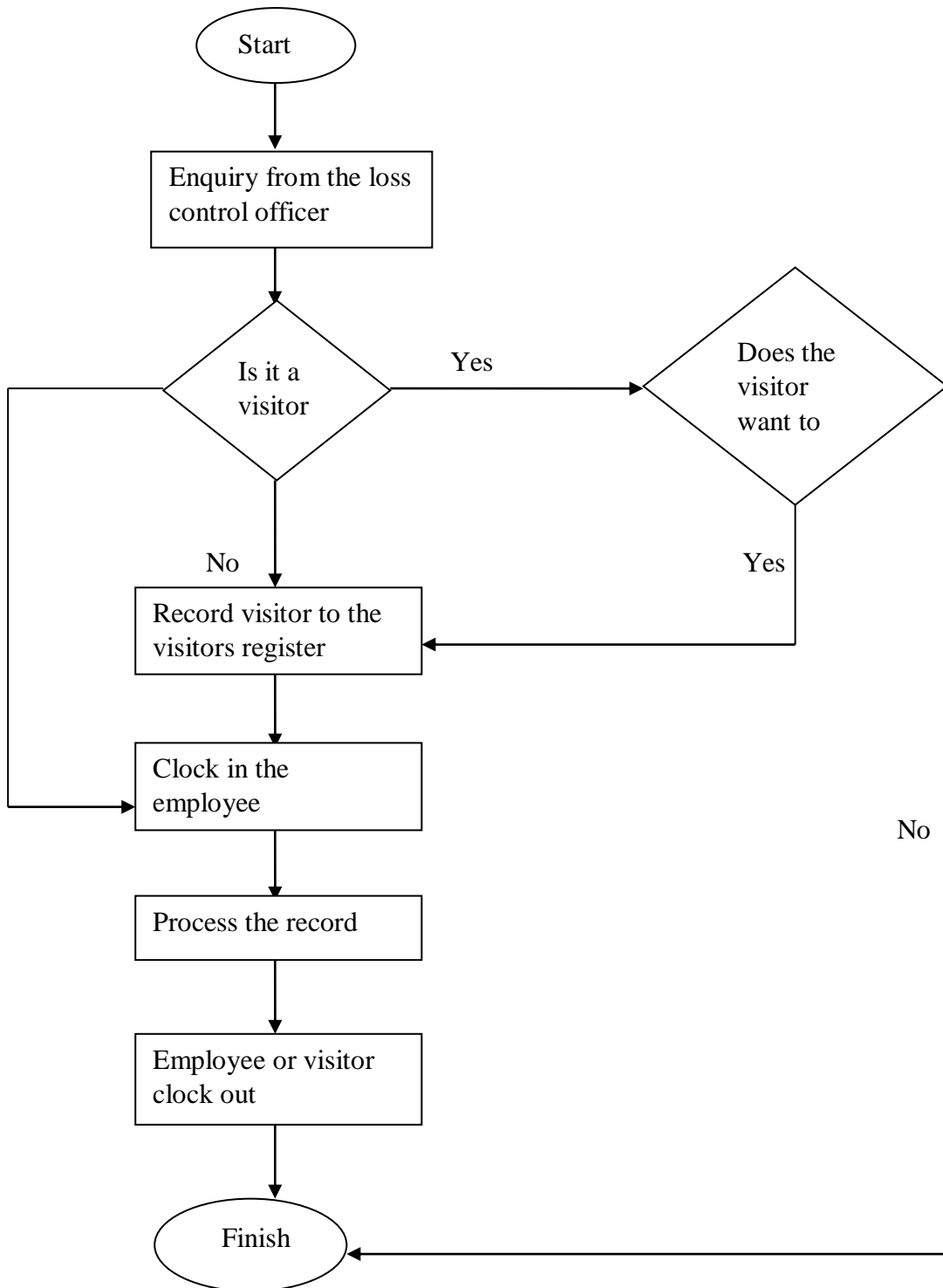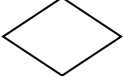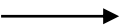
Start

Enquiry from the loss control officer

Is it a visitor

Does the visitor want to

Yes

Yes

No

No

Record visitor to the visitors register

Clock in the employee

Process the record

Employee or visitor clock out

No

Finish

Fig 3.1 Activity diagram

Key

- start or end of an activity

- represents processes that change input to output

 - represents a decision that makes the activities flow

 - represents the flow of the data

3.5 Data analysis

This is a logic method for evaluating and carrying out an analysis of the data. These methods are:

- ➢ Context diagram
- ➢ Data flow diagram.

3.5.1 Context diagram

Grossmann and Rinderle-Ma (2015) says that a context diagram is referred to either a level 0 DFD or the context level DFD responsible for highlighting the interaction of the existing system with external parties. The diagram below shows the current system context diagram. It helps in identifying the boundaries of the system being modelled and identifying the relationship between the internal and external entities. In order to come up with a context diagram the developer needs to interact with the users in order to come up with the current activities of the existing system. The diagram below shows the context diagram of the existing system.
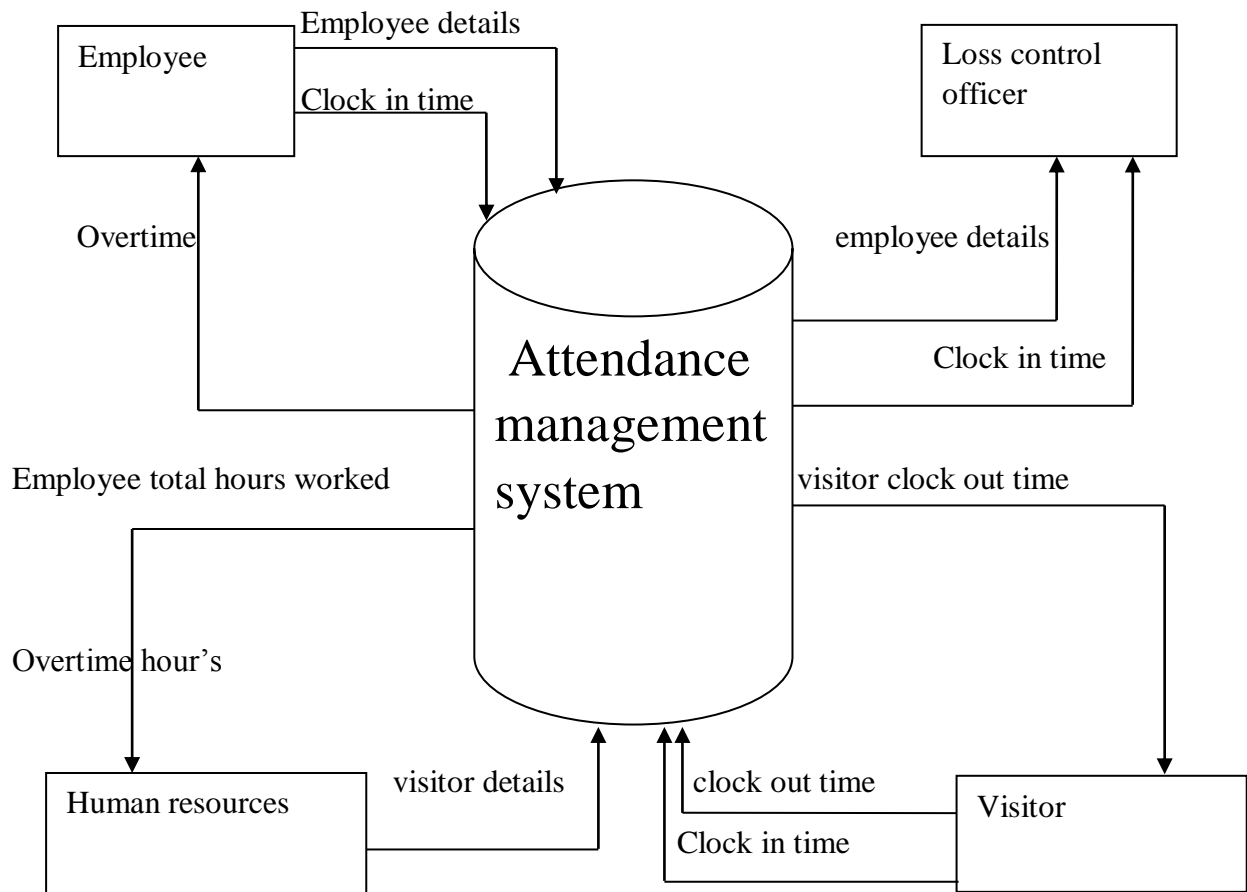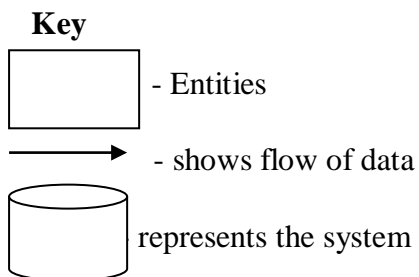
Fig 3.2 Context diagram of the existing system

Key

☐ - Entities

→ - shows flow of data

⬭ represents the system

3.5.2 Data flow diagram of the current system
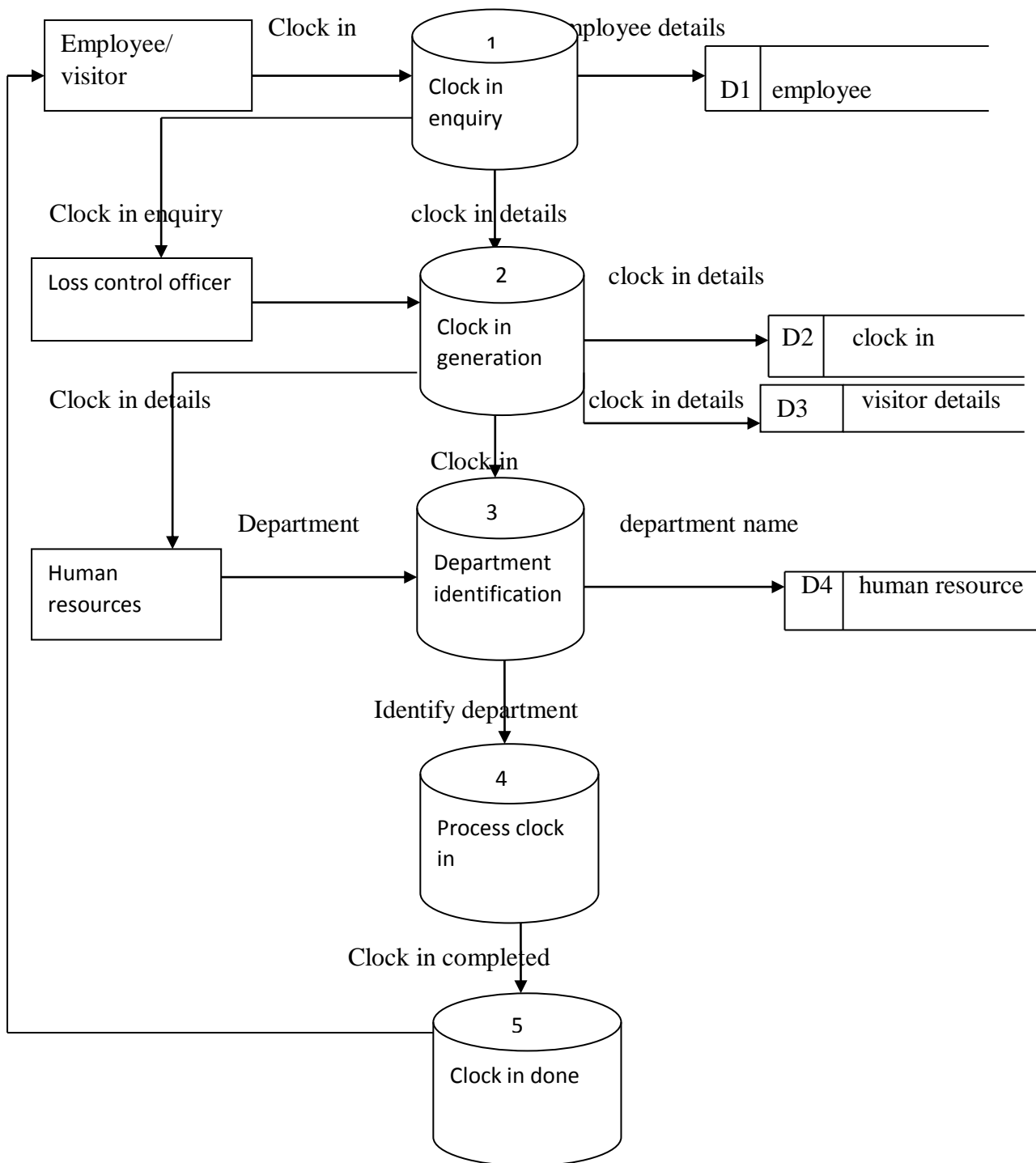
Fig 3.4 DFD of the current system

Key

→ Flow of data

☐ Entity

 Processes

 Data store
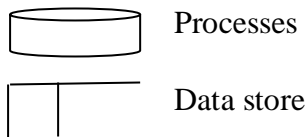
The diagram above highlights how the data flows in the current system. It shows how entities, processes and the database interact together in order to produce output according to the activities.

3.6 Weaknesses of the current system

1. The existing system needs users that is the employees to try and write the correct data when clocking in. as such it is very difficult in most cases as employees that will be clocking in would be many at peak hours hence the loss control officer the loss control officer will be under pressure to try and reduce congestion at the entrance.

2. Inconsistency is the result because of the manual data entry system. Thus a lot of mistakes occur when clocking in or clocking out an employee and this may lead to a lot of difficulties when making reports.

3. It is very time consuming when tracking records because a lot of books are used thus making it take a lot of time when analysing the data to produce a report.

4. It is very costly to conduct monthly or yearend reports since it takes a lot of time and resources to produce a report for a year because of a lot of paperwork

5. There is need to recheck details that have been recorded to reduce the number of errors made

6. There is usually a tendency of repeating or writing data or details which are already there for example names, department name etc.

7. Security is always a problem. Any user which is not authorised to have access to the documents of the current system can have access as the records are not strongly protected. The records can be destroyed by a fire, rains or stolen as such it is always difficult to have a backup facility for recovery when using a manual system.

3.7 Evaluating alternatives

There was need for the developer of the system to explain and analyse why other alternatives such as outsourcing or in-house development were not taken into consideration during the feasibility analysis.

