ASSET MANAGEMENT AND FAULTS RECTIFYING SYSTEM

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By

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ABSTRACT

The purpose of this project, the Zimbabwe Electricity Transmission and Distribution Company (ZETDC) Assets management and faults rectifying system was based on the provision of an in-depth and detailed records of newly acquired assets and faults reports. Assets acquired are maintained and monitored by the system. Automatically the system schedules attention on assets that needs maintenance and those that require to be disposed. Faults rectification process was instigated as a result of detailed work arising information from users that is the employees. The Information Technology (I.T) department that consist of the systems administrator and the technicians, is responsible for using the system and they keep a constant checkout on the system for assets and faults management purposes. A range of software tools were proposed in developing the new system and interfaces were modelled and designed using CS8 Dreamweaver. The database implemented using the MySQL. The data collection method used included the observations, interviews as well as the questionnaires. These data collection methods helped in coming out with a valid research and supported the notion that advocated for the development of a new system that endeavored to address the perceived gap between the desired state and the existing state. In pursuit of the above, the documentation of the research project discussed five detailed chapters namely the introduction phase, planning phase, analysis phase, design phase and implementation phase. Apart from the listed the proposed system was user friendly and able to meet the non-functional requirements of the system. An ongoing maintenance would be useful throughout the course operation of the system.

DECLARATION

I, **GODFREY.T.MUZANENHAMO (R142576Q),** 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 **"Assets management and faults rectifying system"** by **Godfrey. T. Muzanenhamo** meets the regulations governing the award of the degree of **BSc Honours Information Systems** of the **Midlands State University,** and is approved for its contribution to knowledge and literary presentation.

Supervisor's Signature: …….

Date: ……..

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I foremost give praise to the Lord Jesus, for it is by his grace for me to reach this far.

Special thanks dedicated to my supervisor Mrs. T.G Zhou who initiated the direction and support through the course period of my project research. I acknowledge and appreciate that through her support I managed to deliver the best in my project and reach this far end.

More love to my family who kept on encouraging me and believed that in any way I will make it through to the end.

Lastly thanks to Mr Murinye the Systems Administrator who approved my research letter and helped me through with every relevant information that I needed to complete my project.

DEDICATION

Mostly I dedicate all the best to my family who is so loving and caring.

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LIST OF ACRONYMS

CEO.....Chief executive officer.

DBMS……..Database Management System.

ESI……Electricity Supply Industry.

HTTP……....Hypertext Transfer Protocol.

IT……..Information Technology.

NPV.....Net Present Value.

PHP……..Php Hypertext Processor

PTC…….....PowerTel Communications.

REA…….Rural Electrification.

ROI……...Return on investment.

SQL…….....Structured query language.

ZESA…….....Zimbabwe Electricity Supply Authority.

ZEDC……....Zimbabwe Electricity Distribution Company

ZETDC…….Zimbabwe Electricity Transmission and Distribution Company.

ZENT…….....Zesa Enterprise.

ZERC…….....Zimbabwe Electricity Regulatory Commission.

ZPC…….....Zimbabwe Power Company.

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CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

The Zimbabwe Electricity Transmission and Distribution Company Assets management and faults rectifying system is an electronic system that provides an in-depth and detailed records of newly acquired assets and faults reports. Assets acquired are maintained and monitored by the system, automatically the system schedules attention on assets that needs maintenance and those that require to be disposed. Faults rectification process is instigated as a result of detailed work arising information from users that is the employees. The I.T department are the ones responsible for using the system and they will keep a constant checkout on the system for assets and faults management purposes. Several instruments and gathering methodologies will be proposed.

1.2 BACKGROUND OF THE STUDY

The emergence of a global economy, digital firms and business enterprises shifted the industrial economies resulting in the transformational effects of new general purpose technologies in the field of information and communication. Such development in today's business has enhanced numerous digital ways of operating businesses. Likewise, companies are entrusted by the situation to coherently pursue innovative systems that promote efficiency and effectiveness in the way of doing business.

1.2.1 BACKGROUND OF THE ORGANISATION

ZESA Holdings is the parent body of the ZETDC (Zimbabwe Electricity and Distribution Company) company which initiated the ideal of transmitting and distributing electricity from power stations and retailing it to the end-users. Its commencement was established after the collaboration of councils to form a board ZESA Holdings. The Electricity Power generation was introduced back date in 1897 in the city of Kings (Bulawayo) and further distributed to Harare (Salisbury) in 1994. The outstanding demand in power by industries and an increase in demand by domestic consumption forced in the construction of numerous power stations in several cities

namely, Mutare, Gweru, Hwange and Harare. By then, since there was no regulation in respect to pricing, each city was liable for its own tariffs. This steered up to the union of councils to form Electricity Supply Industry (E.S. I) in 1936.In the course of that time electricity was controlled by three bodies namely CAPCO, E.S.C and Councils. A proposal of amalgamation was then reached and approved as a solution to standardize the pricing structure in 1983, so that electricity will be controlled by a single entity. This led to the passing of electricity act in 1985 and as a result the birth of Z.E.S.A

Subsequently structural changes evolve in the E.S.I (Electricity Supply Industry) following regular procession implementation of the Novel Electricity Deed Chapter [13:19] as a result of the formation of Z.E.S.A. The **1st phase** of the reform process saw the unbundling of formerly ZESA, operating now as a Holding company with the subsequent subsidiaries on commercial lines;

- Z.E.T.D.C (Zimbabwe Electricity Transmission and Distribution Company).
- Z.P.C known as the Zimbabwe Power Company.
- P.T.C known as the PowerTel Communications.
- Z.E.N.T known as the Zesa Enterprise.

The Rural Electrification Fund Deed, conceded in Jan (2002) embed the formation of the separate Rural Electrification Fund, a Board and Agency. The Agency oversee the distinctive fund molded under the Fund Deed in-order to finance the rural electrification schemes. The Board is held responsible towards the Ministry of Energy and Power Development. The interchange was made towards the restructuring of electricity sectors from vastly outsized cohesive entities to reduced more focused units. In this regard, the government inaugurated power sector reforms with the subsequent objectives:

- To fascinate investors and guarantee proficient and bearable performance privatization at generation level and commercialization of other successor companies were to be done.

- To guarantee convenience, availability and adequacy of electrical energy as a major contributor to sustainable economic growth and enhancement in the eminence of life for all.

- Inaugurating a high degree of competitiveness in unbundled structure by unbundling the electricity sector from vertically integrated structure into separate business units
- To certify that customer and investor interests are balanced within a framework of government policy by establishing the Zimbabwe Electricity Regulatory commission (ZERC).

The **2nd phase** was situated in June 2006 at the time the Cabinet fused the set-ups of the Z.E.T.C.O and Z.E.D.C into operations of a solitary body named the Z.E.T.D.C (Zimbabwe Electricity Transmission and Distribution Company).

1.2.2 ORGANISATIONAL STRUCTURE

The organizational structure is defined as a graphical representation that depicts the formal relationship within the organization (Pettinga, 2014). The subsequent relationships are shown which include: decentralization of decision making, chain and lines of communication, span of control and delegation of authority. The structure seeks to eradicate the potential of conflict amongst the workforces with due respect to the area of responsibility, demarcation of authority and accountability. The **Fig 1.1** below shows the structure of ZESA Holdings and also its relationship with Z.E.R.C and Rural Electrification Fund Agency (R.E.A), as well as the parent Ministry.

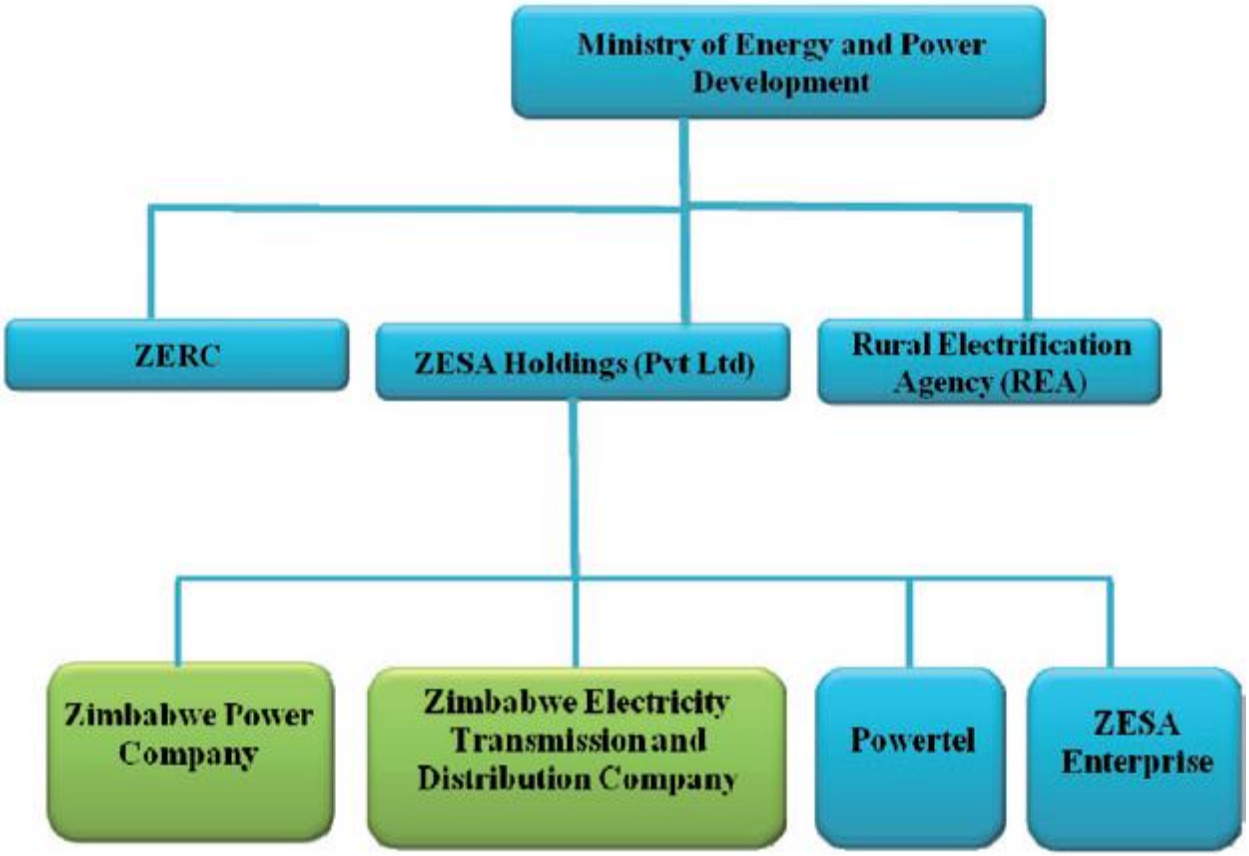


Fig 1.1: ZESA Holdings Structure

The above chart is the structure of ZESA Holdings which is the parent body of the organization ZETDC. ZETDC is derived from, and a subsidiary of ZESA holdings. ZETDC board of directors comprises of the Chairperson, Non-Executive Directors, 1 Executive and 3 Ex-officio. Below **Fig 1.2** is the structure of ZETDC.

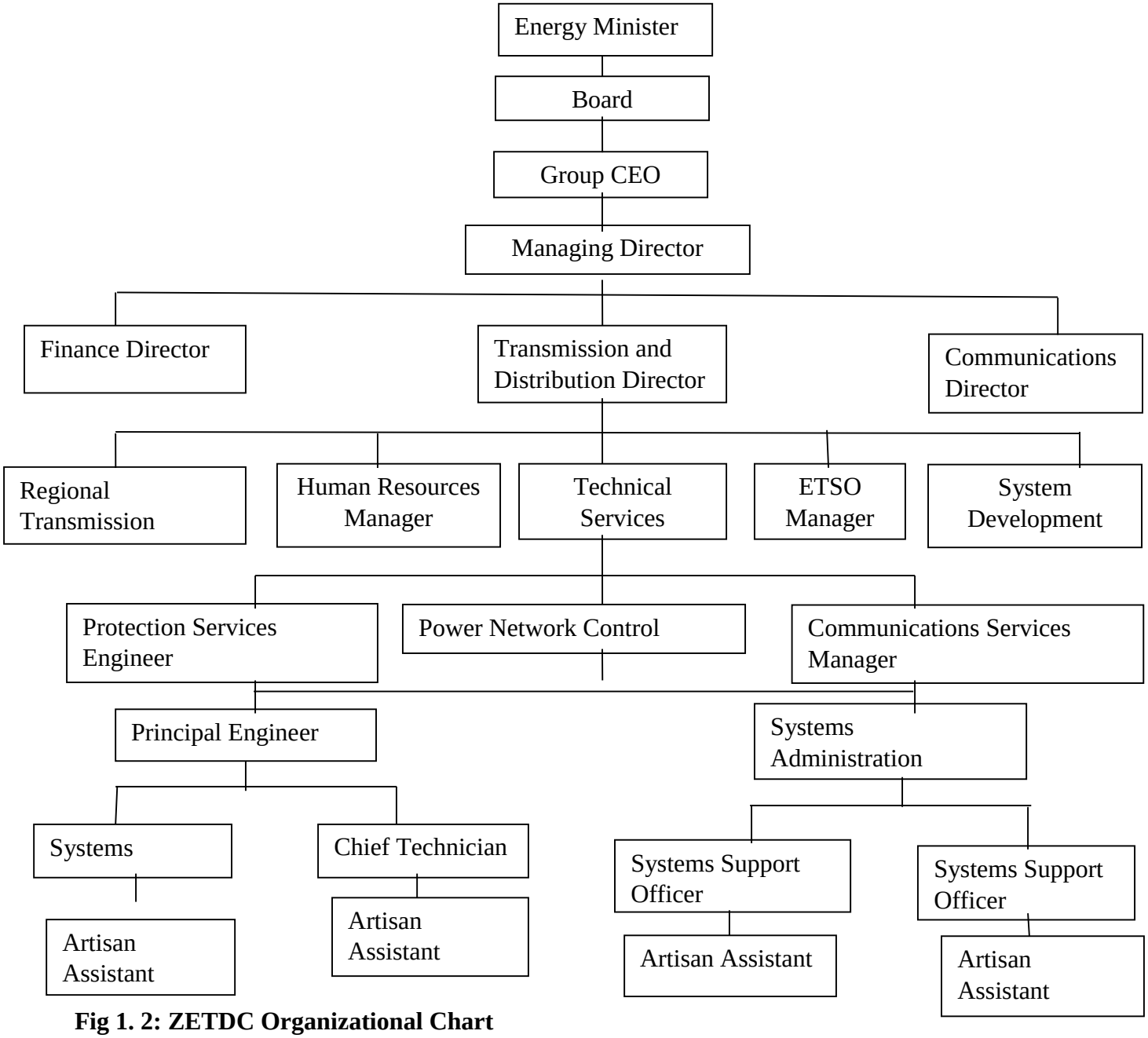


Fig 1. 2: ZETDC Organizational Chart

1.2.3 VISION

Bringing expediency to our esteemed consumers through the endowment of ample, safe and reliable electricity and other correlated services at modest prices.

1.2.4 MISSION STATEMENT

To lead as the preferred provider of electricity county-wide and other related services globally.

1.2.5 CORE VALUES

The core values consist of the subsequent:

- Integrity
- Teamwork
- Customer focus
- Social responsibility

1.3 PROBLEM DEFINITION

Assets management challenges, for instance some assets are not well known in the organisation or no proper list of them is kept. This affects the overall strategy plan on how to maintain and monitor the assets the organisation have at hand. The work is based on a guess work.

Inconsistent decision-making and issues resolution. Over or under maintenance of assets is anticipated. Much is spent on over maintained assets and little on under maintained assets. This costs much to the organisation as they give rise to inconsistence in decision making.

No formality is maintained when documenting assets. Anyone can be in danger if some documents are missing. Managers spend at-least 4 weeks on average annually probing for or waiting on misfiled, un-tracked or mislaid info.

Searching and retrieving of assets records is time consuming. IT technicians can lose up-to two hours on non-adding activities a day searching for mislaid paperwork. At-most ninety percent (90%) of records are never referred to once filed.

Lacks active policies or procedures for systematically controlling of recorded info. As a result, some records are retained for too long, much spend on storing them and lost much time looking for misplaced info. Faults reports left hanging whilst attending another over the phone.

1.4 AIM

The chief purpose of the proposed system is to develop the Assets management and Fault rectifying system which monitors and maintains an in-depth and detailed record of newly acquired assets and gives users' access to report on faults issues.

1.5 OBJECTIVES

1. Monitoring, maintaining assets record by adding newly acquired assets by name, value, serial number and acquisition date.
2. Calculating the current book value of assets over their depreciating period for the purpose of disposing it. As well as monitoring the life span of assets by displaying automatic alert messages and searching assets according to periods.
3. Displaying automatic alerts messages on assets ready for disposal in-order to transform maintenance and operational performance and enabling file sharing on assets and faults reports.
4. Facilitating fault reporting by users via web real time communication.
5. Assign and monitor fault teams to specific locations.
6. Tracking login trails of users.
7. Generating asset and fault reports.

1.6 METHODS AND INSTRUMENTS

The subsequent data collection methodologies and instruments are to be used in coming up with the proposed system.

1.6.1 DATA COLLECTION METHODS

OBSERVATION. A comment based on something the researcher has seen or noticed is referred to as observation. This encompasses the assembling of data either by inspected behavior or noting down the physical attributes in their natural setting (Pawar, 2013). Observation where carried out in overt which ratifies observing the system during its operation and anticipated outcomes where noted. The Employees physical behavior in their natural settings where obtained. The ways in which they conduct operations in a day to day rather than the speculated ways they claim they do.

INTERVIEW. A formal meeting instigated by the researcher for special purpose of attaining crucial info labelled by the research study intents of depiction and clarification is known as interview (Pawar, 2013). The information pertaining to the organization where obtained through face to face interviews. In-depth findings were conceived. For instance, the abstraction of comprehensive info about the methods they use in recording assets, retrieving assets records, schedule maintenance, dispose old assets to cater for the new-ones, how fault reports by employees are generated, how IT personnel are assigned for fault rectifying.

QUESTIONNAIRE. It is regarded as a form containing a list of structured questions aimed to gather information from the respondents (Pawar, 2013). Open-ended and closed-ended questions where submitted to the respondents for them to give their feedback. Factual information obtained without fear or favor due to the limit of answering posed by the examiner for the respondent to reason or explain their own views.

1.6.2 INSTRUMENTS

MySQL is regarded as the open source relational DBMS grounded on SQ language (Dubois, 2013). In-order to access, retrieve, and process data deposited, a DBMS is required. MySQL offers a distinctive storing engine framework that is possible in assisting the systems administrator and I.T Personal (Technicians) to configure the MySQL database server in order to ensure a sound performance. MySQL is regarded to be the better engine intended to be useful for most challenging applications while safeguarding optimal speed.

CS8 DREAMWEAVER is a proprietary web development tool that supports CSS, java script and various server side scripting language Mcfarland (2013). This web development tool supports the MySQL database and is capable of operating on diverse platforms. The combination of the MySQL and CS8 is pleasingly zippy in the system performance execution.

XXAMP is an apache web server designed for testing and deployment purposes. Web Server is necessary to process request via the HTTP on the World Wide Web for business operations.

1.7 JUSTIFICATION AND RATIONALE

Business processes are improved through faster access to and retrieval of information. In this regard the system ought to be built as a result of the well-managed, reliable and accessible digital information brought by the system as a valuable resource to staff over time. Better control over records are obtained and the following are the resulting benefits to be encountered upon using the proposed system: Able to locate, retrieve and respond quickly to information in a fraction of the time required for paper documents; Documents can be saved once and shared easily, facilitating and encouraging new approaches to work that is automatic scheduling of assets for maintenance purposes and those ready for disposal; Reinventing the wheel can be avoided that is easy access to past work that can be re-used to support current responsibilities; Reduced duplication of time and effort. By way of asset management, you save once and share many times. Enhances greater flexibility in where and when staff locate and cooperate on work-related documents.

Fault management is thus a critical part of the asset management. Quicker attendance to faults can be adhered to and monitored as well for feedback rather than having long waiting lists of queries by employees. Improved service delivery and once a fault is reported, action is taken instantaneously. Reduced information silos as I.T is able to interact with other functional department for services delivery.

Assured continuing information access is vital to constant perfection of services, outputs and operational effectiveness. Maintenance updates can be scheduled in-advance to reduce too many fault reports on related issues. Over and under maintained costs minimized. Better asset management works to reduce fault tolerant. Better-informed decision-making enhanced by the system helping the staff make the right kind of decisions at the right time. Better control over records supports a corporate memory and aids staff apprehend former decisions, activities and processes.

1.8 CONCLUSION

Conclusively the project unveiled the possibilities on how records kept by the Assets management system are central to the effort of all controlled entities. The currently problems faced by the manual system where noted and objective set in-line with problem definition. Gathering methodologies notified as they helped identify major current problems and generated any idea of carrying out the study with given solutions arising from the problems stated. Justification made on how the system will benefit the organisation.

CHAPTER TWO: PLANNING PHASE

2.1 INTRODUCTION

The planning phase is defined as a scheme of arrangement that focuses on developing and selecting the best alternative plans in decision making process. It is considered to be the major procedural aspect or a framework for management review and control. The phase proposes the following processes into consideration, time management review, costs management, scope management review, risk management analysis, resources required for project completion and commitments. This chapter will cover all areas of feasibility which will include the technical feasibility, economic feasibility, social feasibility as well as the operational feasibility and the potential risks that are likely to affect the project planning and the several ways to address them.

2.2 BUSINESS VALUE OF THE PROPOSED SYSTEM

Schwartz (2016) described business value as the standard measure that provides numerous practices concerning values that briefly define the health and wellbeing of the corporate over a long trend. In simple term it is referred to as a standard measure of value used in business valuation. Business value lies in hand with stakeholder analysis, which is further carried out to understand the following question that lies; for whom the proposed system value determined. Stakeholders are people who are affected by or capable to effect the behavior of the organization. The system is termed to support internal stakeholders operating within the organization, these stakeholders include the employees, managers as well as I.T personals. The business value drivers that the proposed system will seek to enrich as a way of improving operations within the organization include the following; free staff (I.T personal and the management) interval time for core tasks rather than waste resources time on activities associated with paper records, reduced registry activities directed to paper files, improved work flow processes as a result of automatic updates scheduled for preventive maintenance and monitoring on how any asset can the replaced before its intended company life span through automatic updates. Facilitating file sharing and respond to reported faults quickly. Below are some of the stakeholders to whom the proposed system value is determined.

SHAREHOLDER VALUE –These are values delivered by the company to the shareholders. Shareholders relishes those values by retaining the shares of the company. The value drivers that the proposed system will seek to enrich include the following: Making strategic decisions by the management that maximizes expected value even at the expense of lowering near term earnings. Freeing staff time for core tasks as a way of improved operations by the system. By so doing that, it is of prime importance to increase the shareholders' value. Management ought to bear in mind the interests of shareholders while making decisions.

EMPLOYEE KNOWLEDGE- Imparting a culture of learning to employees at all levels of an organization will help them to constantly seek, part, spread over new knowledge and skills in order to advance their individual performance at the benefit of the organization. Through engagement and participation in corporate learning employee knowledge can be built. The knowledge to be imparted include trainings on how to use the new system applications and how business assets can be maintained and monitored internally simply by just a click to the system and constant checkout. Such engagement can also benefit the organization in such that, the deployment of the new system will not be a hard nut to crack for them since they are already imparted with knowledge on how to participate in I.T related works. Less training will be conducted as they are already equipped with skills driven through participation at all different levels of the organization.

MANAGERIAL VALUE- The newly proposed system will aid in the management by reducing the uncertainty in order to foster effectiveness in decision making. The scheduling of dates on preventive maintenance will automatically be done by the system, this reduces the management fixing dates in order to foster maintenance. Quick track of assets reports that minimizes time wastage. In business operations time is a valuable resource that need to be handled with care. Reports on assets that require attention can be obtained, that is those reports on assets that need to be disposed and the depreciation value of the asset will be calculated automatically by the system. All these reduces management work overload and aid in fostering quality management decisions.

SOCIETAL VALUE- These are values obtained as a result of the surrounding community. The motivational expression shown forth by the employees can result in improved organization's productivity and better service generation. The society will benefit in terms network availability when procuring electricity. ZETDC is a supporting structure to the Engineering company therefore any quality of service delivered within the I.T department will benefit the organization as a whole in bringing expediency to our esteemed societal consumers through the endowment of ample, safe and reliable electricity and other correlated services at the modest prices. Once the organization benefits from employee morale the community will also benefits and employee carrier prospects within the organization can be increased.

2.3 FEASIBILITY STUDY

Feasibility study involves assessing the different variables involved in developing the proposed system and their acceptance (Rumane, 2013). The study seeks to evaluate the associated strength and weaknesses of the proposed system and show forth required directions of activities needed to improve the project and achieve desired results (Munsaka, 2013). The primary goal of the feasibility study depends much on the areas in which the analyzed project is implemented. The study consists of the following; evaluation of the technological and system capabilities, evaluation of operational requirements, evaluation of economic capabilities and social requirements.

2.3.1 TECHNICAL FEASIBILITY

Technical feasibility study is referred to as the examination of the readiness of resources and technology (Kendall and Kendall, 2013). This include evaluating whether the obligatory technology is readily accessible or not, whether the prerequisite resources (programmers, testers and debuggers, software and hardware.) are available. In other words, the study seeks to evaluate whether the system proposed is competent enough to be undertaken or assesses if the corporate has the capability to advance the new system. Given the existing technology, the study can assess whether the diffusion of innovation can be able to interact with the existing technology. This describes the degree of the expediency of a definite technical clarification and the convenience of technical resources and expertise.

2.3.1.1 TECHNICAL EXPERTISE

The ability to perform a specific professional task with skill of an acceptable quality is referred to as technical expertise (Kendall and Kendall, 2013). The relevance of technical expertise is known through facilitating support technically to the dedicated team players and engaging several policies of the business, outlining and cooperating coding standards and supervising technical problems. The ZETDC Company is in-fluxed with professional holders of different skills which are able to deliver the following; cultivating several technical programs and provision to the dedicated team and proposing resolutions and implement them in the real context. The dedicated side players use PHP as their programming language hence assisting in the project completion can be deemed so easy. This can restrict the need to hire computer programmers or analyst since they core exists from within.