3.7.1 Improvement

Muhammad, Matias and Markku (2010) say that improvement of the existing system is when only certain functionalities or processes which are not being provided by the current system are added to the system. This is also known as upgrading thus integrating new functionalities with the existing system. This method was not implemented because of:

➢ The difficulties of upgrading the manual existing system. in this case there is need to develop a completely new computerised system in order to make the organisation advance in terms of technology and move up with the changing times

➢ Maintenance costs of the system upgraded were going to increase and constantly required because of more errors and problems that may continue to hinder the manual attendance management system

3.7.2 Outsourcing

Outsourcing refers to the process were a part of a system or the whole system is acquired from outside the organisation and the developer just implements the system developed by external developers according to (Muhammad et al 2010). They continue to say that the system is not developed by developers within the organisation; they are only taught how the system works. The developer of the system did not outsource the system because it was very costly to purchase the system and not feasible enough. Also there were not enough resources. The reasons for not outsourcing are:

➢ The need for technical experts will be required to train the organisational employees also resulting in increased costs

➢ Maintenance expenses in years in years to come will also be high because there will be need to outsource the service from those developers of the system to come and conduct the maintenance process of the system.

➢ The system outsourced may not meet the user requirements because the developer may not have a clear insight of what the employees really require or expect

➢ Also there is a possibility of the system not solving the current problems that are being brought because of the existing manual system being used in the organisation

➢ There might be the need to modify the outsourced system hence increasing costs.

3.7.3 In-house development

According to Muhammad et al (2010) it refers to the process where the whole system or part of the system is developed within the organisation by the employees. This is the total

opposite of outsourcing because everything or every process in the development is done internally within the organisation. This development method was chosen because of:

> It is a method were a system that meets the user expectations and needs can be developed because of an in-depth knowledge of the developer on how things are done within the organisation

> Communication between the developer and employees can result in problem solving because employees can form part of the development team hence they can be able to air their views and grievances about the system being developed.

> Ownership of the system can be claimed by the organisation because they are the ones who would have developed it as compare to outsourcing were the organisation does not gain ownership of the system

> Less costs are incurred because of the availability of most of the resources in the organisation

> Labour costs are minimum because all the employees are from within the organisation

> There is a direct link of the system being developed because the developers have the knowledge of what needs to be done and otherwise

3.8 Requirement analysis

According to Adam and Kevin (2015) requirement analysis is the process of identifying user requirements of the system being developed. In order to be able to determine the user expectations there should be communication between the development team and the end users of the system.

3.8.1 Functional requirements

According to Adam and Kevin (2015), it refers to the process which identifies all the activities that a system should conduct or fulfil. These include

> Accessibility of the system
> Should alert the user that the current activity that they have been doing has been completed for example having a pop up message when the employee have successfully clocked in to the system
> There should be a facility that enables employees to edit the data anytime so that it is always up-to-date
> It should be a system that is secured enough in order to make sure that only authorised users can have and encryption should be put as a measure to secure data

- As soon as the user clocks in or edits the user profile, there should be changes instantly as per the activity conducted
- The system should give room for accountability and be easy to track records so that it is easier to deduce a report

3.8.2 Non-functional requirements

It refers to the functionalities that are integrated with the system in order to ensure that it meets user expectations and requirements according to Adam and Kevin (2015). These include

- Privacy – the system should ensure that users are given room to conduct their activities privately. An employee should not be able to log in onto another employee's profile. Each employee should have their unique details and user accounts
- Data backup – if there is a hiccup in the in the system's processes such as data being lost, deleted or tempered with inappropriately, the IT department must be able to recover that data or it must be obtained from the back up facility
- Error handling – when there is an error, it should not affect or hinder other operational activities being conducted by other employees. The system should ensure virtual operational accessibility
- User interface – the system must easier for users to work with especially those who do not have much knowledge for example the interface must have easy navigation bars
- Security – encryption methods should be injected into the system in order to ensure that the system is very much protected and not all users can have access to the system

3.9 Conclusion

The chapter highlighted how the developer gathered information and explained all the methods used for gathering information. The logical flow diagram and the context diagram were drawn up so that there is a clear view on how the existing system operates. Diagrams such as the activity diagram were created in order to see all the processes that are conducted in the system. Alternatives used for developing the system where also explained and why in house development was chosen.

Chapter 4: Design phase

4.1 Introduction

The phase shows how the system is going to function and it identifies all the processes of the system being developed. Also, the software and hardware interaction and how they are going to be integrated will be explained in detail. Context diagram and the data flow diagram will be designed in order to identify how the processes and data will flow in the system. The interface design of the will also be designed and all the tables in the system will be identified. An entity relationship diagram and an enhanced entity relationship diagram will be drawn in order to identify entities and their relationships. This chapter in general will explain in detail how the system will work and all the activities will be explained in further detail.

4.2 System Design

According to Mark and Levin (2015).It is the process which identifies the systems architecture, its components, modules, interface and all the requirements which are needed for the system to be a success thus meeting its aims and goals highlighted in the first chapter. This process also includes the identification of data and the input processes of the system in detail. This enables in identifying that the system being developed is going to meet the user expectations and needs. System design ensures that system being developed will in the future be modifiable or allow alterations to continue to be made in order to ensure the system continue to be usable according to dynamic changes in technology says Claudius (2014). This helps to develop a system that effectively and efficiently responds to the user requirements and produce the desired output. Security is another objective of system design in order to protect the organisations data and ensure that it is secured for privacy.

The system will aid and have a platform which allows the administrator to add employees to the database or to edit or delete the employee. The system will ensure easy clock in and clock out of users into and out of the organisation. The time will be determined automatically y the system. The activity will be processed and stored by the system. After the process is complete, a pop up message will appear with the conformation of the activity which has been completed. The system will be very effective in that all employees will be able to clock in much easily and hence making it easier to track records and reports of the employee attendance. Privacy will be enhanced since employees have different user names and for an employee to be able to clock in they should have a username and password. Security will be ensured because of unique passwords with strong requirements.

4.2.1 Context diagram

Wiegers (2017) says that a context diagram is a tool that shows the relationship that a system has with other entities especially external entities for example databases. It is also known as a scope model, a context level DFD or level O DFD. It involves activities that explain every process and also explain how the system receive and send information between its entities. The diagram below is the context diagram of the system.
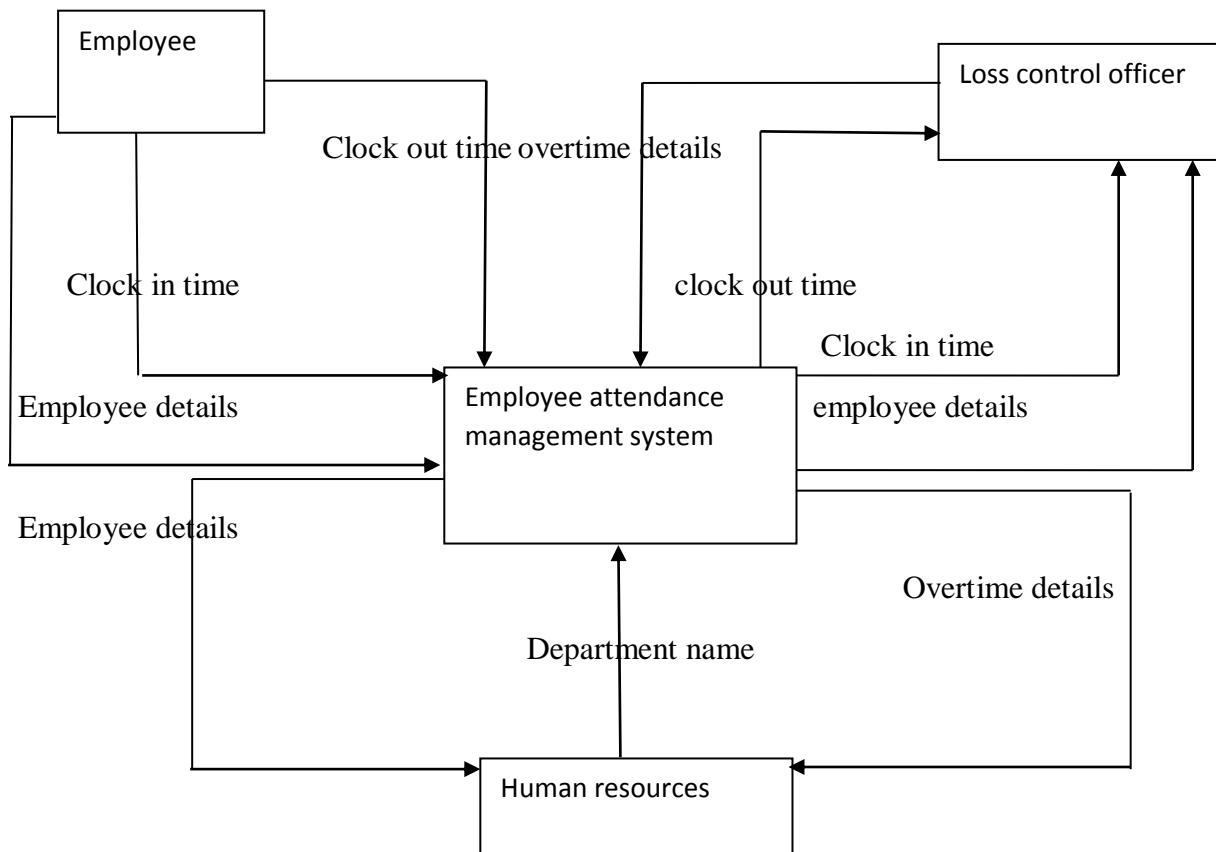

Fig 4.1 Context diagram

Key

→ Data flow

▭ Entity

4.2.2 Data flow diagram

A DFD helps in mapping the flow of data or information in a system according to Jens, Lienig and Hans Bruemmer (2017).It helps in providing a diagrammatically architecture of how the system operates and it is very easier to analyse and understand the activities.

Claudius (2014) also says that a DFD identifies how the data is processed in a system. It identifies how the data is transmitted from the entity to the data store and how the output is generated. The order in which activities and processes should occur is also provided or shown in the DFD.
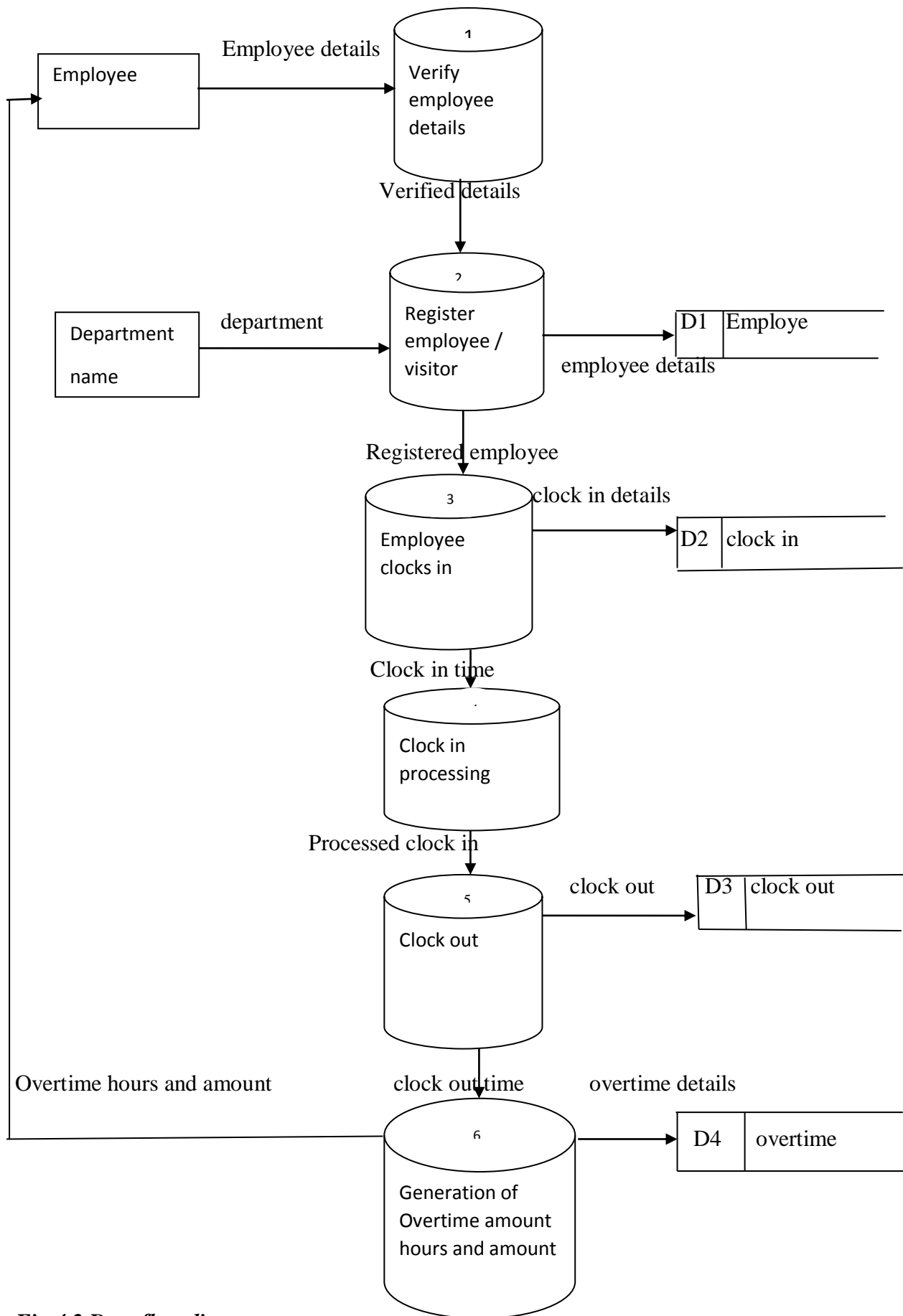
Employee → Employee details → **1 Verify employee details**

Verified details ↓

2 Register employee / visitor → employee details → D1 | Employe

Department name → department → **2 Register employee / visitor**

Registered employee ↓

3 Employee clocks in → clock in details → D2 | clock in

Clock in time ↓

Clock in processing

Processed clock in ↓

5 Clock out → clock out → D3 | clock out

clock out time ↓

Overtime hours and amount

6 Generation of Overtime amount hours and amount → overtime details → D4 | overtime

Fig 4.2 Data flow diagram

Key

→ Flow of data

☐ Entity

⬭ Processes

☐ Data store

4.3 Architectural design

Scammel and Umanath (2017) defines architectural design as the "process that encompasses the components of a system structure and unifies them into a coherent and functional whole according to a particular approach in achieving the objectives under the given constraints or limitations. Each project is unique in its own way hence the architectural design differs according to the functionalities of the system. Below are the components of the architectural design of the industrial attendance management system.