2.3.1.2 HARDWARE AND SOFTWARE REQUIREMENTS

Computer hardware is regarded as the physical peripheral elements of a computer that can be actually touched or seen for example a monitor. These elements are valuable in the advance of the anticipated system. Software is considered to be the application or program that guides all the processes of a computer. Table **2.1** below shows the elements required to develop the system.

Computer elements	**Qnty**	**Availability**	**Commentary**
Hardware requested			
HP color LaserJet Ent CP5525dn	4	Yes	Additional 4 LaserJet Ent CP5525 may be needed
HP ProOne 600 All in one	8	Yes	
Cisco 2900 series router	1	Yes	
PS2 KVM Console switch	4	No	Organization can procure extra PS2 KVM Console switch
HP envy 14 core7 laptop 8gb	10	No	transform into manageable laptops
Cat 6 Ethernet cables	-	No	Needed in bulk
Software requested			
MS office suite 2016	1	✓	
Windows Server	1	✓	

System Endpoint Protection	1	✓	
XAMPP	1	No	O.S Software
CS8 Dreamweaver	1	No	O.S Software
DB MySQL V5.1	1	No	O.S Software

Table 2.1: Hardware and Software Requirements

2.3.2 ECONOMIC FEASIBILITY

Economic feasibility is the study commonly used in determining the efficiency of the proposed new project. It can also be regarded as cost analysis. Profits against investment expected from the proposed new project are identified as well as the time and costs. Williams (2015) defines economic feasibility as the associated cost for a new project business. Further-on states that it is the study that involves assessing the data in order to regulate whether the new proposed system will ultimately be profitable to the business. The economic feasibility helps the business examine the costs or budget before embarking on a project. Such exercise enhances careful money management so that the business can insure that the most profitable project is undertaken. It also helps businesses endorse revisions on whether or not the project that at first seems unfeasible will make it feasible. Cost benefit analysis can be undertaken to further examine the costs.

2.3.2.1 BENEFITS

Any anticipated results in a given business situation embraced by the organization or profit gained is referred to as Benefits. Rumane (2013) categorizes benefits into two pairs that is tangible and non-tangible benefits.

2.3.2.2 TANGIBLE BENEFITS

Tangible benefits are those benefits that the organization considers to be of utmost importance since they are presumed to be devoured under assured conditions (Williams, 2015). The enjoyment of these benefits is achieved progressively later in the deployment of the novel system and are expressed in financial positions. Tangible costs consist of the following costs; Travelling costs which involve (employee wages, truck serving and fuel consumption), costs of paper work often used and costs relating to errors (wrong balancing of accounts). Such costs are minimized as a

result of the introduction of the proposed new system, ZETDC will minimize those costs through channeling information via emails thereby solving problems on reported faults remotely. A drop off in costs associated with travelling is minimized to $US 14000.Costs on faulting assets can be minimized as a result of the introduction of automatic alert messages scheduled on maintenance. Assets are being monitored and maintained, avoiding future accidents. Below is the tangible benefits table.

Specifics	**Costs attained past system employment**	**Projected costs after the launch of the system**
Drop-off costs in travelling	**$**US25 000	**$**US14 000
Drop-off costs in paperwork	**$**US6 500	**$**US5 000
Drop-off costs in physical filing	**$**US6 000	**$**US5 000
Costs minimization relating to errors	**$**US4 200	**$**US3 800
Overall Total	**$US41 700**	**$US27 800**

Table 2.2: Tangible benefits

2.3.2.3 INTANGIBLE BENEFITS

Intangible benefits are those benefits that cannot be stated in financial position of a listed financial accounts although they raise business values (Williams, 2015). Such costs consist of overall perceptions and outlooks regarding the business. The business can relinquish large economies of scale either in the long or short run. The ZETDC Company can presume the subsequent benefits as a result of new system deployment:

- Able to locate, retrieve and respond quickly to info in a short section of time needed for paper leaflets and faults attendance.
- Documents can be saved once and shared easily, facilitating and encouraging novel methods to work.

- Reinventing the wheel can be avoided that is easy access to past work that can be re-used to support current responsibilities.
- Lessen duplicates efforts and time. By way of the new system, you save just the once and share countless times. Enhances flexibility when staff locate and cooperate on work-related documents. Employee moral enhanced and improved workflow processes.
- Improved service delivery and once a fault is reported, action is taken instantaneously. Reduced information silos as I.T is able to interact with other functional department for services delivery. Assured continuing access of info is vital to constant perfection of services and operational efficaciousness.

2.3.2.4 COST OF DEVELOPING THE SYSTEM

These costs are obtained during the course of the development phases of the novel system (Mahmood, 2017). Such costs are referred to as development costs, they are catered for during the deployment phases of the system. **Table 2.3** below shows development costs. ZETDC will order any additional Hardware components that will be used in different department to facilitate enhanced work processes. The online store fronts and e-Bays offers the following at their best affordable costs, HP All in one (core i7) cost $US1000, HP LaserJet All in one printer cost per each varies from $US 350 - 750, CISCO Switches are shortlisted for $4000 and CISCO routers costs $US 500 and Ethernet cables cat 6 costs ranges according to the number of meters needed. The ZETDC I.T is a supporting structure to the ZETDC Company henceforth to promote excellent performance and network reliability the for-mentioned is needed in their vast. Ethernet cables promotes the distribution of frequent communication between switches, routers and machines.

Items	**Quantity**	**Price $US**
Hardware requested		
HP color LaserJet Ent CP5525dn	4	1200
PS2 KVM Console switch	4	4000
HP envy 14 core7 laptop 8gb	10	8000
Cat 6 Ethernet cables	-	300
Software requested		
Xampp	1	Free

CS8 Dreamweaver	1	Free
DB My SQL V5.1	1	Free
Overall Total		$US13 500

Table 2.3: Developing costs

2.3.2.5 OPERATIONAL COSTS

The costs that are incurred on a daily basis or that involves the day-to-day running of the corporate are stated to be Operational Costs (Boussabaine, 2013). They are recorded every so often by the business. Operational costs are divided into two partition namely direct and indirect. **Table 2.4** shows operational costs that are needed in developing the system.

Item	**Costs $US**
Computer consumables	900
System maintenance costs	7000
Installation of the system	280
Server upgrade	1500
Updating of software	500
Overall Total	**$US10 180**

Table 2.4: Operational costs

2.3.2.6 COST BENEFIT ANALYSIS

Cost benefit analysis is referred to as those costs that are taken into consideration when evaluating the in-depth prospective gains and risk of the anticipated project (Kendall and Kendall, 2013). Various factors are examined in order to project the anticipated project. Cost analysis is regarded as the major aspect in the study of feasibility. They assist the company ZETDC to further examine that the new proposed system will it be able to offer more benefits than those costs associated in developing the system. A conclusion is drawn up after assessing and summing up the equivalent costs values and benefits. The sum of operational and developmental costs is deducted from the overall benefits. The following **Table 2.5** is a cost benefit analysis weighing up decisions.

Costs	**2017**	**2018**	**2019**
Total developing costs	13 500	-	-
Total operational costs	10 180	15 000	15 100
Total Costs	**23 680**	**15 000**	**15 100**
Benefits			
Tangible	27 800	25 000	26 100
Overall Benefits	**27 800**	**25 000**	**26 100**
Profit	**4120**	**10 000**	**11 000**

Table 2.5: Cost Benefit Analysis

2.3.2.7 INVESTMENT TECHNIQUES

Investment techniques are capital expenditure tools used to evaluate the cash inflows and outflows of a given project given a stated specified time (Drury, 2013). The three capital appraisal tools will be used in assessing the project. These techniques include the following stated below.

2.3.2.7.1 RETURN ON INVESTMENT

The R.O. I technique is used to measure the project success (Laudon and Laudon, 2016). The syntax of the R.O.I is measured in percentage.

$$R.O.I = \frac{\text{Total Benefits} - \text{Total Costs}}{\text{Total Costs}} * 100$$

Year 2017 = Total Benefits 27 800

Less Total Costs 23 680

Profit 4 120 / Total Costs = 17.40%

Year 2018 = Total Benefits 25 000

Less Total Costs 15 000

Profit 10 000 / Total Costs = 66.67%

Year 2019 = Total Benefits 26 100

Less Total Costs 15 100

Profit 11 000 / Total Costs = 72.85%

The ROI technique which measures the project success, generated profits between the year 2018 and 2019 showing the highest level of satisfactory. As a result, the project is considered to be viable.

2.3.2.7.2 THE PAYBBACK PERIOD

The payback period is the capital expenditure technique used to generate adequate cash inflow in a set time interval in order to restitute for itself (Baker and English, 2013). The period of payback is articulated in years.

Years	**Annual Cash flow $**	**Cumulative $**
0	**(53 780)**	**(53 780)**
1	27 800	(25 980)
2	25 000	(980)
3	26 100	25 120

Table 2.6: Payback period

The outcome payback generated lies between the period of 2 years and 4days and is considered to be less risk since cash inflow are recouped within a period of 2years with higher cash inflow in the year 1. Henceforth the project seems viable to be undertaken.

2.3.2.7.3 NET PRESENT VALUE

The NPV is a discounting factor method that considers the time value of money and is applied in order to assess the value of money throughout the course of the project periods (Baker and English, 2013). The NPV sums the net cash receipts and subtracts them from the initial outlay of the project.

Year	**Annual Cash flows $**	**Discounting rate @ 10%**	**Cumulative $**
0	**(53 780)**	**1**	**(53 780)**
1	27 800	0.909	25 270.2
2	25 000	0.826	20 650
3	26 100	0.751	19601.1

Net Profit			**11 741.3**

Table 2.7: The NPV

Assuming a decrease in investment value of 10%, the investment is still profitable and worth to be passed onwards.

2.3.3 SOCIAL FEASIBILITY

Social feasibility is the feasibility study that measures the social aspect brought about by the new proposed system in relation to the organization as a whole (Rosenblatt,2013). The study gives much emphasis on identifying ways in which the system has effects in the organization. For instance, answering questions like in what way will the employee prospects be advanced, performance and operations simplicity. The study of feasibility is considered complete until all the aspects of feasibility is covered. Social feasibility aims at surpassing the following:

- Freeing staff interval time for primary aspects rather than waste resource time on activities associated with paper records.
- Reducing registry activity directed to paper files which include the creation, managing of physical files.
- Staff motivational since every candidate is able to communicate with the I.T department via email for any fault confronted.
- Reducing the need for corruption, used to cater only for the need of those with higher grades. Due to the introduction of the system updates for any assets acquired is recorded and monitored. The system will facilitate maintenance updates reports automatically on assets and those that need to be disposed.
- Added advantage in computer literacy to the employees as they will be able to play around with technology introduction.
- Improved work flow process, files are able to be shared using the system not querying the physical files.

The system is regarded social feasible once all the social aspect of the study is covered.

2.3.4 OPERATIONAL FEASIBILITY

Operational feasibility is the study of the feasibility that focuses on the proficiency and efficaciousness of the processes of the business (Rosenblatt, 2013). It checks the well-being of the newly proposed system against problem criteria, does the system respond to a given problem stated and offer solutions in relation to that stated problem. Operational feasibility will check the following aspects in response to the system. The Performance which is the main needed tool in processing operations within the organization. Directly weighed with objective in-order to improve the throughput and response time. Managers and I.T personnel time freed for primary aspects rather than waste resource time on activities associated with paper records. Records retrieved and shared in a time span of seconds. Information availability across all functional departments. Employees are the major candidate directed-to for fault reports and feedback by the I. T personnel. Basic questions concerning the information dissemination to various departments will be asked on whether the system offers timely, pertinent and accurate information. Control needed to facilitate high level of security that the system devours. Services tackles the issue of system flexibility and expandability, does the system offer reliable services to system users. Any interface for users to report on faults will be provided. The system will be user friendly to the users as well as management. The need for control, services, information as well as performance can prove the efficiency and effectiveness of the system.

2.4 RISK ANALYSIS

Risk analysis measures the degree in which how often certain events may occur and their effects given the existing information (Iverson, 2013). Qualitative and quantitative approaches to risk analysis can be used. According to Lam 2014 risk analysis involves notifying the stakeholders, candidates and others about arriving at risk management decisions. Strategic planning is often conducted to analyze risk in areas where critical events are likely to happen. For instance, the emerging of the global economy and business enterprises can pose effects on the evolving technology. Shedding light on programming languages where languages do often change. In some cases, projected deadlines for the project can be failed to be meet. Threats posed by viruses that modifies the computer programs. Employee's resistance to change. Some of the critical issues can be categorized as technical risk, process risk and programmatic risk.

2.4.1 TECHNICAL RISK

Technical risk include those risks associated in the hardware and technical failure (Lam, 2014). The root causes of technical risk can be a result of some numerous effects which include; the constant varying of requirements, for instance some of the programming languages changes very often and may lack the interconnectivity party for example PHP versus C#. Applications made by C# cannot be easily interconnected with those made by PHP. In this regard the system performance maybe affected; the unavailability of advanced technology, in this case some of the system functionality may not perform very well as a result of limited technology or the present technology is at the initial stages. Poorly defined parameters and excessive constraints in technology causes some of these technical risks to affect the project progression. Below are some of the ways used to address those risks.

2.4.2 PROCESS RISK

Process risk is described as the possibility of losses in relation to the business process (Iverson, 2013). Process risk is a type of operational risk due to the fact that most processes are conducted on a daily business routine (Jeynes, 2013). The likely process risk that are liable to affect the project progression include the following: lack of employee knowledge as a result of ignorance, not imparting a culture of learning to employees at all levels of an organization so that they can constantly seek, part, spread over new knowledge and skills in order to advance process performance at the benefit of the organization. The knowledge to be imparted include trainings on how to use the new system applications and how business assets can be maintained and monitored simply by just a click to the system and constant checkout; Risk of loss as a result of inappropriate process employment; Security incidents that disrupts processes for instance interconnectivity of I.T passwords. One can simply perform a task linking routes that do not correspond to their system platform unknowably; System breakdown as a result of viruses that modifies the computer programs; Lack of resource planning which may cause over and under maintenance of assets.

2.4.3 PROGRAMMATIC RISK

Programmatic risk are those risks outside the scope of our business operation limits (Iverson, 2013). They are exterior in their nature and rise beyond the business operational limits. These risks can take the form of: Shortage of funds, for instance over and under maintenance of assets causes imbalances; market growth, market development can give rise to new applications that will render the current or proposed application useless as a result of the evolving technology. Below are some of the ways used to address those risks

2.4.4 RISK PLANNING

Risk planning involves formulating the best strategies in order to compensate the associated mentioned risks. It is a management review on risk that involves consultation with other stakeholders in different functional departments. Some of the risks requires to be prioritized and worked out in conjunction.

AVOIDANCE STRATEGIES – This strategy is referred to as a pro-active strategy that seeks to avoid risk by notifying stakeholders on issues that are critical in posing risk in the development of the project. The avoidance strategy can use the pilot conversation method as a risk curbing strategy. Process risks such as lack of employee knowledge, inappropriate process employment can be avoided through employee engagement and participation in corporate learning as they engage trainings. This can reduce a lot of human errors. Programmatic risk in the form of shortage of funds can also be avoided through proper budgeting such that imbalances in over and under maintenance of assets is avoided.

CONTINGENT PLANS – Contingent plans are those plans that occurs in the future nevertheless their foreseen cannot be projected with certainty. Risks can be dealt with but never eluded. Conflicts that arises within the organization can be dealt with but cannot be avoided. Programmatic risk in the form of market growth can be dealt by simply having a group of programmers and I.T personnel that participate on embarking the evolving changes in technology world so that any change can be dealt with.

MINIMISATION STRATEGIES – Minimization is a risk planning strategy that aims at reducing risk as it happens. Considering viruses that embeds on programs, it can be reduced but never deleted. Both technical and process risk can be reduced by simply engaging minimization strategies.

In conclusion risk planning provides strategies that aims to curb the existing of risks.

2.5 STAKEHOLDERS ANALYSIS

Stakeholders are referred to as those people who are affected or are able to be influenced by the behavior of the organization (Kendall and Kendall, 2013). Stakeholders within the project comprises of the management, system users, programmers and the analyst and the government as well.

SYSTEM USERS – The project participation takes into consideration the system users as their key players in giving feedback concerning the system. System users comprises of the ZETDC staff members. They interact with the system across different functional departments. Any system failure might send unnecessary signals across all departments.

MANAGEMENT – These are people who have direct influence in the commitment of the project. All their effort is tailored towards the system development. Failure to corporate decisions can cause risk in the planning process. Such risk may involve failure to compile to projects deadlines as well as lack of commitment by the team players.

ANALYSTS AND PROGRAMMERS

Programmers and analysts are those stakeholders who are responsible in transforming computer specific characters into a common character sets. Programmers need to be innovative in such that any evolving technology should not be able to affect their project development. In other words, any failure by the programmers to meet evolving technology may cause risk of the project success.

EMPLOYEES – These are the line workers likely to effect the behavior of the organization. Employees can resist change and as a result causing risk.

2.6 WORK PLAN DEVELOPMENT

A work plan development is a scheduled detailed plan that incorporates strategic planning effort upon undertaking a particular project. Below **Table 2.8** shows a development work plan.

Phases	Commence date	Completion date	Duration period
Proposal	05-07-17	11-07-17	7
Planning	12-07-17	25-07-17	14
Analysis	26-07-17	08-08-17	14
Design	09-08-17	23-08-17	14
Implementation	24-11-17	06-11-17	14
Documentation	05-12-17	06-12-17	Event Phases
Maintenance	07-12-17	30-12-17	Ongoing

Table 2.8: development work plan

2.7 GANTT CHART

The Gantt chart is described as the demonstration of graphical presentations citing the interval of activities contrary to the project progression time and accomplishment (Rosenblatt, 2013). Each project stage is allotted a time span. Below shows **Fig 2.1.**

Phases(Week)	1	2	3	4	5	6	7	8	9	10	11	12
Proposal												
Planning												
Analysis												
Design												
Implementation												
Documentation												
Maintenance												Continuous Assessment

Fig 2.1: Gantt chart

2.8 CONCLUSION

Conclusively, study of feasibility underscored all the aspects of how feasible the project is, citing the social, economic, technical and operational feasibility. Each feasibility study clearly mentioned the viability of the project to be commenced. The capital expenditure techniques have also been used, measuring how successful the project can be against different alternatives. As a result, the outcomes proved the possibility of carrying on the project.

CHAPTER THREE: ANALYSIS PHASE

3.1 INTRODUCTION

The system analysis phase comprises of the comprehensive examination of the existing system. This implicates the identification of the current system operations. Major areas of concern to be covered in this chapter include the gathering methodologies, analysis of the existing system, evaluation of alternatives as well as the requirements analysis of the system. Gathering methodologies will specify the practices to be used in conveying necessary information. System analysis will constitute of the activity diagrams, dataflow diagrams describing the existing asset management and faults rectifying system.

3.2 INFORMATION GATHERING METHODOLOGIES

Information gathering methods are techniques that convey a procedural formation for regulating a given discipline finding. These are guidelines that contain information necessary to carry out a study about the existing system (Pawar, 2013). The researcher is imparted with as much in-depth information about the existing system, identifying all areas that may require immediate attention and notified on the strength and weaknesses posed by the existing system. How best the system can be improved and concluded best on the findings. The gathering tools that were used include: Interviews, observations and questionnaires. A determined argument will be clarified based on the noted methodologies.

3.2.1 OBSERVATION

A comment based on something the researcher has seen or noticed is referred to as observation. This encompasses the assembling of data either by inspected behavior or noting down the physical attributes in their natural setting (Pawar, 2013). Observation can be done either in covert or overt. Overt ratifies observing the system during its operation and covert include notifying the behavior of employees either in any concealed way or not. The observation where carried out and anticipated outcomes noted respectively. The routine behavior of employees noted during their day to day running of the business include the following activities: Filing of documents on physical files, reaction to information on reported faults, physical file sharing, formalities undertaken when keeping files. The activities specified earlier will be elucidated more in the additional segment of the documentation in the appendix D. Reliability and validity of the research where checked as a result of the intended observations doings. Observations works to check or measure the reliability,

validity of the study. Validity displays the precision of the research study. It merely assists in confirming the integrity of the research study by aiding emphasis on substantial matters and whether the findings are pertinent to be practical.

3.2.1.1 ADVANTAGES

- The research proves its validity by showing its compliance with the results obtained through overt and covert. Henceforth, the researcher was conceived with mere understanding whilst at the planning stage.
- The employees physical behavior in their natural settings where obtained. The ways in which they conduct operation in a day to day rather than the speculated ways they claim they do. The inspection of their natural behavior towards work helps examine how efficient and effective the business is in its operations. How do they respond to certain information and in what fraction of time?
- The research also enlightens more on identifying some of the hidden areas that where impossible to be noted without physical attendance.

3.2.1.2 DISADVANTAGE

- Some of the information where biased .The scheduled days for the observations were disturbed by some meetings and the busy working schedules on their plate which causes the researcher to obtain some inadequate information. In simple term the observation where susceptible to observer bias.

3.2.2 INTERVIEWS

A formal meeting instigated by the researcher for special purpose of attaining crucial info labelled by the research study intents of depiction and clarification is known as interview (Pawar, 2013). Interviews can take the form of telephone interviews, face to face interviews and so forth (Nayar and Stanley, 2014). The researcher obtained necessary information from the organization, to pursue the study through face to face interviews. Precise questions were asked in a formal way. The ZETDC IT personal department and the surrounding employees participated in the formal meeting conducted in-order for the researcher to gather essential information necessary to proceed with the project. Dedicated time for the interviews where set aligned with compensated working hours for each group participating in the interview. The interviews were conducted on the 15-16th of June at the ZETDC Company in kwekwe. It takes only two days to complete the interviews.

Some of the key areas covered during the interviews consist of: ways in which the IT department attend to faults reported, how assets are being recorded, how do they schedule their activities on a daily basis, how do they monitor assets once received. All of the merely identified info is clarified further in the additional segment of the documentation listed in appendix B. The researcher was imparted with an abstraction of exhaustive information.

3.2.2.1 ADVANTAGES

- In-depth findings were conceived that is to understand or give rise to a situation. For instance, the abstraction of comprehensive info about the methods they use in recording assets, retrieving assets records, schedule maintenance, dispose old assets to cater for the new-ones and how fault reports by employees are generated, how IT personnel are assigned for fault rectifying.
- Areas that were not fully covered by the questionnaire or by observing physical behavior were clarified through the use of interviews. This helped the researcher to have a broad knowledge on how the current system performs.
- Noting also the physical behavior of the respondent helped the researcher gathers information on how confident they are with the current system.

3.2.2.2 DISADVANTAGE

- Only a short time frame for the interviews were given and this adversely affected the researcher when a comprehensive information necessary to broaden the research was needed.

3.2.3 QUESTIONNAIRE

It is regarded as a form containing a list of structured questions aimed to gather information from the respondents (Pawar, 2013). Questionnaires can be either open-ended or closed-ended questions. Open-ended questions are those queries that gives the respondent a chance to prompt his/her views. Closed ended questions limit chances to the respondents to prompt his/her views, they are mostly termed 'YES' or 'NO' (Kendall and Kendall, 2013). The participants involved in the research study where given those questionnaires to fill-in. The questionnaires were distributed one per each employee. Information containing the reporting of faults and time taken to attend a problem constituted as part of some of the questions reviewed. Other requests are clarified in the additional division of the documentation listed in the appendix D. Questionnaires distribution enlightened the validity of the research as different answers where provided by different employees form different departments. Helped also to collect factual information concerning system performance and reliability.

3.2.3.1 ADVANTAGES

- No biased information was obtained, straight forward question where asked and straight forward answers given in terms of 'YES' or 'NO'.
- Factual information obtained without fear or favor due to the limit of answering posed by the examiner for the respondent to reason or explain their own views.

3.2.3.2 DISADVANTAGES

- Prohibit the use of additional information, as a result clueless answers were given by the employees. However, in such a way information can be biased.

3.3 ANALYSIS OF THE EXISTING SYSTEM

The above mentioned data gathering methodologies indicate that the recording and maintaining of assets records done by the IT personnel department is conducted manually. On a day to day running of the business the following activities are carried out manually by the organization: The I.T Technicians adds assets to the asset list file. A listing of assets is performed and recorded in the physical files not categorized according to specifications. After the adding of assets, later, assets maybe searched by unpacking those heaped files in their unorderly manner. No sections of categorizing assets is maintained. The search process is time consuming. Identified assets are then used for the business operations. The Systems administrator then confirms by checking the list of

assets recorded and the list of work done by the I.T Technicians. In the fault section, Employees report fault to the I.T technicians and the I.T Technicians respond by attending the fault either physically or through telephone lines communication if possible depending on the cause of the fault.

3.4 PROCESS ANALYSIS

Process analysis shown forth the breakdown of processes into inputs, operations and outputs as shown below.

3.4.1 INPUTS

- Assets details
- Assets file
- Fault details
- Work done details

3.4.2 PROCESSES

- Add assets
- Search assets
- Confirm assets and work done
- Attend fault

3.4.3 OUTPUTS

- Assets summary report
- Confirmed work assigned

3.4.4 ACTIVITY DIAGRAM

A graphical presentation showing a sequence of actions, flows of data or decisions in a system is regarded as an activity diagram (Patel, 2014). Activity diagram is characterized using the following notation which include the start point, action, decision and the end point. It is mostly used in modelling business processes. The rule of an activity diagram state that they should be a start point and an end point. The **fig 3.1** below shows the Assets management activity diagram.