- ➢ **Network cables** – used to connect two or more devices in order to facilitate the sharing of resources for example printer. They will help in transferring information or data between devices in a Local area network or in a wider area network.
- ➢ **Client** – this is the computer that is used to access he services that will be made available by the server. It will be used to connect and get access to the resources of a remote computer in a network.
- ➢ **Printer** – it will be used to produce reports since it is an output device and it produces a hardcopy of data stored in an electronic device such a computer.
- ➢ **Server** – it will be used to process request and send data to another device via the internet on a Local area network

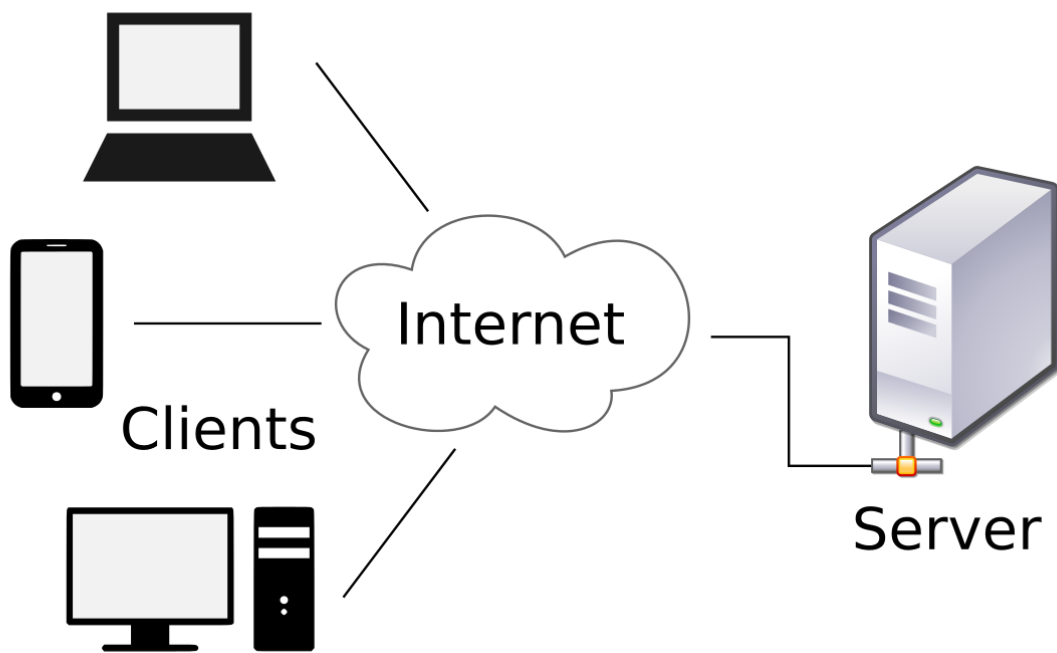The diagram below shows the client server architecture.

Fig 4.3 Client server architecture

Source: client server model-Wikipedia

The diagram below shows the network architecture design of the industrial attendance management system.
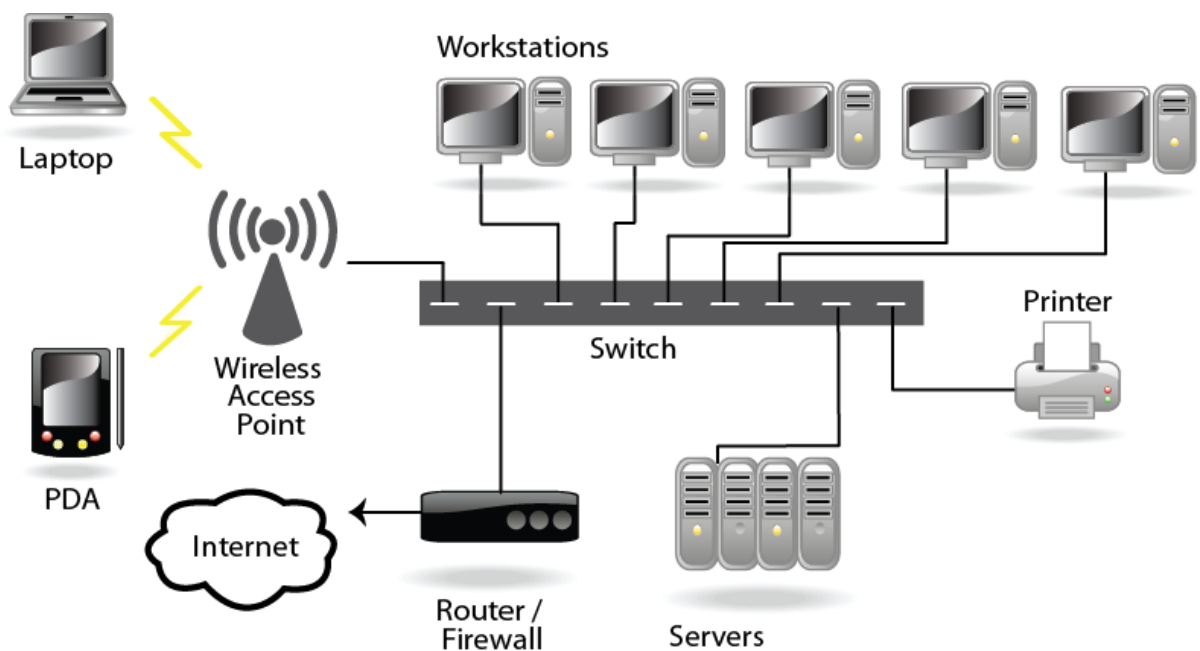

Fig 4.4 Network architecture design

Source: conceptdraw.com

4.4 Physical design

Mark and Levin (2015) say that physical design is a representation of a system identifying the systems internal and external entities and also showing the flow of data into an out of these processes. It also shows the relationship of the input and output processes of the system. Physical design also identifies how data is entered into the system, how it is processed and how it is displayed that is the output. Physical design highlights translate the systems model in a logic way into a model that is specific technically, (Hernandez 2013). It also identifies how the software will interact with the hardware. The administrator will be the one managing the system. The systems database will also be connected to the LAN and WAN. This will in the future aid in other ZPC subsidiaries having access to the data and information in other power stations especially by the headquarters. The diagram below shows the physical design of the system.
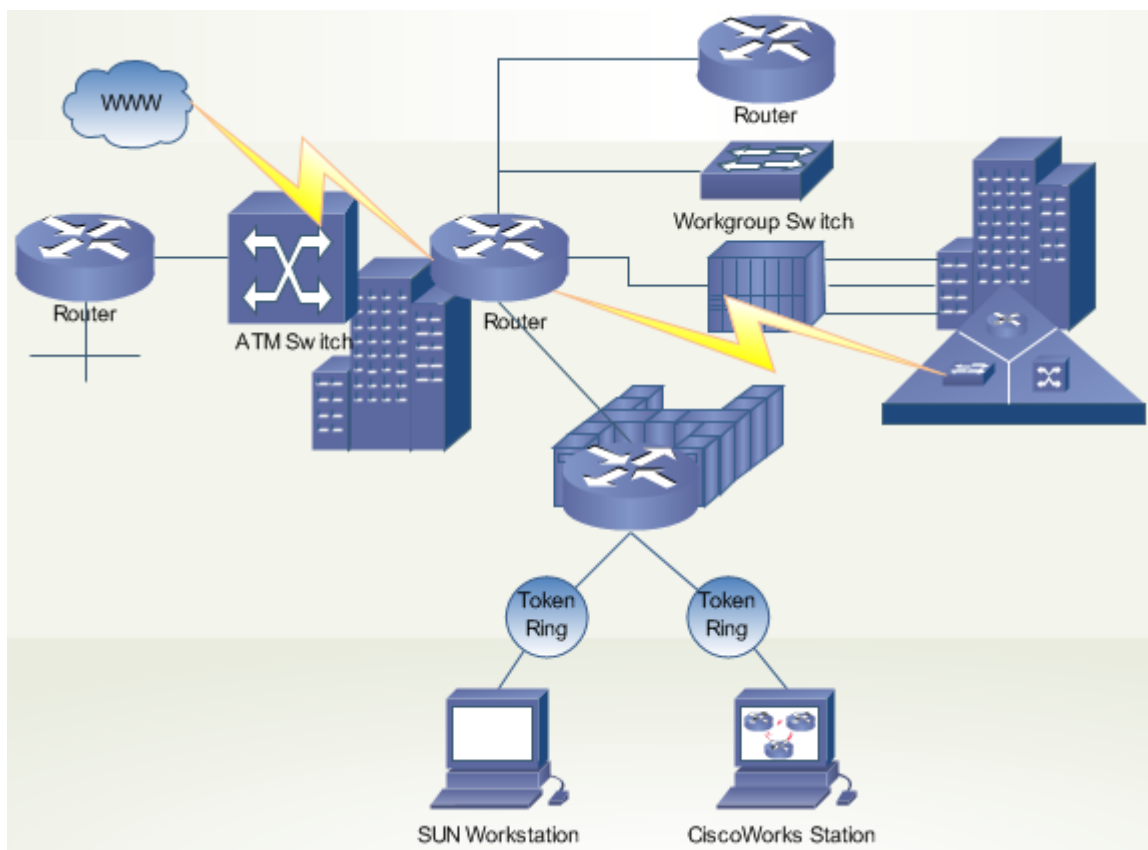

Fig 4.5 Physical design

Source: https//www.network_diagram.com

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4.4.1 Hardware requirements

- Printer
- Network cable
- PC or desktop computer
- Switches
- Routers

4.4.2 Software requirements

- Operating system that is windows 8 or 8.1
- Microsoft office
- Google chrome
- MySQL
- Windows defender
- Dreamweaver

4.5 Database design

Database design is the process which identifies how data is presented in the database, (Hernandez 2013). The database is the one that manages data hence resulting in a fast retrieval and storage process of data in the database. The process is successful because of the availability of the database management system and has MySQL. A database management system helps in maintaining and the creation of the database. It ensures that there is data normalisation that is first normal forma, second normal form etc., integrity of data and security.

4.5.1 Reasons for using database management system

- Validation is always ensured because data is always checked before being entered in the database hence data is always consistent
- Costs of labour and resources are always reduced because data is combined into a database which is single
- Data redundancy is reduced if not eliminated because of file integration
- Accurateness of data is ensured because the database ensures that data which is being stored is correct and valid and it is achieved through the use of integrity constraints
- Data stored is secured because unauthorised users do not have the ability to access the database since it is secured through the use of encryption, passwords and unique usernames.

> ➢ Multiple users can have access to the database at the same time without disturbing or affecting other users.

4.5.2 Architectural view of the database design

Hernandez (2013) says that architectural design refers to the way in which data is presented and this is done through the use of database layers. The layers are referred to as database schemas and they form part of the database design. The layers of the database are:

> ➢ External layer
> ➢ Conceptual layer
> ➢ Physical layer
> ➢ Internal layer

Below is the diagram that highlights the architectural view of the database diagrammatically
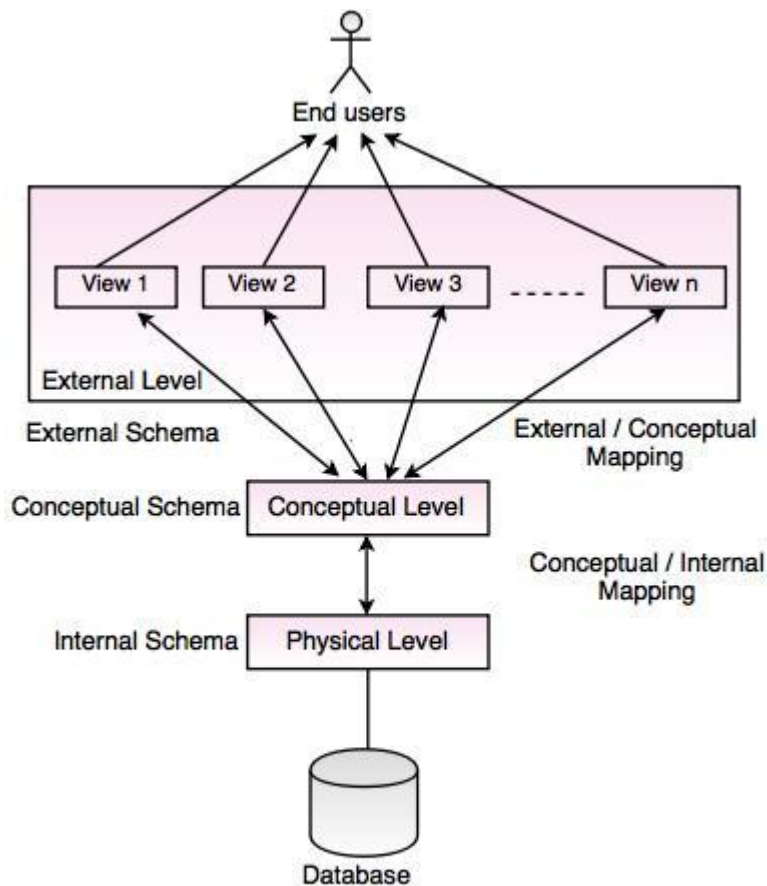
Fig. Three Level Architechture of DBMS

Fig 4.6 Ansi sparc diagram

Source: https://www//Ansi_sparc_achitecture.org

External view

According to Scammel and Umanath (2017), the external view of the database is where end users can have access and can also interact with the system. The external view has got many views which are different in the database that is one user is allocated a single view. This enables the user to have access to the data they need freely without inconveniencing other users since they have got different views. Data abstraction is also represented on this level.

Conceptual level

It is known also as community view. The conceptual view takes a holistic representation of data and it is an overview of the database. Claudius (2014) says that it shows how the database was logically structured. It identifies the relationship between the members of the database. The level identifies the relationship between members of the database. The conceptual level also shows exactly the data stored in the database and what the use will require in order to use it. It also acts as an intermediary between the external and internal level of the ansi sparc. The complexity of the database is hidden here and how the data is actually stored. The level is only modified by the administrator since all the operational activities are conducted on the conceptual view.

Internal level

The internal level highlights the physical representation of the data. It is the lowest level of the ansi sparc architecture. According to Hernandez (2013), the level is concerned about how the data stored in the database will be presented to the end user. Also how data is organised and stored is conducted in this level. This level is very essential and, most important part of the model. Data is stored in the database by firstly identifying the following factors and these are:

➢ Correct space allocation technique
➢ Data compression technique
➢ Security
➢ Data encryption
➢ Retrieval of data

This ensures that data uses storage space that is minimal.