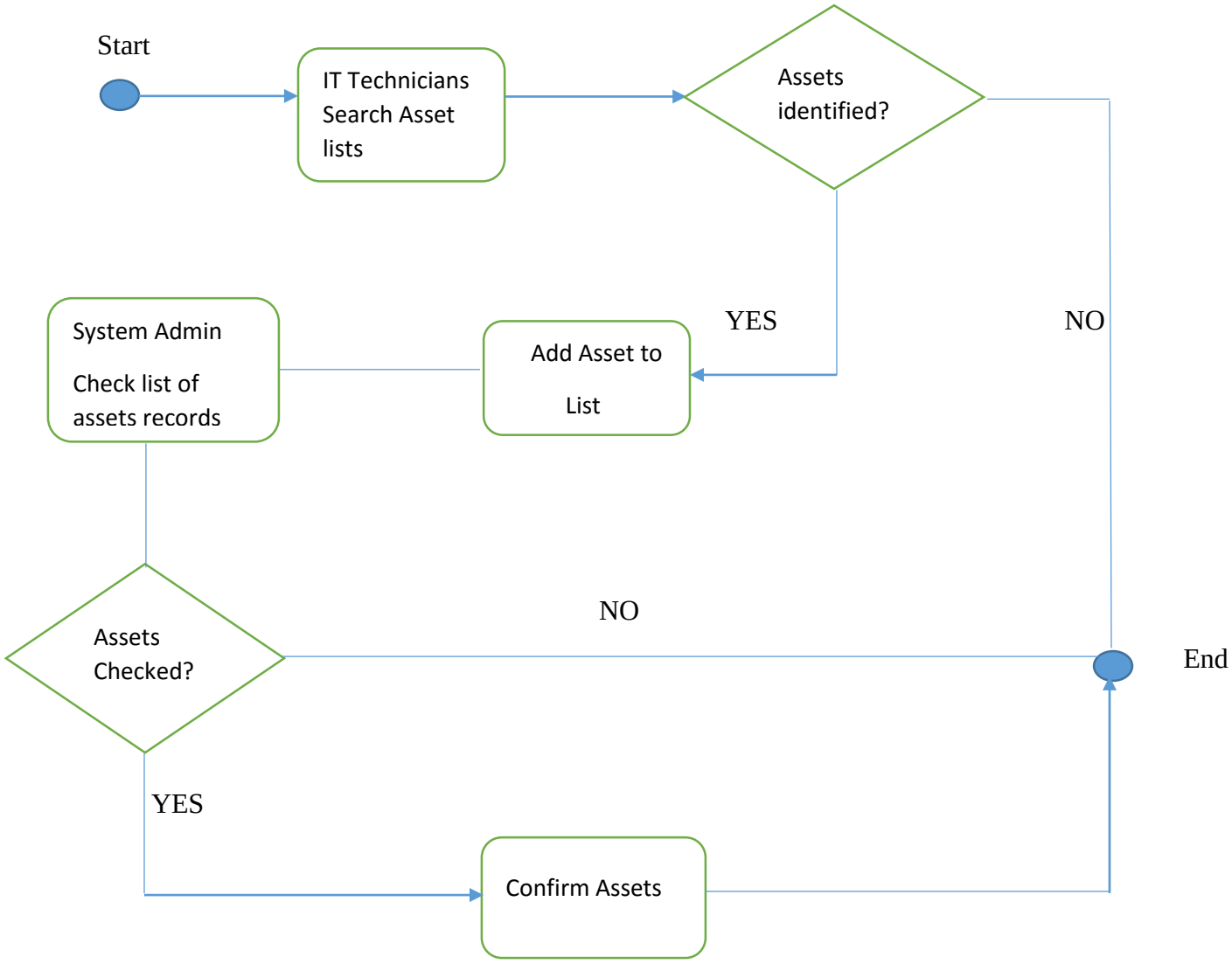


Fig 3.1: Asset Management Activity diagram

Keys

FAULT ATTENDANCE ACTIVITY DIAGRAM

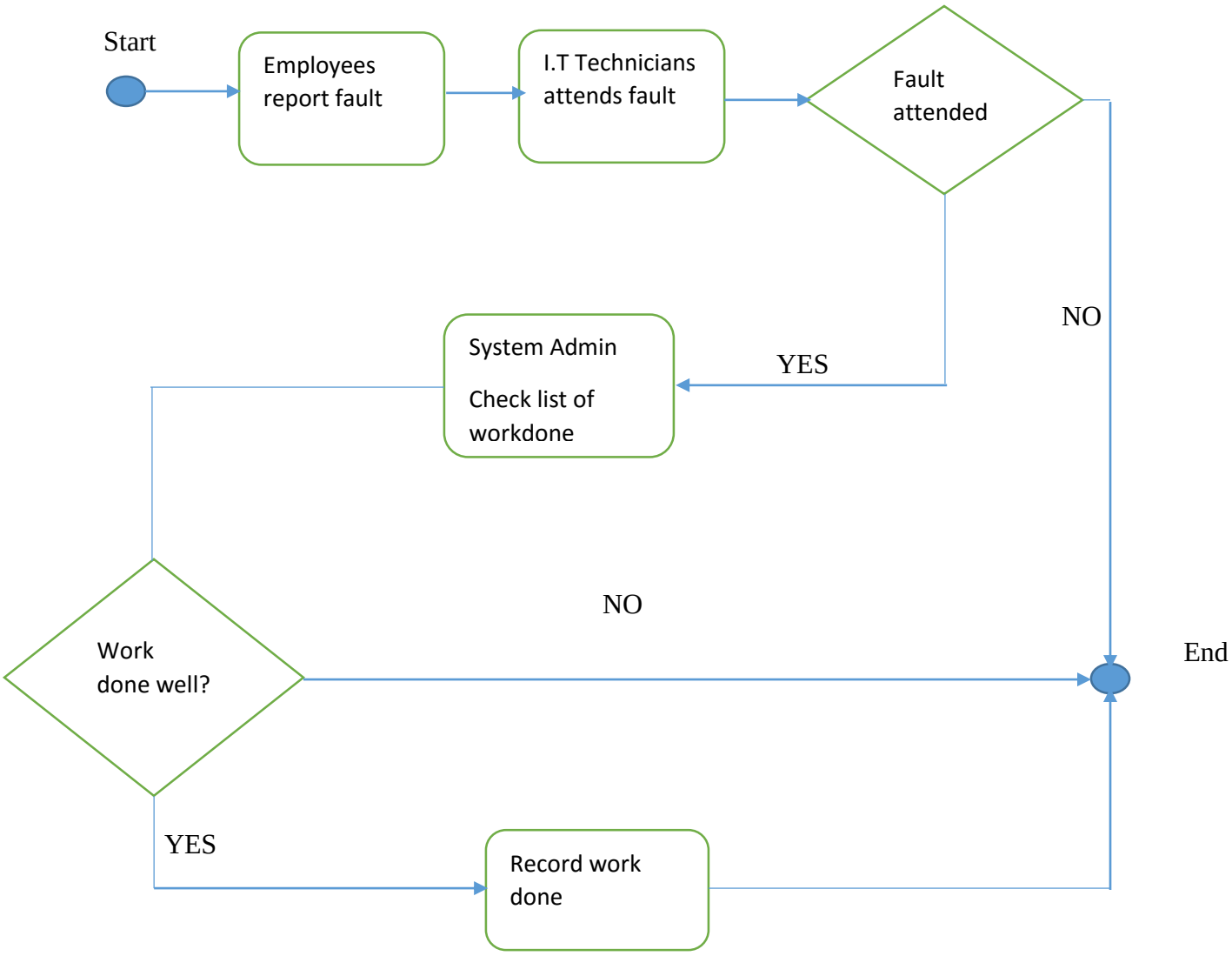


Fig 3.2: Fault attendance Activity diagram

Keys

3.5 DATA ANALYSIS

A scheme that regards the evaluation of data in the process by investigation and logical thinking of each section of data delivered (Jawadekar, 2013). The evaluated data is then assembled, observed and inspected so that a derived conclusion can be generated based on the newly proposed system. Further introspection will be demonstrated using the context diagram as well as the dataflow diagram.

3.5.1 CONTEXT DIAGRAM

A context diagram is explored as a sketch-able design that explicitly elucidates the interfaces and borders of the prearranged project to be embarked on (Rosenblatt, 2013). This is the level zero of the system, considered as the most paramount outlook level exhibiting the inclusiveness and completeness showing the inputs and outputs from/to exterior factors of the system. Below shows the ZETDC context diagram.

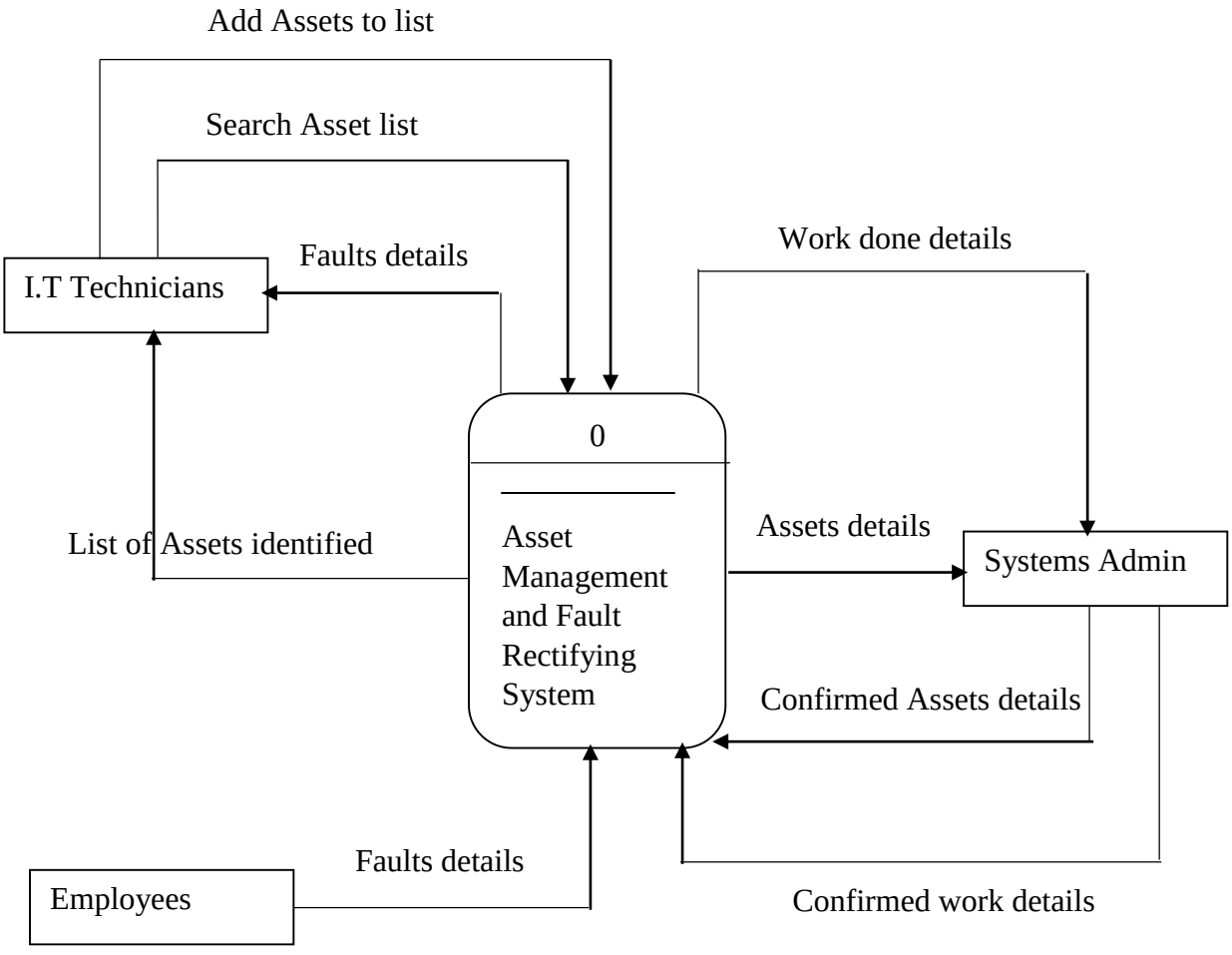
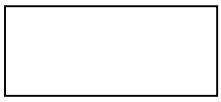


Fig 3.3: Context Diagram

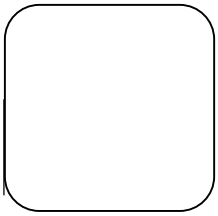
3.5.2 DATAFLOW DIAGRAM

The dataflow diagram is the viewpoint that elucidates the main functions of the system modifying its inputs into anticipated outputs (Rosenblatt, 2013). This facilitates the process of capturing the transformation that transpires when input is converted to output. In-order to simplify, the dataflow diagram demonstrate exactly how data streams through the system. Below shows the dataflow chart of the present system.

Context and Dataflow Chart Key



Entity



Process

Data Flow

Data store

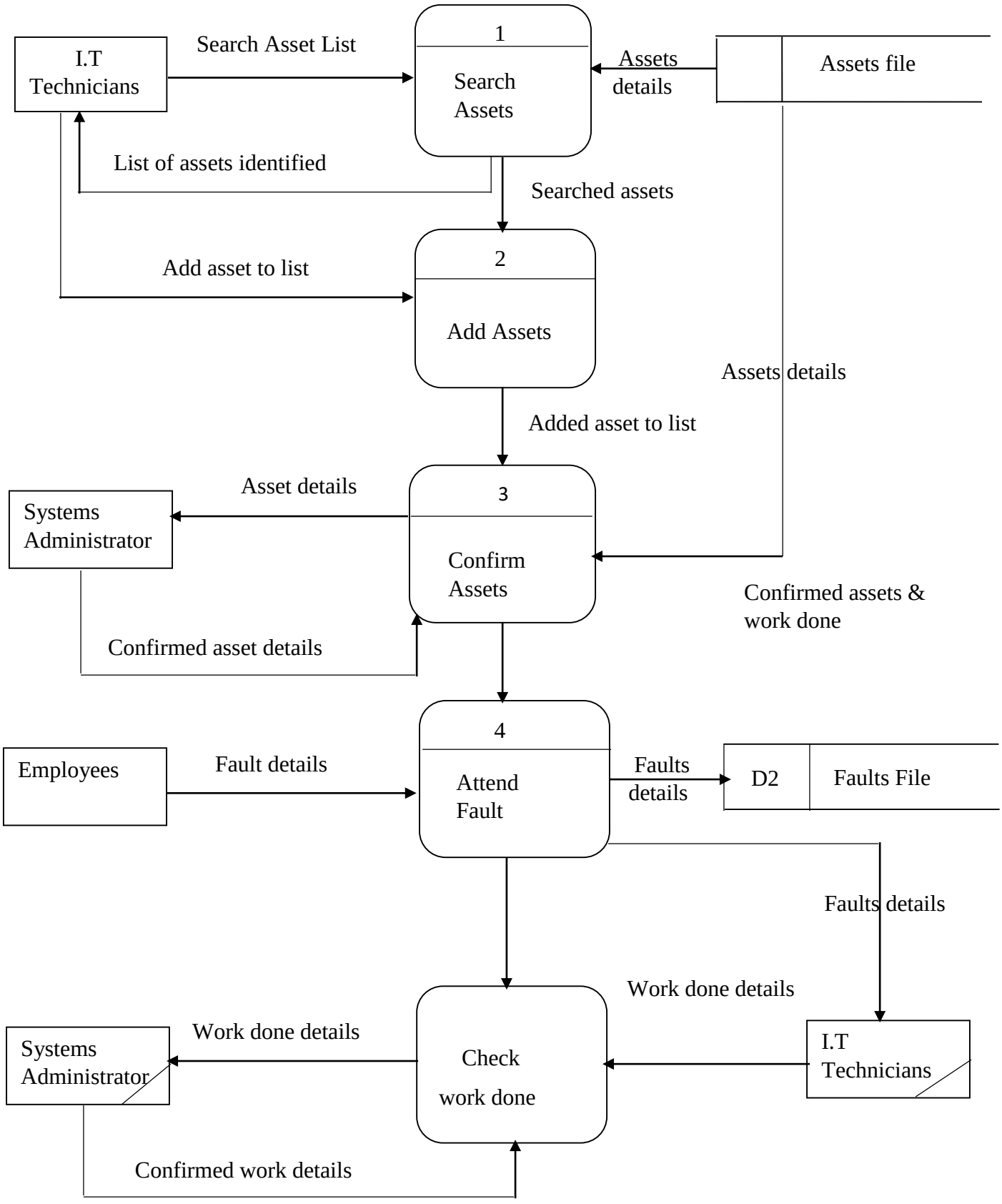


Fig 3.4: Dataflow Diagram

3.6 WEAKNESSES OF THE CURRENT SYSTEM

The emergence of a global economy, digital firms and business enterprises shifted positively the industrial economies resulting in the transformational effects of the new general purpose technologies in the field of information and communication. Such development in today's business has enhanced numerous digital ways of operating businesses rendering old system invalid with unpleasant issues that contribute in abundance of problems. The subsequent illustrates the weaknesses that the current system encounters.

IT Operation management challenges, for instance time and attendance system is time consuming and lacks planning. There is also delays in response to assets replacement.

Inconsistent decision-making and issues resolution. Managers spend at-least 4 weeks on average annually probing for or waiting on misfiled, un-tracked or mislaid info. Searching and retrieving of assets records. IT technicians can lose up-to two hours on non-adding activities a day searching for mislaid paperwork. At-most ninety percent (90%) of records are never referred to once filed.

Lack of sufficient experience and capability within IT department. No formality is maintained when documenting Assets reports. Anyone can be in danger if some documents are missing.

Lacks active policies or procedures for systematically controlling of recorded info. As a result, some records are retained for too long, much spend on storing them and lost much time looking for misplaced info. Faults reports left hanging whilst attending another over the phone.

3.7 EVALUATION OF ALTERNATIVES

Method evaluation of alternatives is an exclusive way of excavating out the best decisions that serves on financial resources and minimize costs at large on development (Jawadekar, 2013). The organization is prompted to consider several alternative forms when they are in need of employing the newly system. The several alternatives that the organization can consider include outsourcing method, in-house building as well as system improvement. The applicability of each alternatives and their pros and cons will be further examined. The table below will display costs and alternatives analysis.

3.7.1 OUTSOURCING

According to Patel (2014), outsourcing is defined as the contracting out of the business processes to another party. This technique is used by several organizations when they want to minimize costs by way of assigning a section of work to the external suppliers rather than carrying-out internally. Outsourcing can be the best method to undertake given the ensuing scenario: When the supplementary attributes related with the software or service are not mandatory; When the organization wants to avoid adjournments in the product distribution and lastly when the economy is steady and documentation is of supreme imperative. Below show costs related to software outsourcing. Outsourcing consists of costs of acquiring reliable machines with no compatibility issues and able to suite the software product, costs relating to the training of employees that they may have an understanding of the new outsourced system since it is not developed internally, costs related to the employment of project management team that can supervise all necessary functions in setting or connecting complex IP provisioning services, costs of maintenance .The above costs on aggregation ranges to US$ 20 000.

3.7.1.1 ADVANTAGES

- Able to maintain business loyalty by concentrating more on business core aspects.
- Product excellence can be highly expected in some instances.
- The product can be delivered promptly without delaying the overall success of the project.

3.7.1.2 DISADVANTAGES

- Can encounter delays as a result of increased waiting list to the product.
- A lot of tutorials are needed in the process in-order to impart users with knowledge on how to use the product.

3.7.2 SYSTEM IMPROVEMENT

System improvement involves refining the product until it becomes better than before, its quality rendered (O'Brien and Marakas, 2013). Henceforth the ZETDC Company might opt to refine or upgrade the corresponding manual system in some section where it is gradually used. That option vastly costs and challenging in its nature. Another way maybe to computerize the entire section

habitually needed by the organization in a particular department. As a result, the success of the process may involve the costs of upgrading the software, altering changes of old machines to those that evolve with the current technology (All in one machines), acquiring extra CISCO routers that maybe needed to enhance network efficiency in each department and costs on wiring network cat 6 cables. Several old application (system) consists of outmoded architecture that are inflexible and to alter such processes cost more and is a challenging process to undertake. The projected costs that are assumed ranges up to US$ 16 200.The **table 3.1** indicates system improvement costs.

3.7.2.1 ADVANTAGES

- The method maybe regarded as cost effective at some point.
- Offers facilities like branding your features in your own way and may save time at some point.

3.7.2.2 DISADVANTAGES

- Stagnation may result when key skills players are limited in the process. Henceforth managing the project maybe too difficult.

3.7.3 INHOUSE DEVELOPMENT

In-house building is a method that involve organizations scheduling their in-house team in developing and implementing the system that fits the exact needs of the organization (O'Brien and Marakas, 2013). The in-house building indorses the creation of a new custom-built system that is able to inherit the customized features of the organization. The management of the in-house building is in-fluxed with a vast number of dedicated programmers, analysts that ardently exert their effort together with line workers in-order to maintain a stress free coordination between teams. The table below shows in-house building costs.

3.7.3.1 ADVANTAGES

- The ZETDC company can formally take overall control of the system
- Facilitate the creation of a new custom-built system.

3.7.3.2 DISADVANTAGES

- In-house building is time consuming as compared with outsourcing.

Alternative	Estimated Costs $US
Outsourcing	20 000
In-house development	15 000
System Improvement	16 200

Table 3.1: Evaluation of Alternatives

Costs in-relation to in-house building is considered much more favorable as compared with other two alternatives though the method shown its pros and cons along the way. ZETDC Company opted to undertake in-house building since it retains customized features of the business requirements.

3.8 REQUIREMENTS ANALYSIS

Requirements analysis is defined as the practice adopted to promote the facility of identifying, capturing, formalizing, examining the application domain and indorse the user requests on the system to be constructed (Denis et al, 2013). In simple term it is referred to as an evaluation of the prerequisites that the system has to accomplish. User requests adds-up to the specifications of the system to be built. The aforementioned specifications will support as an arrangement agreed upon by the users and designers of the system. The requirement analysis is broadly categorized into two activities which are functional and non-functional. The system will further be perceived as a black-box and objects modelled on the system boundary.

3.8.1 FUNCTIONAL REQUIREMENTS

Functional requirements determine the activities or functions undertaken by the system, its components as well as the outputs (Rosenblatt, 2013). This is the process that encompasses the activities, operations supported by the newly system, reciting the inputs, processes and finally the outputs to be produced.

3.8.1.1 USE CASE DIAGRAM OF THE PROPOSED SYSTEM

The Use case diagram amasses a usage prerequisite of the system. The model designates the events of the system from the user point of view (Rosenblatt, 2013). The Functions of the system are identified, elaborated clearly. The model is the upper level outlook of the system, treasured most when bestowing to the diverse stakeholders. They are four objects that are used to define the use case diagram namely the actor, use case, system and the association. Below shows the use case diagram of the projected system.

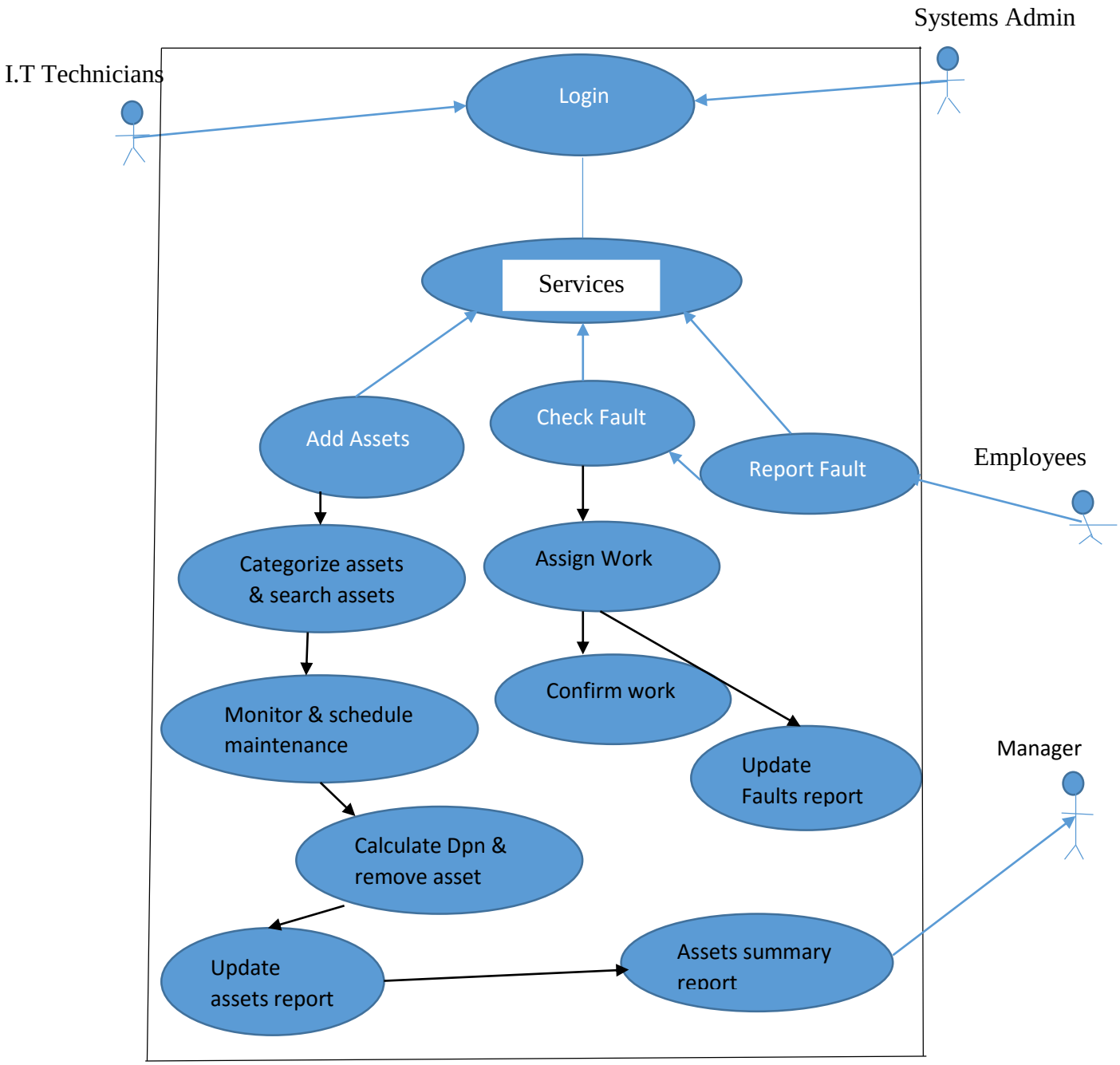
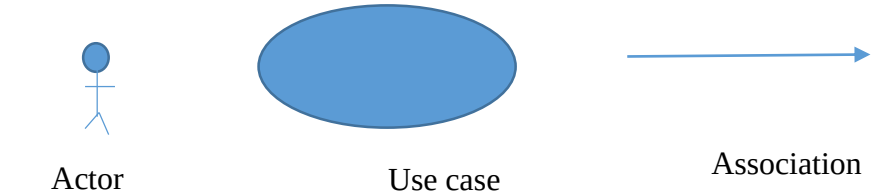


Fig 3.3: Proposed system use case diagram

Key



3.8.2 NON FUNCTIONAL REQUIREMENTS

Non-Functional is a practice of the requirements analysis that entails how well the system supports the functional requirements (Rosenblatt, 2013). The core aspect of non-functional is to inspect into the very vital qualities that combat the system. These required qualities are as follows, addressed to combat some of the system weaknesses.