4.5.3 Database tables

Database tables are also known as relational databases. A database table consists of data that is related and is kept in a database, Hernandez (2013). This is where data in the database is stored hence the importance of the database tables. A database is made up of a single or more tables. These tables are made up of a row and a column.

Table 4.1: Table employee

Attributes	Data types
Email	Varchar
Password	Varchar
Name	Varchar
Surname	Varchar
Designation	Varchar

Table 4.2: Table department

Attributes	Data type
Department name	Varchar

Table 4.3: Table clock in

Attributes	Data types
Time	date
Date	Date
Email	Varchar

Table 4.4: Table clock out

Attributes	Data types
Time	date
Date	date
Email	Varchar

4.5.4 Enhanced Entity Relationship Diagram

It is also known as an extended ER model since they are similar to ER diagrams. According to Claudius (2014), EER diagrams represent complex databases with complex requirements. It represents diagrammatically the super and sub classes, generalisation and specialisation, aggregation, category and union attribute and relationship inheritance.

- ➢ **Super types –** it consist of a single or more subtypes
- ➢ **Subtypes –** belong to a sub group of entities with unique attributes
- ➢ **Generalisation –** it is defined by a general entity type from a collection of specialised entity types
- ➢ **Specialisation –** it defines the sub type of the super type and determines the relationship between the two
- ➢ **Disjointness constraints –** a super type instance maybe a member of 2 or more subtypes at the same time.
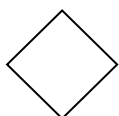- ➢ **Completeness constraints –** an entity in a super type must belong to a sub class.
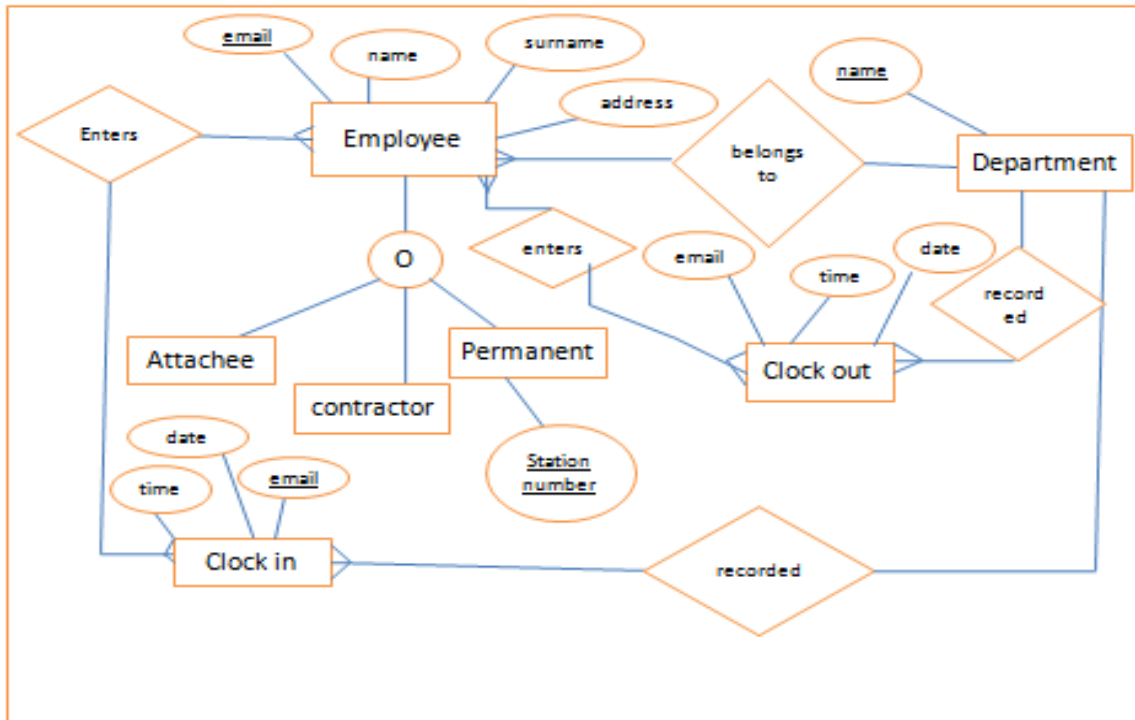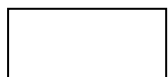
Fig 4.7 Enhanced entity relationship diagram

Key

⎯⎯ -The flow of information

☐ - represents the entity

◇ - represents the relationship

⬭ - represents the attributes

4.6 Program design

According to McGuirre (2016), program design is the way or method that an organisation uses to come up or develop an application. The waterfall model includes the program design under the system design of the project. It highlights the specifications of what the system should fulfil. Plain language is used when writing the design of a program or system. This is done before coding takes place in order to understand and identify the flow of activity. It is

conducted by the use of class diagrams, package diagrams and sequence or collaboration diagrams.

4.6.1 Package diagram

Scammel and Umanath (2017) state that a package diagram is structured architectural diagrams that show relationships between objects and packages. They also represent a namespace. They identify all the multiple views of a system for example multi tiered model. The package diagram also helps in simplifying the complexity of class diagrams. The diagram below shows a package diagram of the industrial attendance management system in understandable terms.
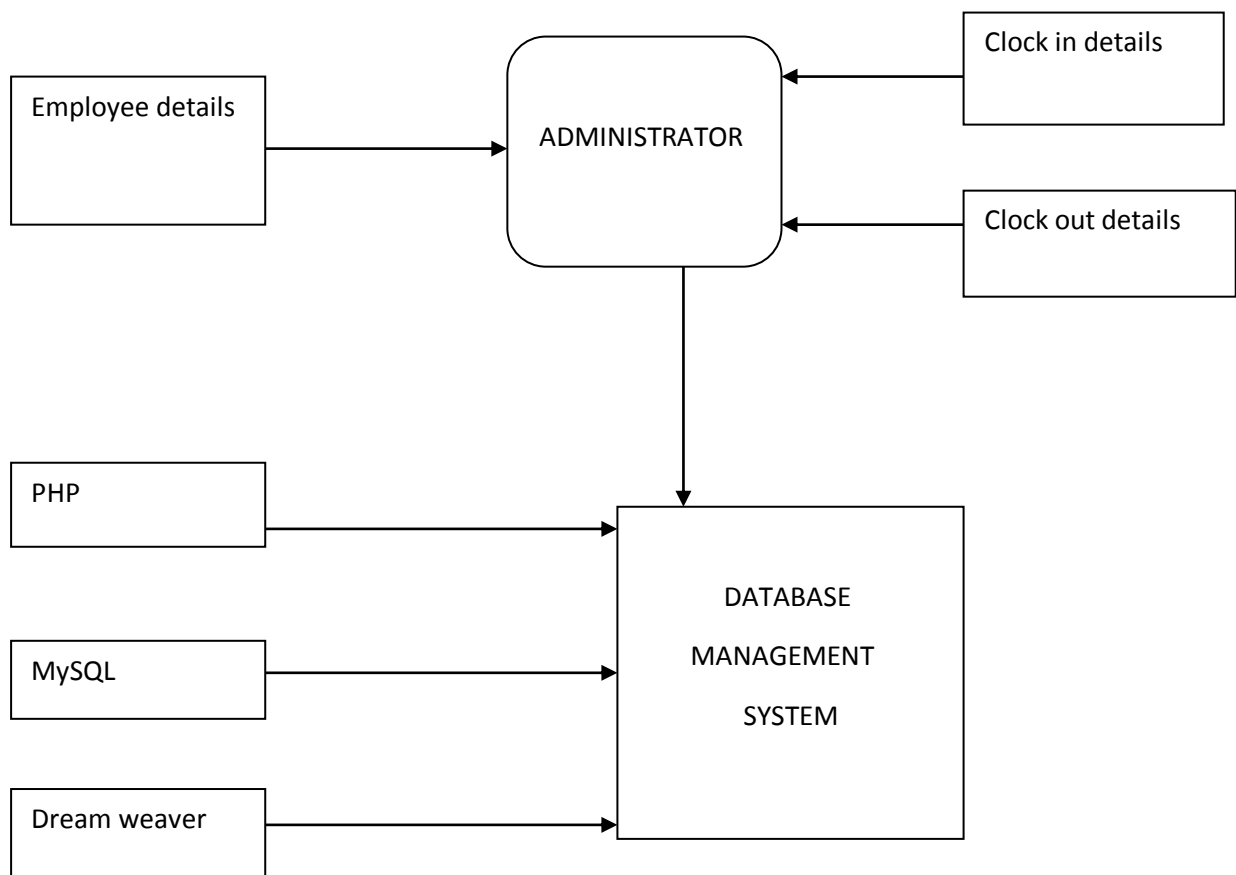
Fig 4.8 Package diagram of the industrial attendance management system

4.6.2 Class diagrams

According to Seidl, Scholz, Huemer and Kappel (2015), class diagrams are used when illustrating data models regardless of the simplicity or complexity of the system. Class diagrams are a type of UML that is Unified Modelling Language. They are also known as static diagrams. Class diagrams help in the creation and construction of code for the system.

They help in identifying the constraints that can be found in the system. The purpose of class diagrams are as follows:

- ➤ Reverse and forward engineering
- ➤ Identify objectives of a system
- ➤ Design and analyse the static view of an application.

Class diagrams are the mostly used in UML diagrams when modelling object oriented systems.
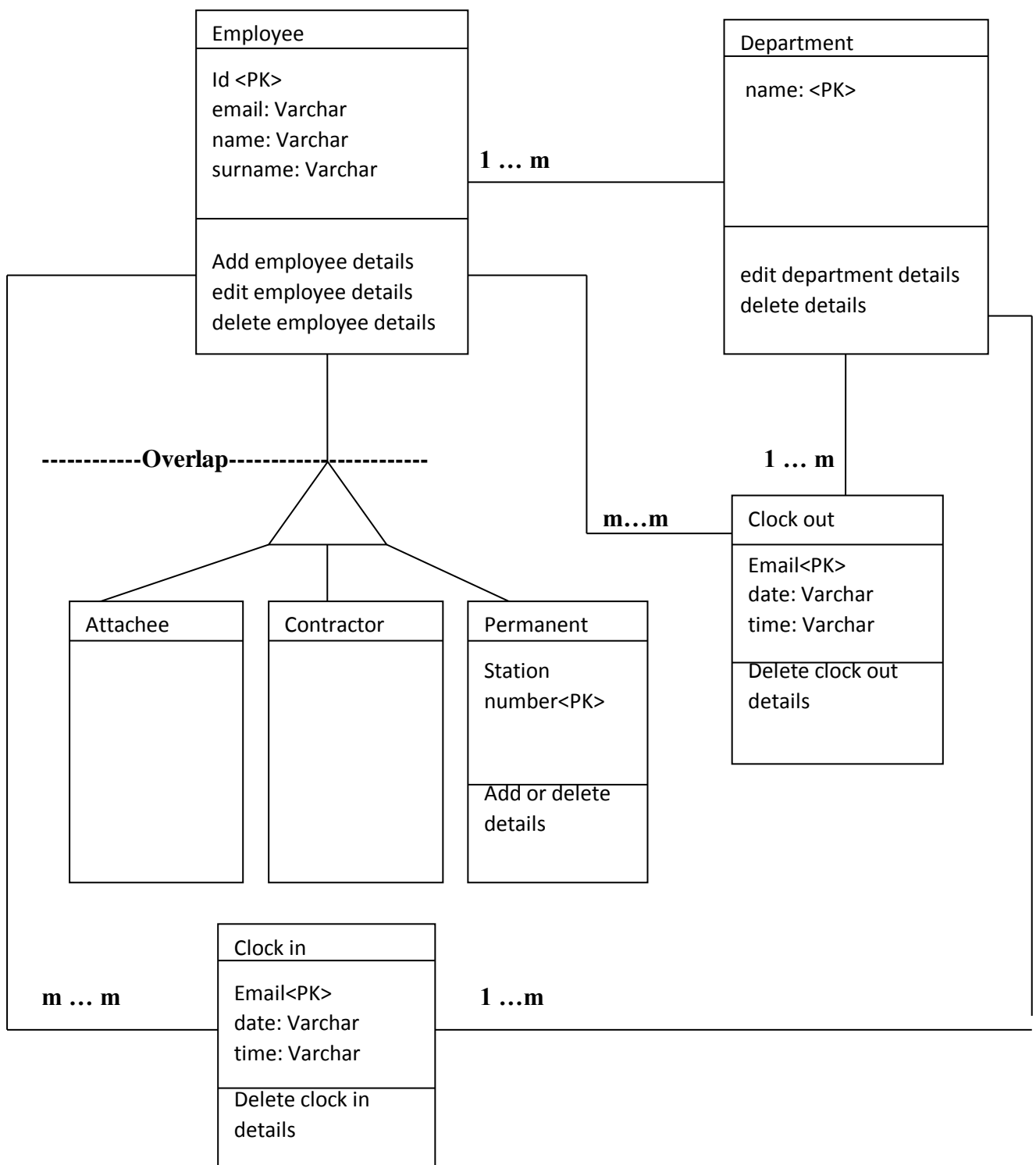
Fig 4.9 Class diagrams

4.6.3 Sequence diagrams

According to Seidl et al (2015), sequence diagrams are used to model systems in a dynamic format. Sequence diagrams also fall under UML. A sequence diagram interacts with all

objects of the system. It helps in making it easier to understand the processes involved diagrammatically. They are also used for analysis and design of the system. They identify the behaviour of objects and classes. They act as a platform used to visualise and validate errors as they occur. The benefits of sequence diagrams are as follows:

➢ Use case details are presented through the use of sequences
➢ Functions and operations of classes and objects are modelled
➢ They identify the interaction of objects and their relationships
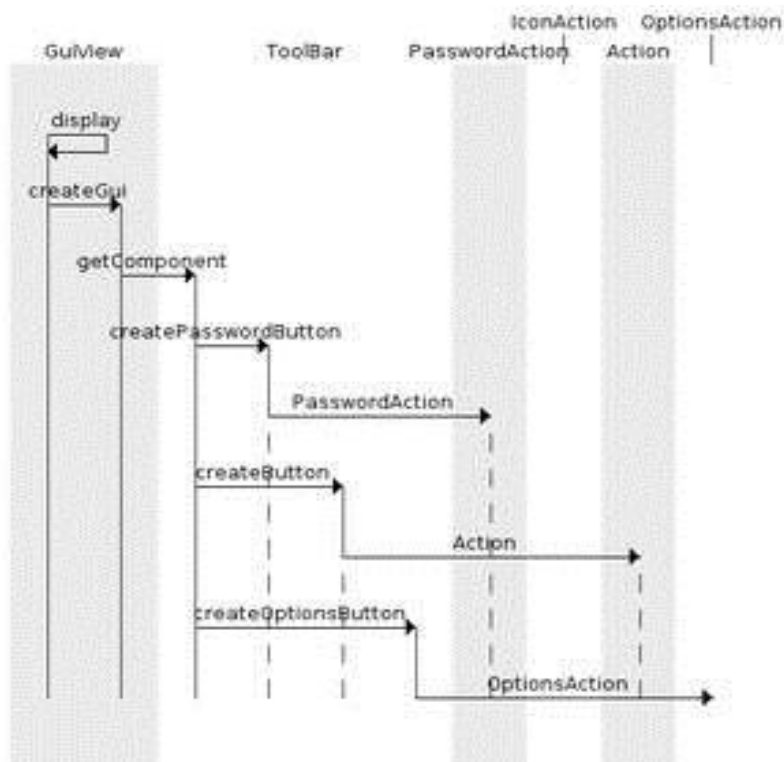
Source:

Fig4.10 Sequence diagrams

4.7 Interface design

According to Shelly and Rosenblatt (2012), interface design refers to the phases that are undertaken when developing a system such as the web page design, software applications and devices which will be used for communication such as computers with a goal of ensuring interaction between users. Interface design enables users to interact with the system or the software application. It ensures effective and efficient interaction between users and the application.