System usability. The system should offer ease of use with no defined complications. To simplify, the system must be user friendly and gold plating with a good graphical user interface.

Performance which is the total of useful labor consummated and assessed in relation to time needed or resources used. This explains transmit and response time taken between users (sending requests on faults) and IT personnel (responding within a fraction of specified time).

Reliability. The quality of being reliable, the system should be zero fault tolerant and being consistent at all times. The work done should be measurable. The system ensures preventive maintenance in order to cater for zero fault tolerance and all work done is measurable.

Maintainability. The system must be able to offer the following attributes: easy to modify, repair and upgrade. Security should be on top of the priority; without security anyone can be threatened with wrong allegations. Securing and enforcing strong passwords on users is of utmost important.

Henceforth the aforementioned qualities should exist in the system to be built and supplement to the credentials of the functional requirements.

3.9 CONCLUSION

The chapter highlighted the fundamental aspect of how the current system operates and expel all its associated weaknesses and solutions to cater for those problems. The data collection methods helped in defining the functionality of the current system and a starting point on how the system is to be built with the solutions as the corresponding answers to the problem mentioned. Evaluation methods helped in determining the best alternative and considered the in-house development as the safest and cheapest means of coming out with a system. Such gathered information qualified the project to the next phase which is the design.

CHAPTER FOUR: DESIGN PHASE

4.1 INTRODUCTION

An in-depth analysis into the functional and non-functional requirements of the system covered earlier in the analysis phase introduced the design phase. The design phase now seeks to alter the aforementioned requirements into a system design document that specifically delineates the design of the system as well as using them as inputs for the development of the system. The phase will outline a plan citing the critical success features of the system architectural design, database design, the interface design as well as enforcing security features.

4.2 SYSTEM DESIGN

System design is defined as an approach that gratifies the assembling of the system design to satisfy a particular business requirement (Kendall and Kendall, 2013). It is regarded as a set of rules or formula in which system elements, modules, data and interfaces are demarcated to gratify the system specified requirements. Patel (2014) states that the major effort in the design is to foster work driven from the system requirements specification so that a comprehensive set of features describing the system constitute system specification. The subsequent are the essential attributes that a system should portray: User friendly, serviceable and favorable are the conditions that satisfies the user friendly of the system. The system should guard against user consultation to maintain it at minimal; Reliability, is the system able to be relied on, does it offer consistence in operations. The system should be consistency enough to transform unit A into a consistence unit B; Efficiency, output ratio per unit time. Does the system deliver output in specified unit of time required? All these should resemble the system operability; Maintainability, keeping the system at the better same level by checking it regularly either in different working environments.

4.2.1 CONTEXT DIAGRAM

A context diagram is explored as a sketch-able design that explicitly elucidates the interfaces and borders of the prearranged project to be embarked on (Rosenblatt, 2013). This is the level zero of the system, considered as the most paramount outlook level exhibiting the inclusiveness and completeness showing the inputs and outputs from/to exterior factors of the system. The **fig 4.1** below shows the ZETDC context diagram.

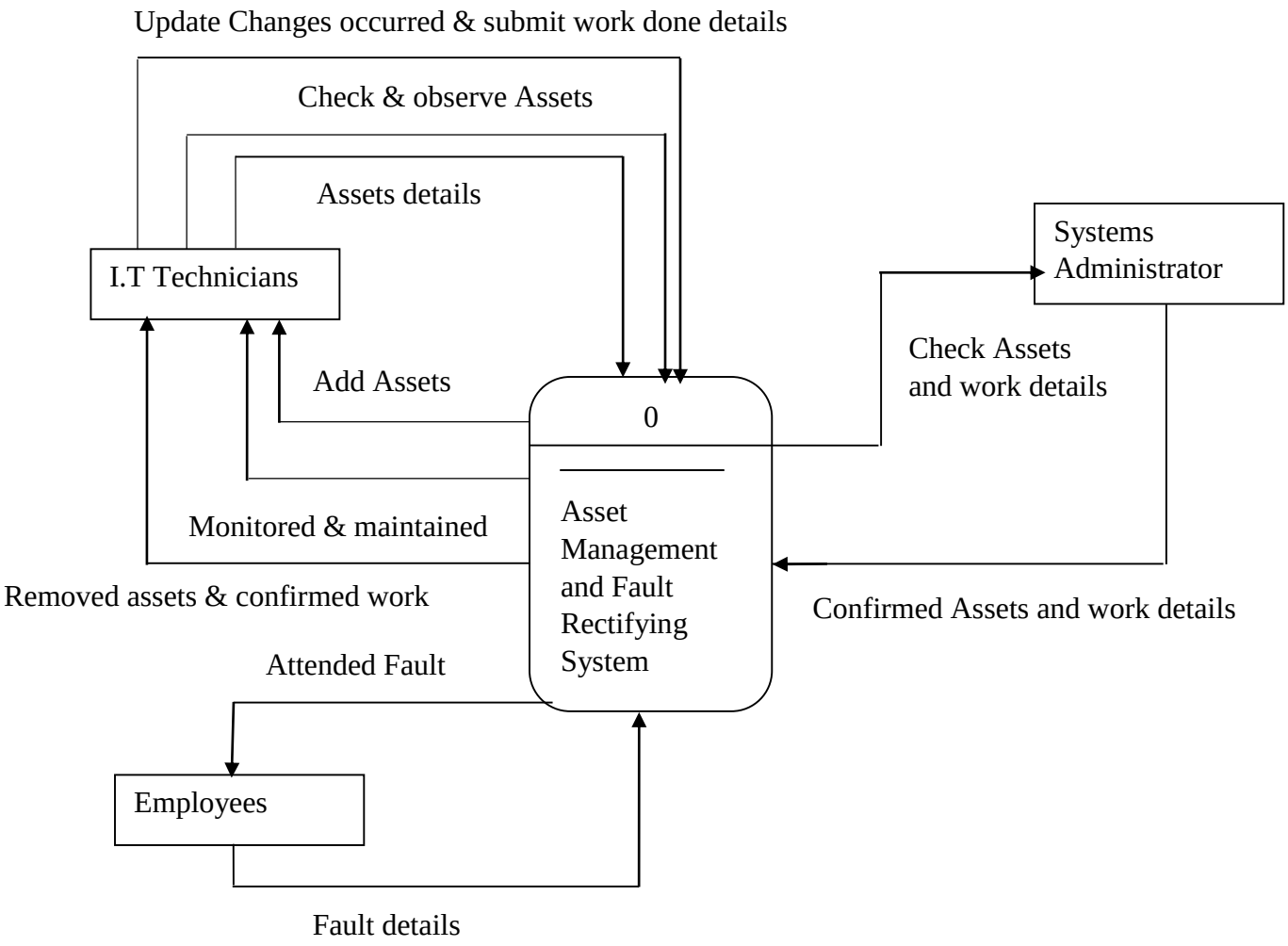


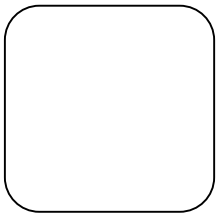
Fig 4.1: Context diagram

4.2.2 DATA FLOW DIAGRAM

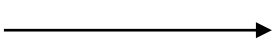
The dataflow diagram is the viewpoint that elucidates the main functions of the system modifying its inputs into anticipated outputs (Rosenblatt, 2013). This facilitates the process of capturing the transformation that transpires when input is converted to output. In-order to simplify, the dataflow diagram demonstrate exactly how data streams through the system. Below shows the dataflow diagram of the current system.

Key for the Context diagram and the Dataflow diagram

Entity



Process



Data flow

Data store

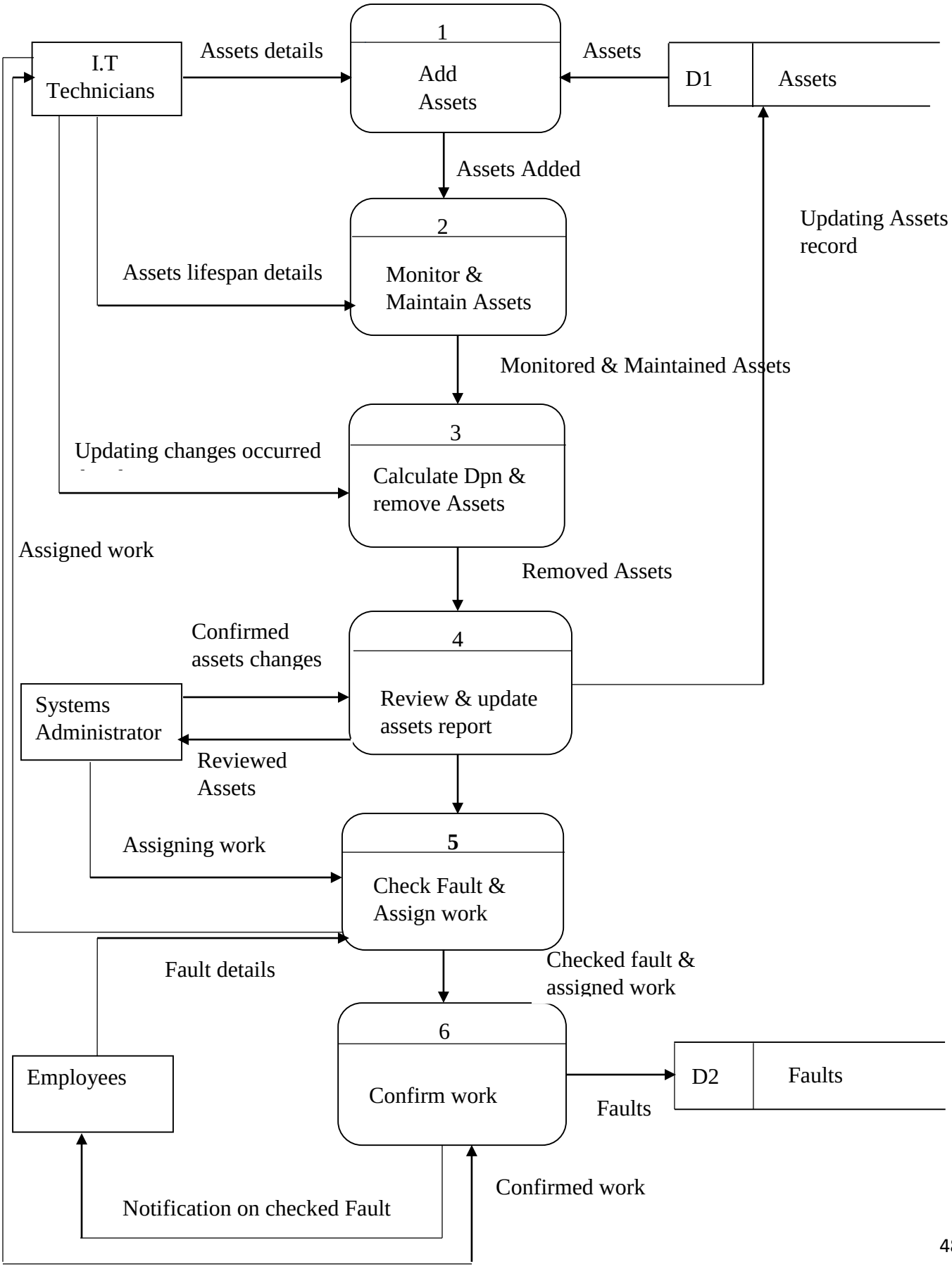


Fig 4.2: Dataflow diagram

4.3 ARCHITECTURAL DESIGN

Architectural design is described as an arrangement that addresses the mutual relationship that exists between hardware, software components and networks (Rosenblatt, 2013). Kendall and Kendall (2013) discourses architectural design as a resolution of the software platform and hardware of the new system. The endorsement of the communication framework in the architectural design is the major aspect linking the hardware configurations and software components together. Any association of linking software components, networks and hardware's may be determined through the use of network cables(cat6) linking networks, server for storing ZETDC information, employee's info as well as the inclusion of a client server machine for resource sharing.