Tidwell (2011) also says that interface design is a continuous process in which commands are in phases and are known. The user must be familiar with the commands in order to enable easy communication with the application. Hence developers must develop a system that gives room for user involvement in order to ensure that user needs are met. Interfaces must be user friendly. Training costs are reduced if a good interface is developed thus making sure that there will be no need for user manuals. The structure of the program is highlighted by identifying the input and output of the system.

4.7.1 Menu design

According to Tidwell (2011) a menu design is the interface that pops up or a web page that appears firstly when a user accesses the program or application. The diagram below identifies the menu design of the system.
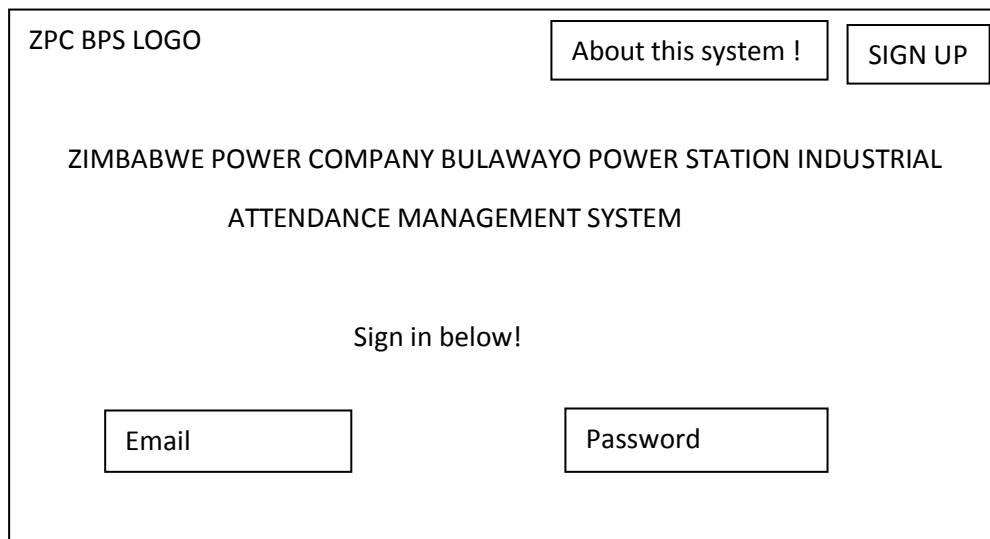

ZPC BPS LOGO   About this system !   SIGN UP

ZIMBABWE POWER COMPANY BULAWAYO POWER STATION INDUSTRIAL

ATTENDANCE MANAGEMENT SYSTEM

Sign in below!

Email   Password

Fig 4.11 Menu design of the system

4.7.2 Input design

Input design is an intermediary between the system and it users, (Scammel and Umanath 2017). It focuses on the identification of the necessary input required, control of errors, avoiding any delays due to problems that may arise and minimising the processes or phases that are undertaken when accepting input to the system.

Tidwell (2011) also says that input design includes input forms. The input forms enable easy capturing of data into the system. The duty of the administrator will be to add users to the system and to manage it. The database will be the one responsible for storing data and

information that will be entered into the database. The users must be first added into the system so that they will be able to login to the system and be able to use the software application. Validation of data being entered into the system will be conducted in order to ensure data integrity.

Login form

The users will be created their own login forms with their credentials which must be unique for each individual and having strong passwords in order to secure the data. This will ensure that unauthorised users will not be able to have access to the system. the following diagram shows the login form for the users of the system.

Sign in below!

Email

Password

login

Fig 4.12 login form

Employee registration form

Employees should be first added into the system in order to make sure that they can be able to login and be added into the database. This will allow users to be able to interact with the system. The diagram below represents diagrammatically the registration form of the users that is the employees.

Fig 4.13 Registration form

Clock in form

The clock in form is where the employees clock in or indicate their time of arrival at the work station.

Fig 4.14 Clock in form

Clock out form

The clock out form is where employees enter the details and time of when they leave the work station or when they dismiss from work. Each employee is mandated to clock in and clock out each time they enter or leave the work station.

Fig 4.15 Clock out form

4.7.3 Output design

The process whereby data inputted into the system and has been processed and produces a certain result is called the output design according to Shelly and Rosenblatt (2012). Interface forms should be created and these will enable in displaying output after it has been processed to the employees. High quality of the output should be ensured in order to meet user expectations. This will ensure that the output is presented in an accurate manner to the users. Also the output design should include pop up messages for example if an employee has successfully clocked into the system there should be a confirmation message that pops up immediately after the process. Below are the output forms of the industrial attendance system.

Summary of employee attendance

The output form shows all the employee clock in time and clock out times. It also identifies all the days the employees showed up for work including their clock in times. The diagram below shows the employees attendance summary report.

Email address	Date	Time in	Time out
			Print

Fig 4.16 Summary of employee attendance

Employee report form

The output form identifies all the information that has successfully been processed by the system. The employee report form summarises the results that will have been processed by the system

Clock in	Clock out	Reports	Logout	Welcome user

Reports

Department	From (date)	To (date)	Search

Email address	Date	Time in	Time out

Print

Fig 4.17 Employee report form

4.8 Pseudo Code

Pseudo code is the code which is understandable by the end users, Shelly and Rosenblatt (2012. The code helps the users to have a better understanding on how the system functions. Statements in English form are the one used in explaining the system processes. Below is the pseudo code for the industrial attendance system.

4.8.1 Creating employee account

Start

   Open create sign up form

      Enter employee details and click register here button

   If the data is correct then click ok

 Else if data is not correct begin the process

Then re enters the details and click register here button again

End

4.8.2 User login form

Start

 Enter login details that is the username and password and click log in button

   If details are correct then the user has automatically successfully clocked in

Else if, details are not correct

Then failed to login message appears

The user has to start the login process

End

4.8.3 User clock out form

Start

Click the logout button

Message appears stating logout successful

End

4.9 Security design

Security design refers to the process whereby the developer puts security measures in place during the software development process according to (Shostack 2014). This is done in order to ensure that the system is protected and secure that no unauthorised user will be able to access the system. The security design process was conducted through network, operational and physical security.

Network security

Meeuwisse (2017) says that network security refers to the process which includes ensuring data integrity, data security, accurateness and reliability of data thus resulting in the protection of data. The software maybe affected by some malware functionalities, viruses, spyware etc. Therefore the system needs to be protected from these activities hence the need for data encryption, use of firewalls and antivirus such as windows defender in order to protect information and restrict unauthorised users to have access to the network. Also there is need for establishing a remote secure access point such as the virtual private network so that it is strongly protected.

Operational security

This refers to the process whereby software is protected whilst users are having access to the services provided by the system and this is known as operational security, (Meeuwisse 2017). Measures of online security of the system should be put in place and the developer so that there is no interruption of user activities by hackers. The protection processes include

Physical security

The process that includes protecting a system from situations that are physical in nature which can result in damaging the software, hardware and all the peripherals through natural disasters such as winds, floods, lightning, theft, fire and burglary is called physical security, (Shostack 2014). The server of the system will be kept in a storage room that will be under protection and the authorised user such as the system administrator will be the ones able to have access to the server room.

4.10 Conclusion

The design phase identified how the system would function through the use of DFDs and the context diagram. Architectural design and database design were conducted and they helped in coming up with the enhanced entity relationship diagram and the class diagram. Program design and the interface design were carried out and also security design was done in order to identify how the system will be protected.

Chapter 5: Implementation Phase

5.1 Introduction

The chapter focuses on the completion and delivery of the system to the end user. This is where the code is written and the testing phase is conducted on this chapter. Youssef (2011) says that the implementation phase is where the developer makes sure that all the objectives are met and all the system tests are conducted. The system installation is carried out here and all the necessary training sessions are carried out including the system changeover strategies and data migration techniques.

5.2 Coding

According to Ford (2015) code refers to a set of instructions that are executed by a computer in a programmable manner with the main aim of producing certain commands and programs. Below are the set of codes.

```
<script language="javascript">

functionlettersOnly(evt) {

evt = (evt) ? evt : event;

varcharCode = (evt.charCode) ? evt.charCode : ((evt.keyCode) ? evt.keyCode :

((evt.which) ?evt.which : 0));

if ( (charCode< 65 || charCode> 90 ) &&

(charCode< 97 || charCode> 122)) {

if(charCode != 8){

alert("Enter letters only.");

return false;

}}

return true;

}

</script>

<script type="text/javascript">
```

```
functionVerifyNum(textBox){

varnvalid = parseFloat(textBox.value) ;

if ( isNaN(nvalid) ) {

alert ("please enter numbers only !");

textBox.value = "" ;

return (false);

}else{

return (true);

}}
</script>
<script language="javascript" type="text/javascript">

function check(e) {

varkeynum

varkeychar

varnumcheck

    // For Internet Explorer

if (window.event) {

keynum = e.keyCode;

    }

    // For Netscape/Firefox/Opera

else if (e.which) {

keynum = e.which;

    }

keychar = String.fromCharCode(keynum);
```

//List of special characters you want to restrict

if (keychar == "." || keychar == "0" || keychar == " " || keychar == "1" || keychar == "2" || keychar == "" || keychar == "3" || keychar == "4" || keychar == "5" || keychar == "6" || keychar == "7" || keychar == "8" || keychar == "9" || keychar =="!" || keychar =="@" || keychar =="#" || keychar =="$" || keychar =="%" || keychar =="^" || keychar =="&" || keychar =="*" || keychar =="(" || keychar ==")" || keychar =="-" || keychar =="_" || keychar =="+" || keychar =="=" || keychar =="/" || keychar =="~" || keychar =="<" || keychar ==">" || keychar =="," || keychar ==";" || keychar ==":" || keychar =="|" || keychar =="?" || keychar =="{" || keychar =="}" || keychar =="[" || keychar =="]" || keychar =="¬" || keychar =="£" || keychar =="" || keychar =="\\") {

return false;

    } else {

return true; }

}

The code above is for signing up a user.

5.3 Testing

Hooda and Chhillar (2015) state that software testing is the process whereby errors are identified before the implementation of the system. Bugs are detected in order to identify and remove them before the installation process is conducted. Software testing is conducted in order to analyse and verify whether the system is functioning according to the objectives and if meets the user expectations. The industrial attendance management system was verified and analysed prior to its implementation process and as such some errors were debugged. The diagram below identifies the stages carried out in system testing.
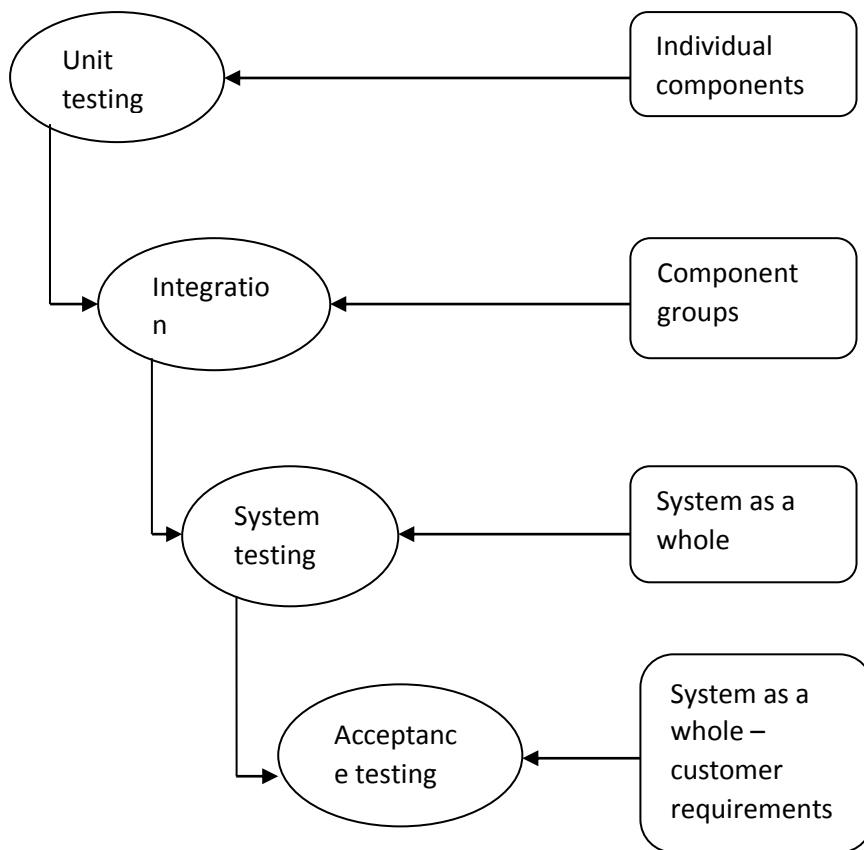
Fig 5.1 System testing process diagram

5.3.1 Unit testing

Seland (2013) states that unit testing refers to a process whereby software being developed is tested in its smallest parts and these parts are known as units and these units are independently verified in order to see whether they are functioning properly. Unit testing can be conducted automatically or manually. If the units of the system have now been scrutinized and errors have been corrected, and the developer is satisfied by the performance of the system then the units are integrated together. Unit testing was conducted through the use of white box testing method. Unit testing was conducted for the system and all units were tested independently and errors found were corrected by the developer. The diagram below shows unit testing for the login form.
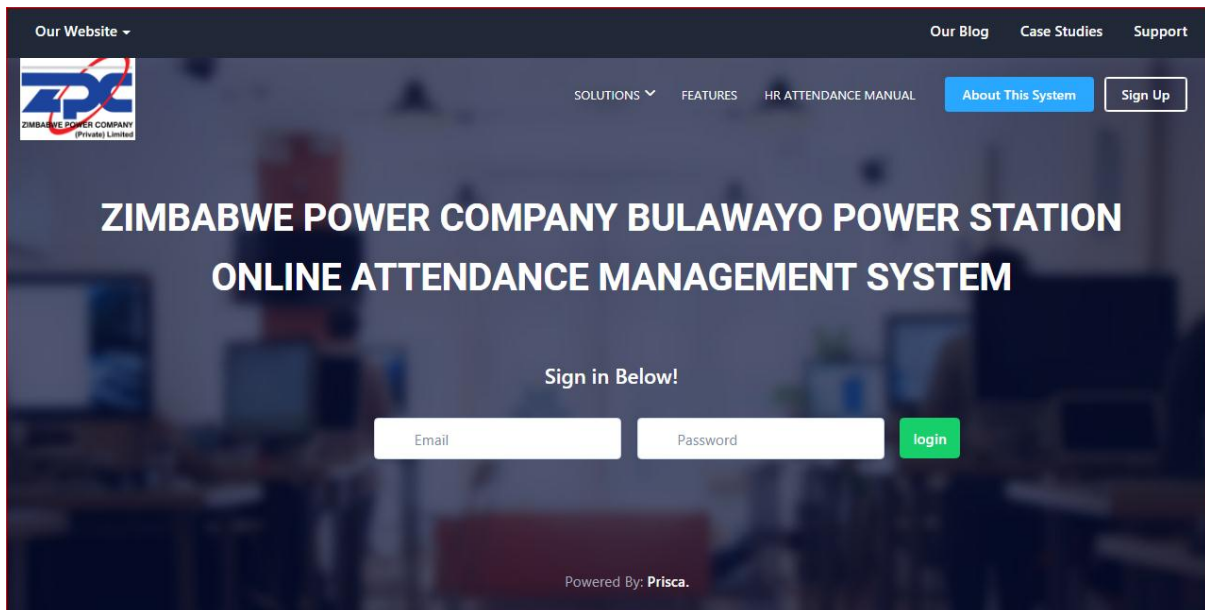
Fig 5.2 Unit testing diagram

5.3.2 Integration testing

Integration testing is the process where individual modules or parts which are testable are combined and are tested as a whole, (Hooda and Chhillar2015). This process is conducted after unit testing. The main aim is to identify errors in the interaction of the integrated units or modules. Integration testing can be carried out through the use of the bottom to up approach or the top to down approach. Also functionality testing is conducted in order to see if the system functions accordingly with the systems objectives.Integration testing was conducted and the modules or units which were tested in unit testing were combined together and tested as a whole. Errors were identified and they were debugged by the developer.

5.3.3 System testing

System testing occurs when the integrated software and the whole system is tested altogether according to (Seland 2013). This is done to ensure that the system functions as per the objectives that is to see if it meets the user requirements. It is performed after integration testing. It is conducted through identifying the System Requirement Specification (SRS) and the Functional Requirement Specification (FRS). It is done in order to verify the functional and non functional requirements. Software testing is conducted through White box testing and Black box testing.

➢ **White box testing –** it involves testing the code that is the internal part of a software.

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> - **Black box testing** – it is more concerned with the external part of the system that is the user requirements.

System testing applies the black box testing since the internal part is not of major concern. The system was tested according to its objectives in order to see if the objectives were really met.

5.3.3.1 Objectives versus system testing

Objective number 1

Implementing a system that allows employees to clock in and clock out of the work station.

Fig 5.3 Clock In form

Objective number 2

To implement a system that calculates the overtime of employees
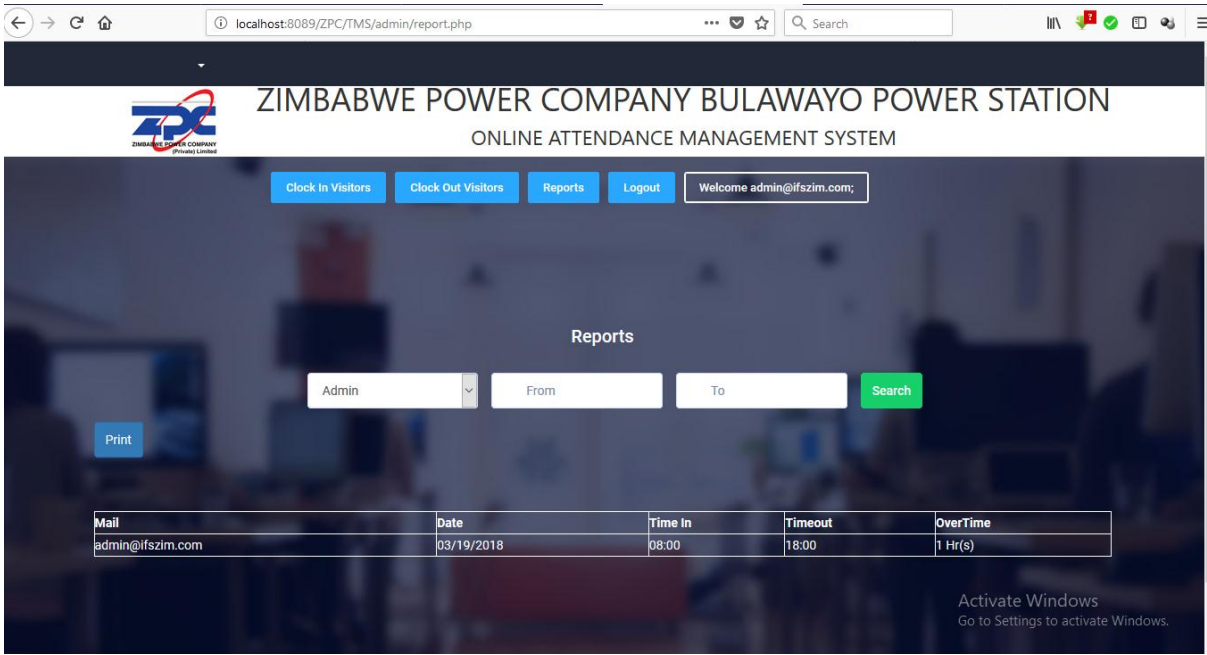
Fig 5. 4 Overtime form

Objective number 3

To help in easy tracking of records.
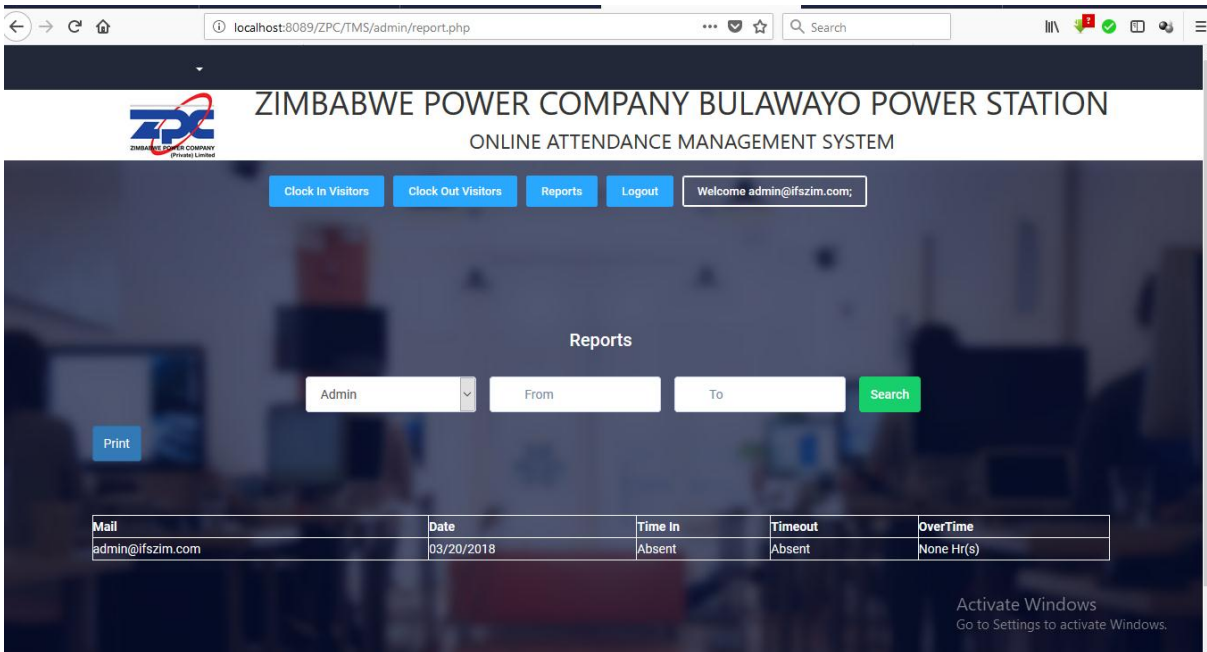
Fig 5.5 Tracking form

Objective number 4

To enable easy generating of reports
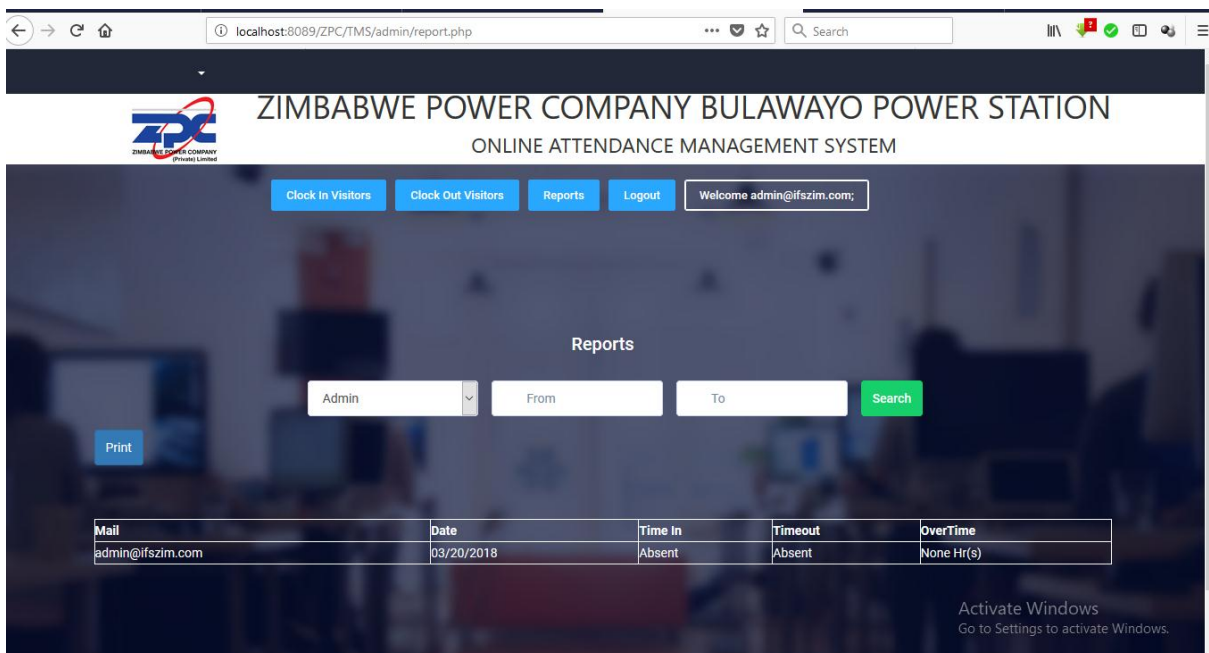
Fig 5.6 Report form

Objective number 5

To help in identifying absent employees.

Fig 5.7 Absenteeism form

5.3.3.2 Defective testing

According to Hooda and Chhillar (2015) defective testing is conducted in order to find an area where the system does not meet its specifications. It is conducted under system testing. Tests are conducted in order to retrieve available defects in the system. Debugging of those defects is then conducted in order to remove them. Testing the system in order to identify defects can be conducted manually by tracking the codes hence enabling in the identification of errors though it takes a lot of time. After the defects have been corrected by the developer, the system is retested through the process called regression testing. Regression testing is done in order to see if the new changes made did not introduce new errors into the system. The process is repeated until the developer and users are satisfied that there are no errors. Defective testing was also conducted by the developer and the diagram shows the processes which were followed.
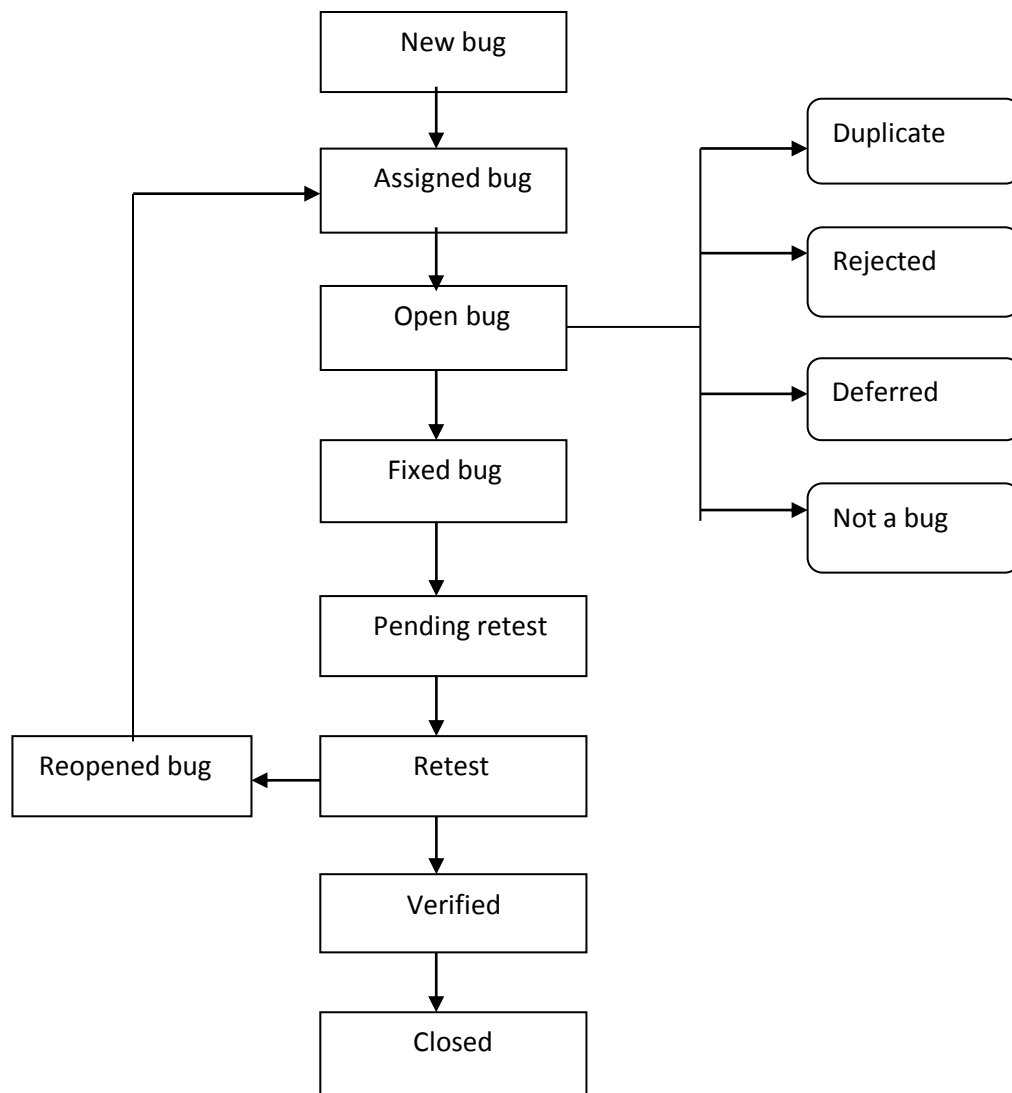

Fig 5.8 Defect Life Cycle

5.3.4 Acceptance testing

According to Seland (2013) acceptance testing is conducted by the users or any entity for acceptability purposes. The result to this test is either pass or fail meaning if it does not perform according to the user expectations. The aim of acceptance testing is to analyse and determine whether the software is functioning as per the user expectations and can be delivered. The procedure for this testing is usually done in an ad hoc manner. It is the last phase of software testing and it is conducted before implementing the system. The different types of acceptance testing consist of alpha testing and beta testing. It was conducted through the use of alpha testing and beta testing in order to see if the users are going to accept the system after delivery.

Alpha testing

Alpha testing is a validation technique. It is an internal acceptance testing technique which is conducted by the development team and testing team according to (Hooda and Chhillar2015). It is conducted in order to identify bugs before issuing the system to its users. It simulates the users of the system through the use of black box and white box testing. The ones who test the system are usually the users of the system. It is conducted before beta testing. The diagram below shows diagrammatically were alpha testing is conducted.
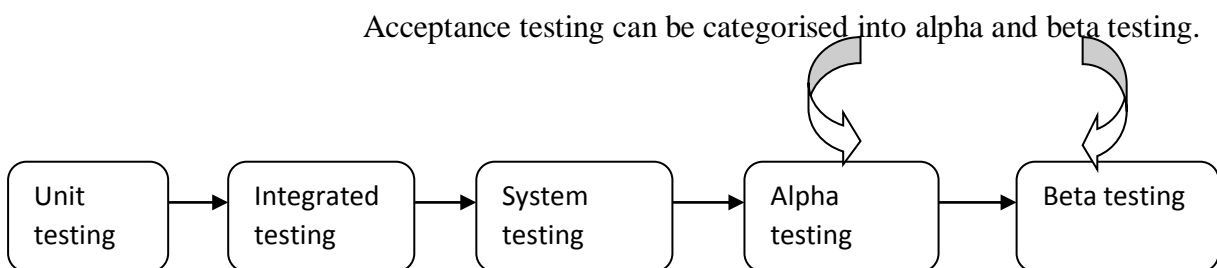
Acceptance testing can be categorised into alpha and beta testing.

| Unit testing | → | Integrated testing | → | System testing | → | Alpha testing | → | Beta testing |

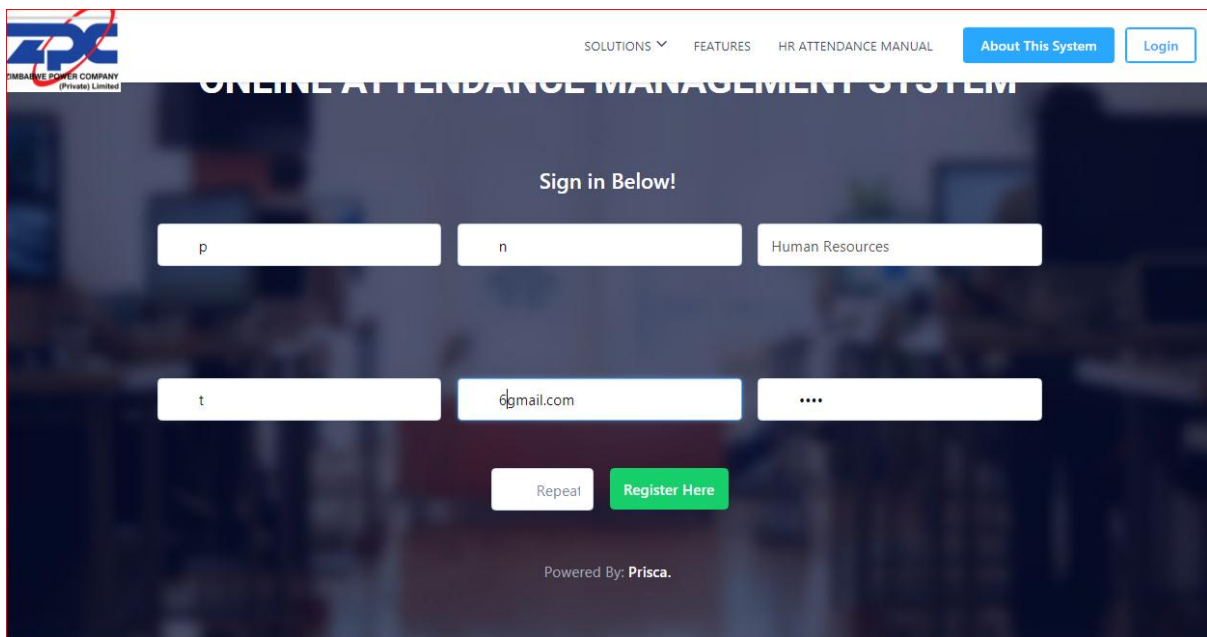*Fig 5.9 Acceptance testing*

Beta testing

It is conducted after the alpha test process. According to (Hooda and Chhillar 2015) beta testing is conducted by the real end users in a real environment. It is considered as an example of external user acceptance testing. A beta version of the system is given to a few end users in order to be able to obtain the feedback on the operations of the software. This process reduces the risk of failure since the end users are the ones who test the system and also give their thoughts either positive or negative on how the system operates. This is the final test phase done before implementing the system to all the users. Beta testing enabled to

test the system in real time environment and also obtaining feedback from the real users of the software.

5.3.5 Validation

Validation is the process of determining whether the system conforms to the user requirements and if conducts some functions which were stated in the system functionality procedure, Engel (2010). It is conducted at the end of the development process and is done after the verification process. It ensures that the data or information being entered into the system conforms to the specifications that are being required for example if a password requires password requires six characters letters and a number then this is known as validation. If a user does not enter the password with the required specification then a pop up message will appear stating that invalid password. The diagram below shows validation by not allowing a user to sign up without an @ character.

Fig 5.10 Validation form

5.3.6 Verification

According to Engel (2010) verification is the process of double checking or proof reading data that is entered into the system. Verification is conducted in order to ensure data accuracy, correctness and data integrity. The system ensures data integrity through verification by allowing users to repeat their passwords before submitting them as shown by the diagram below:

Fig 5.11 Verification form

5.4 Installation

Seland (2013) says that installation is the process of making software ready for use. The system is deployed to a server in order to ensure that users can be able to access the software and be able to use it. It is defined also as the process responsible for creating and extracting all the program files so that they are installed and can run on a computer for use. During installation, the following installation strategies where taken into consideration.

5.4.1 User training

According to Hodgins (2016) user training refers to the process where all the end users of the software will be given the software or application and be taught it operates. It is very essential to draft a training plan which will guide in training the end users of the system. Training sessions were conducted for the employees and all the management so that they were acquainted with all the necessary knowledge they may require in order for them to be able to use the system. The process was conducted until the developers felt that the users had grasped the necessary concepts. These training sessions were conducted within the organisation.

5.4.2 Data migration

It refers to the process whereby information is transferred between computer storage units according to (Hooda and Chhillar 2015). It is transferring the new system to a computer in

general. It is a very important aspect during system implementation. Data being transferred should be extracted and loaded accurately. To ensure this, data verification is done in order to identify if the data was transferred accurately. Data extraction and data loading are key aspects of data migration. Before conducting data migration, checking of the operational environment was done in order to ensure that all the software, hardware peripherals required for the running of the software are functioning correctly before migrating data.

5.4.3 System changeover strategies

Robertson (2018) says that system changeover refers to the process of removing a software or system that is old or out of date. It is placing a new application or a program whilst removing the software which is out dated. The old system is replaced by the new system. The changeover strategies include parallel changeover, direct changeover, phased changeover and pilot changeover. These strategies are discussed further below.

5.4.3.1 Direct changeover

On this changeover strategy, the new system is implemented and it starts being operational immediately whilst the old system is completely removed, (Robertson 2018). Basically, if the new system starts functioning the old system is shut down. This changeover strategy is very risky because if there is a mishap with the new system, the organisation as a whole will be at a standstill that is the whole organisation suffers though it is the least expensive strategy.

5.4.3.2 Parallel changeover

According to Robertson (2018) parallel changeover is a strategy where the old system and the new system will operate simultaneously at the same time. Both systems will be operating fully for a certain period of time. This gives room for the management and the development team to analyse and evaluate the efficiency of the new system. Once the development team and the management become satisfied about the way the new system operates then the old system is terminated leaving the new system to operate on its own. Risk is very low due to the fact that if the new system does not operate correctly, there are no disruptions encountered since the users are able to continue operations using the old system. However, it is very costly since there is need to input data in both the systems. High workload for the employees is usually the result since in most cases have to use both systems.

5.4.3.3 Pilot changeover

Pilot changeover is when the new system is tried at a test site before implementing it in the whole organisation says Robertson (2018). The new system is given to a part of the organisation that is a branch or a department to first try it out. The part of the organisation were the new system is implemented is known as the pilot site. The old system continues to be operational in the whole organisation as well as in the pilot site. If the new system proves to be functional at the pilot site, it is the implemented at the whole organisation. Pilot changeover is also known as a combination of parallel changeover and direct changeover strategies. Pilot sites reduce the risk of failure of the system and it is less costly compared to parallel changeover. Any failures of the new system are dealt with at the test site before implementing the system in the whole organisation.

5.4.3.4 Phased changeover

Robertson (2018) also says that phased changeover implementation strategy refers to the process whereby a unit of the old system is changed through the replaced of the new unit system. The units are implemented one phase at a time. Also it is a combination of direct changeover and parallel changeover. Only a unit of the system is provided to a few users to try it out. Risk is limited since it affects the part were a new unit was implemented. It is less costly compared to the full parallel changeover strategy. However it can be costly if the new system consists of a lot of separate units which will need to be implemented individually in a phases. The units being implemented will be replacing the old ones automatically.

5.4.3.5 Recommended changeover strategy

The changeover strategy in which the new system will be implemented with is the pilot strategy. This technique is cheaper compared to all the other changeover strategies. It is less risky since the new system will implemented only to the pilot site. If the system proves that it is successful then it will be implemented to the whole organisation.

5.5 Maintenance

Garrido (2017) says maintenance is the continuous modification of the software and updates made thus improving the software performance. Software simulates the real world. If there are changes in technology the system also needs to upgrade in order to keep up with the dynamic changes in technology. It includes activities such as error correction and enhancement or modification of existing functionalities. Maintenance consists of different

types which include corrective maintenance, adaptive maintenance, perfective maintenance and preventive maintenance.

5.5.1 Corrective maintenance

These are modification or updates made because of error identification by end users according to (Garrido 2017). If an error is identified then the subsequent cause of the error is also identified and rectified. The anomaly detected is then correct in order to resume operations. Due to these errors the equipment can be damaged hence resulting to an increase in costs.

5.5.2 Adaptive maintenance

This is a type of maintenance were modifications to the system and updates are conducted in order to ensure that the system or the software product remains up to date according to (Garrido 2017). This ensures that the system remains in line with the technological advancements and the operational environment. The system is usually upgraded if there are compatibility issues with the new hardware or other software's that enable the software to operate efficiently. The system can be upgraded by adding other functionalities so that it continues to function instead of being discarded.

5.5.4 Perfective maintenance

Perfective maintenance is when modifications and updates are conducted in order to ensure that the software system continues to be functional over a long period of time, (Garrido 2017). This includes adding new functionalities to the system. Also user expectations should always be taken into consideration and be met in order to be able to improve the systems efficiency and effectiveness.

5.5.4 Preventive maintenance

On preventive maintenance, modifications and updates are conducted in order to prevent future problems of the software system occurring according to (Garrido 2017). The problems which maybe attended to currently may not be significant after the implantation of the system but my start causing serious problems in the future. Preventive maintenance tries to foresee these errors and prevent them from occurring in the future.

5.5.5 Recommendations on the maintenance strategy

Adaptive maintenance is the recommended strategy. It was selected after outweighing the benefits and the limitations of the other maintenance strategies. Adaptive maintenance will be

carried out in order to ensure that the system continues to operate in the real world environment even in the future and continues to be updated according to the technological changes. Other strategies maybe implemented if their need arises for example if there are errors identified, corrective maintenance can be implemented in order to correct the errors.

5.6 Recommendations for future or further development

The following are the recommendations which were stated by the developer for further development in the future and these are:

➢ Employees should be able to clock in on their individual work machines.

➢ Training of end user should be carried out constantly in relation to the changes made on perfective or adaptive maintenance strategies.

➢ Security of the system should also be constantly revisited in order to continue making the system more secure.

➢ Maintenance strategies should also be conducted periodically in order to continue fulfilling user expectations.

5.7 Conclusion

The chapter marked the last stage of the project development. System testing was conducted in order to ensure that there are no errors before its implementation. Installation of the system was done during this phase and a changeover strategy was chosen. Maintenance strategies were also explained in detail. This phase showed that the implementation was a success.

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Appendices

Appendix A: User manual

The user manual informs users on how the application operates. It also helps them to get a little understanding of the system before using it. The user has to first register before login to the system. The user is registered by the administrator.

User registration form

The administrator is the one responsible for monitoring employee registration. The users include employees. If the user is not registered, they cannot access the services. The diagram below shows the registration form. The arrows shows were the users in order to input the required details that are their first name, last name, department, designation, email address and the password. After entering their details, the user should click the register button. The arrows were users should input their login details.

The arrows shows were the user should click after filling all the credentials needed.
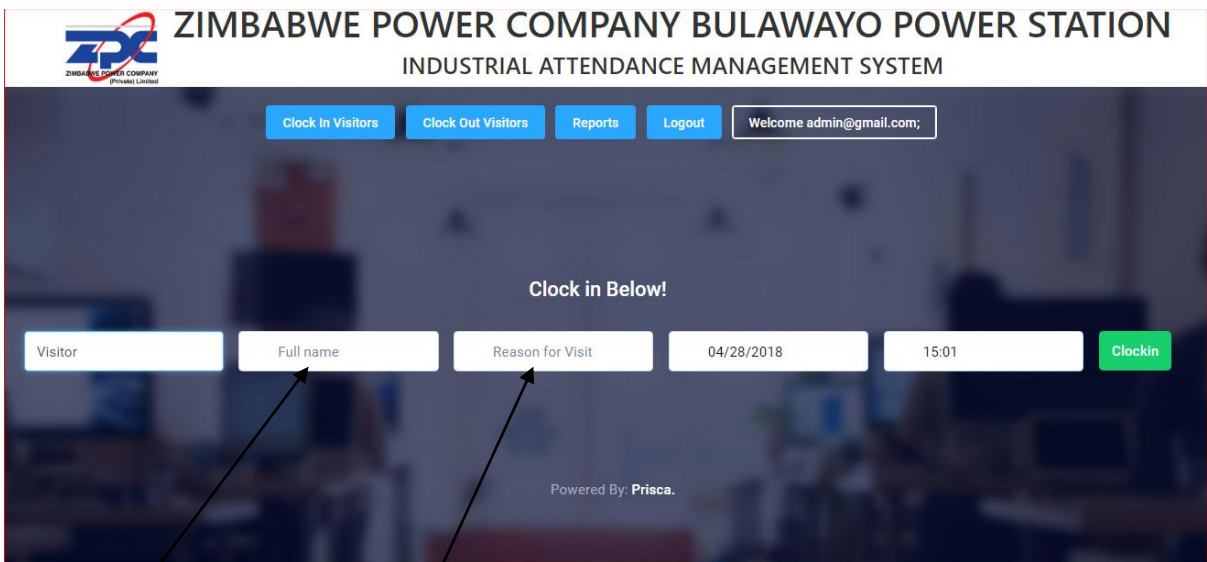
Login form

The login form is where the users and the administrator login in order to be able to access the services provided by the system.
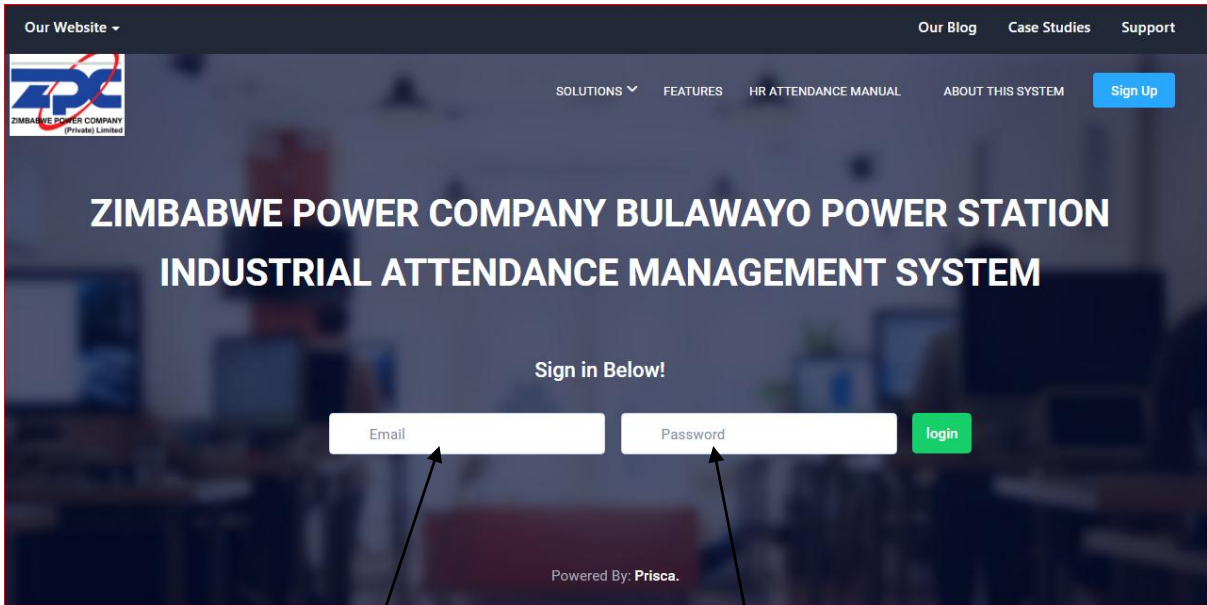
The arrows show were the user should enter their login details that is the email address and their password.

Clock in visitor

This form will be accessed by the user with administrator rights. The form is used to clock in a visitor.

When clocking in a visitor there is need to enter their full name and reason for visit were the arrows indicate. Date and time will be automatically indicated by the system as shown by the diagram below.

Clock out visitor

When the visitor wants to leave the station, the form below is used to indicate their time out at the work station.

The user with administrator rights then selects the visitor name and the date will be automatically indicated and clicks the clock out button.

Report form

The form is used to access a summary of employee attendance. It is accessed by the administrator when they want to view employees or visitors who entered the organisation.

The administrator is supposed to select the department they want to view.

Log out form

When the administrator wants to logout, they click the logout button which is indicated by the arrow below.
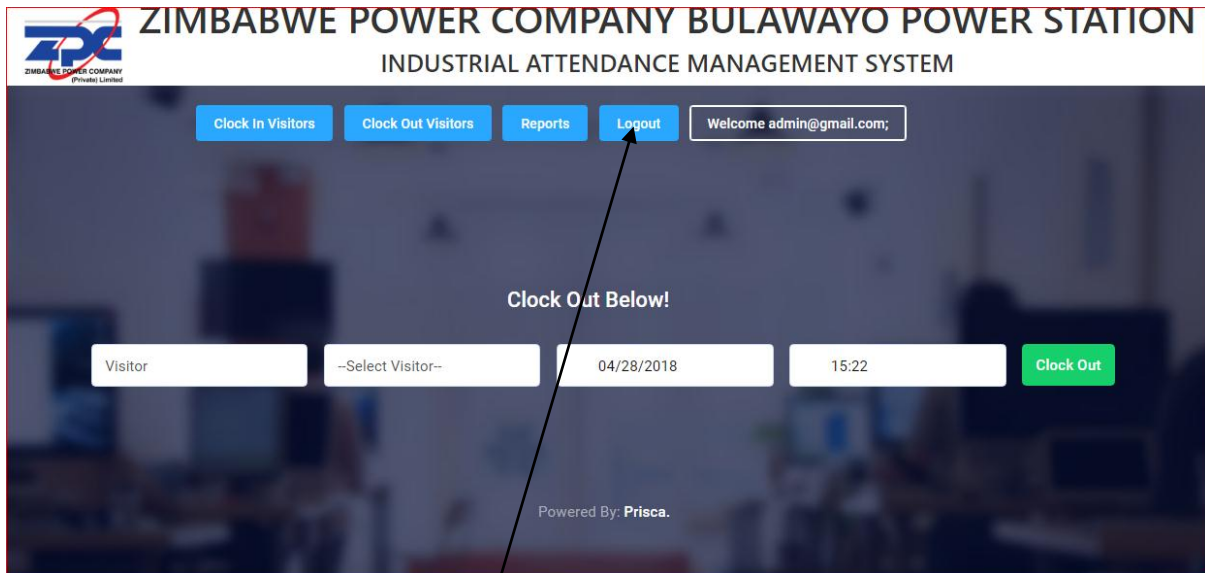
Logout button

Employee report form

On this form, any user can have access to it if they want to view their overtime hours and overtime amount. The user firstly must click on the report button then select the department name, date or period one wants to check reports on and the window below will then appear.
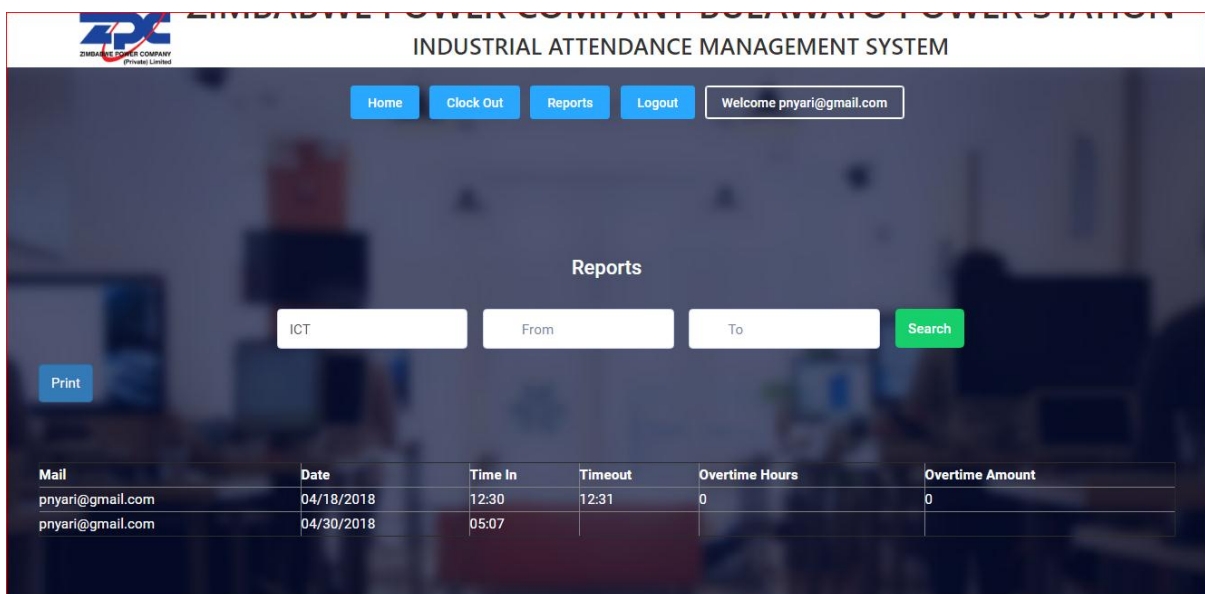
Clock out form

The form is used by users when they want to clock out from the work place. The user clicks the clock out button and then confirms the clock out time and clicks the clock out button.

Appendix B: Interview checklist

Interview questions

1. How do you record the clock in and clock out time of the employees?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   ……………………
2. What type of system do you use to maintain employee attendance records?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   …………
3. How do you monitor activities around your organisation?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   ………………
4. What procedures do your employees follow when clocking in to the organisation?
   …………………………………………………………………………………………………
   …………………………………………………………………………
5. How do you deal with identifying records that are not yet processed for overtime hours and the amount?
   …………………………………………………………………………………………………
   ………………………………………………………………
6. Do you have a way of being able to track records that have been made in order to prepare reports?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
7. Do you think the current system if effective?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   ………
8. Do you have journals in your library? How do the members/users access them?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   ……………………
9. Roughly, how many employees or an average of them who usually record their attendance?
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   …………………………………………………………………………………………………
   ……………………………

Name of interviewer ……………………………………………………………………….

Name of company   ………………………………………………………………………..

Appendix C: Questionnaire checklist

Questionnaires

1. Do you have a system to record the attendance of employees?

   YES [ ]   NO [ ]

2. Are you planning on changing the current system?

   YES [ ]   NO [ ]

3. Does the system you are using motivate you as employees?

   YES [ ]   NO [ ]

4. What method do you use to maintain records?

   MANUAL [ ]   COMPUTERIZED [ ]

5. Are the employees able to view their overtime hours and amount?

   YES [ ]   NO [ ]

6. How do you record new employees?

   MANUALLY [ ]   COMPUTERISED [ ]

7. Do you find the system effective?

   YES [ ]   NO [ ]

8. Do you feel that a computerized industrial attendance management system would be of use to this organization?

   YES [ ]   NO [ ]

9. How would you rate your current management system?

EXCEELENT [ ]   GOOD [ ]   SATISFACTORY [ ]   NEEDS IMPROVING [ ]

Name of interviewer ………………………………………………………………..

Name of company ……………………………………………………………………

Appendix D: Observation score sheet

Observation guideline

1) Brief explanation on the current system?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………

2) Weaknesses of the current system?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
…………………………………………………

3) Strengths of the current attendance system?

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

4) Areas that need to be improved on the current attendnace system?

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

Name of observer ……………………………………………………………………

Name of company ……………………………………………………………………..

Appendix E: Snippet of code

Code for logging in

```php
<?php
error_reporting(0);
?>
<?php
include 'opendb.php';
 $fname = mysql_real_escape_string($_POST["fname"]);
 $lname = mysql_real_escape_string($_POST["lname"]);
 $dpt= ($_POST["dpt"]);
  $desgination= ($_POST["desgination"]);
 $mail = ($_POST["mail"]);
 $password = mysql_real_escape_string($_POST["password"]);
 $cpassword = mysql_real_escape_string($_POST["cpassword"]);
 mysql_select_db('zpc',mysql_connect('localhost','root',''))or die(mysql_error());
javascript:history.go(-1)
$query ="INSERT INTO
users(`access`,`fname`,`lname`,`mail`, `desgination`, `password`, `department`)
VALUES ('Employee','$fname','$lname', '$mail','$desgination','$password', '$dpt')";
 $row1="mysql_num_rows($query)";
mysql_num_rows($queryf);
echo("<SCRIPT LANGUAGE='JavaScript'> window.alert('User Already Exist, Try Again
with a diffrent name'
}
// Import PHPMailer classes into the global namespace
// These must be at the top of your script, not inside a function
 mysql_query($query)or die(mysql_error());
 if(mysql_affected_rows()>=1)
 {
echo "<script>alert('Successfully registered')</script>";
echo "<script>location.href='index.php'</script>";
 }
 else{
```

```php
echo "<script>alert('User not successfully added')</script>";
echo "<script>location.href='index.php'</script>";
}
?>
```