4.3.1 CLIENT SERVER APPROACH

The client server model is an umbrella term describing the association structure of network systems amid service providers, requestors and clients among others. The connection of the server is assembled through a linkage known as network (Patel, 2013). Likewise, the central network builds computing functionality for mail altercation and database access. The protocols fabricated close-by the server model include the; Hypertext Transfer Protocol (HTTP), Domain Name System (DNS), and the Simple Mail Transfer Protocol (SMTP). The client requests detailed processes whereas the server panels most of the processes, store them and delivers output to the client. The internet links the server and client together. Below is the client server approach.

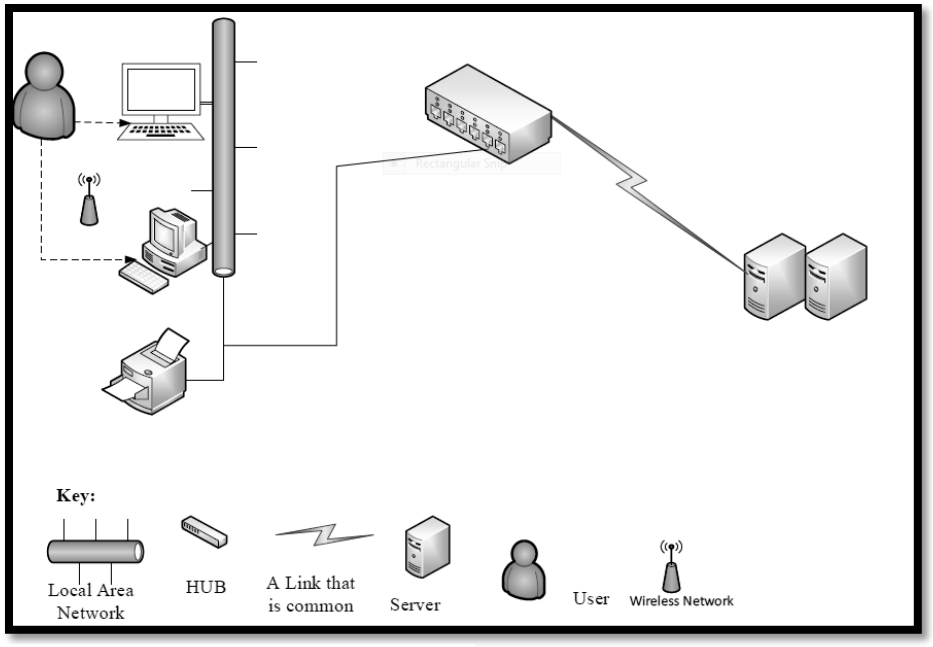


Fig 4.3: Client Server Model

4.3.1.1 ADVANTAGES

- Facilitates easy SQL data dispersal.
- Database modification is easy.
- Able to couple systems together e.g. (clients and servers).

4.3.1.2 DISADVANTAGES

- System overload may cause congestion
- Often pricy to launch.

4.4 PHYSICAL DESIGN

The physical design illustrates how the physical interfaces and software components will be arranged (O'Brien and Marakas, 2013). The scheme transforms the logical design into technical design. The interaction between the hardware and software determine the behavior (as shown by the software inputs, processes and outputs) as a result of the connection made to the server (Rosenblatt, 2013). The physical design is characterized by the following components which include the router, for bridging networks and keep traffic under control (Denis et al, 2013). The server panels most of the processes, stores them and delivers output to the client. Can be used for

backup and security purposes. The firewall monitors and controls network circulation passing in and out of the enterprise. **Fig 4.4** below demonstrates the physical design of the proposed system.

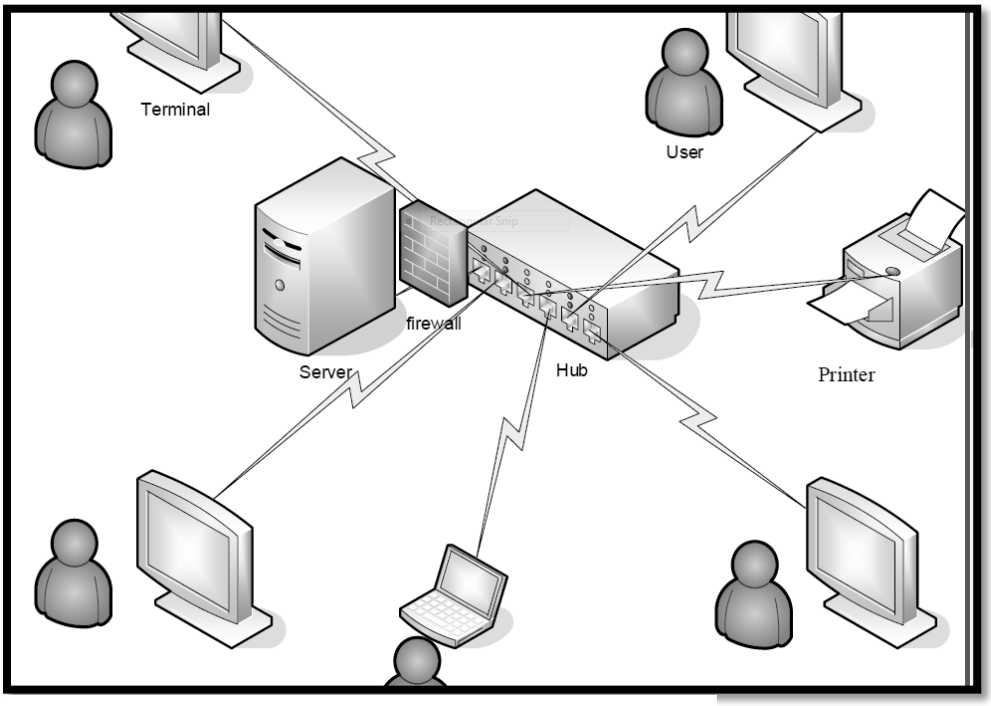


Fig 4.4: Physical design

4.5 DATABASE DESIGN

Database design involves the process of arranging, inspection and the design of data for computerized data processing (Rosenblatt, 2013). This encompasses the modelling of the physical and logical elements of the database. The scheme enhances coordination between the developers and users. The database design must guard against redundant tables and ensure ACID properties on the database.

4.5.1 DATABASE ARCHITECTURAL DESIGN

Database architectural is a method that gratifies the process of organising data into modules perceived as schemas (Umanath and Scamell, 2014). The database architectural exists as a result of the associated coordination of levels. These levels form the bases of the design and they include the internal level, external level and the conceptual level. The 3-level architecture known also as the ANSI-SPARC is responsible for allowing sovereign customized users view of the database

that is separate from the physical representation. **Fig 4.5** below shows the database architectural design.

4.5.1.1 EXTERNAL LEVEL

The external level streamlines information that relates only to the users. This involves describing the ways that portray user's behavior towards database interpretation (Umanath and Scamell, 2014). Users differs in the way in which they portray a behavior towards the database, dissimilar views are returned for each user. Each user is specifically identified and matched according to the specific area of the database. Users of the system which include, the systems administrator, the I.T technicians and the employees may be allotted to a specific portion of the data that is separate for each other. The I.T technicians are liable of accessing the faults details messages sent by the employees concerning a resulting fault that may require attention, and record assets queried from the assets file. The Employees from various departments of the ZETDC might have access to report on faults. The systems administrator might be liable to access all the fields that's relates to employees reports and I.T technicians work.

4.5.1.2 CONCEPTUAL LEVEL

The conceptual level streamlines information that relates to the community. This involves describing the ways that portray the community behavior towards database interpretation. Information pertaining which data is kept and related relations that exists between those data are identified and examined (Umanath and Scamell, 2014). The related relations include those that exists between the entities and their attributes, I.T technicians and employees' in-terms of faults related issues, Systems administrator and I.T Technicians in-terms of detailed summary reports on assets recorded and changes made. Authorization and validation at the conceptual level is of utmost importance. Strong passwords and username will be used for authorization purposes. For instance, I.T technician's passwords maybe encrypted upon logging for security purposes.

4.5.1.3 INTERNAL LEVEL

The internal level streamlines information that relates to the physical illustration of the database. This involves describing the ways that portray the corporal behavior towards the database (Umanath and Scamell, 2014). Information pertaining how data will be retained in the database is

examined in relation to the identified data structures and file organization. At the internal level, space for data, indexes are allocated, classified ways for keeping records are maintained and encryption procedures. Tables that relates to faults and assets recorded will be maintained.

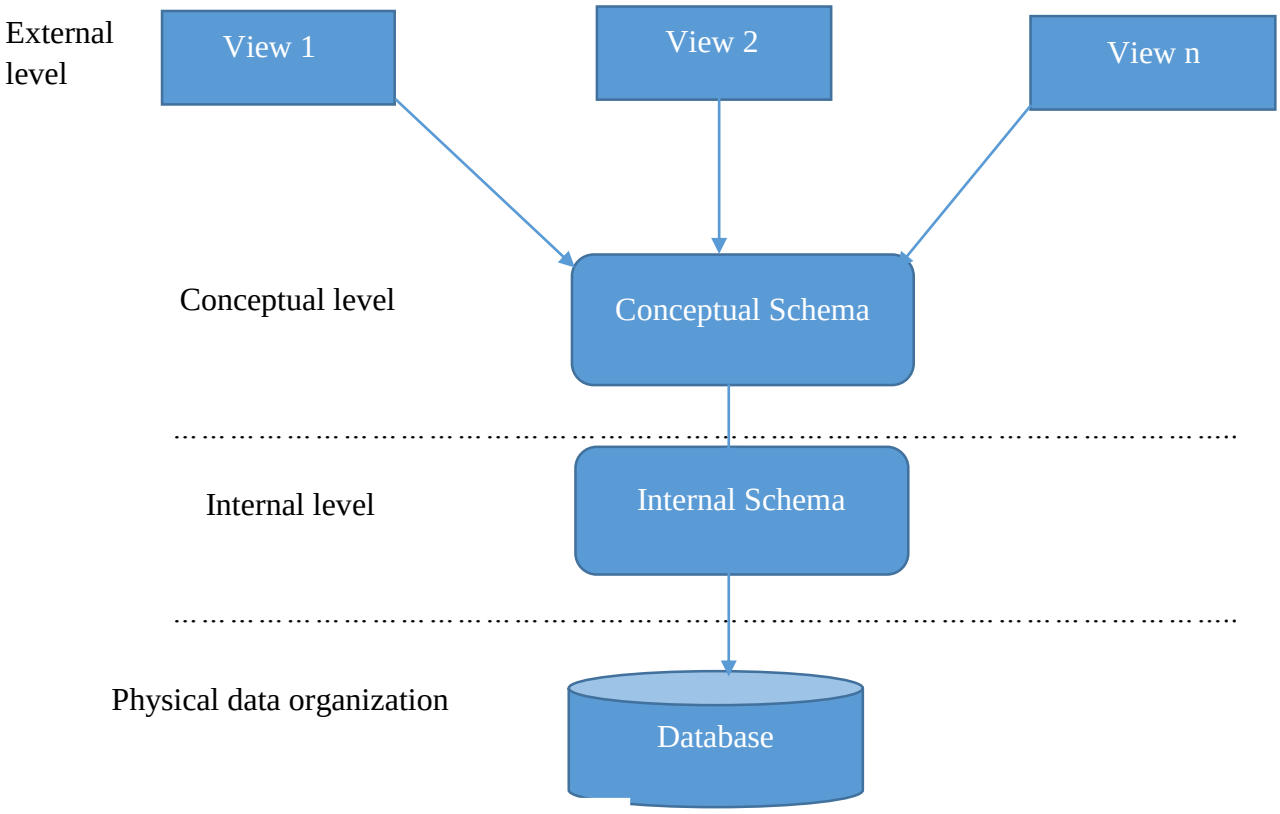


Fig 4.5: Database architectural design

4.5.2 TABLES FOR THE PROPOSED SYSTEM

The table design is the fundamental aspect of the data structure comprising of a fixed set of attributes, domain pairs and a set of tuples that is rows.

4.5.2.1 ASSETS DETAILS

Table showing assets added details

FIELD NAME	DATA TYPE	DESCRIPTION
Serial number	Varchar(100)	Primary key
Name	Varchar(100)	Asset name
Model	Varchar(100)	Identification name
Lifespan	Int(11)	Asset years
Value	Double	Asset initial value
Acquisition date	Date	Posted time

Table 4.1: Added Assets Details

4.5.2.2 USERS ACCESS LEVELS

Table showing users access levels

ACCESS NUMBER	DESCRIPTION
1	Admin
2	Technician
3	HR
4	Employee

Table 4.2: Users access levels

4.5.2.3 USERS

Table showing employee's details.

FIELD NAME	DATA TYPE	DESCRIPTION
EC Number	Varchar(100)	Primary key
Name	Varchar(100)	Identification name
Surname	Varchar(100)	Identification name
Phone	Int(11)	Identification phone number
Email	Varchar(100)	Email name
Gender	Varchar(40)	Status
Department	Varchar(100)	Identification location

Password	Varchar(100)	Secret code
Access	Int(11)	Status

Table 4.3: Employees details

4.5.2.4 FAULTS DETAILS

Faults reports made by employees

FIELD NAME	**DATA TYPE**	**DESCRIPTION**
Fault Id	Int NOT NULL(11)	Primary key
Fault	Varchar(100)	Fault reported
EC_Number	Varchar(40)	Foreign key
Fixer	Varchar(100)	Fault advisor
Status	Int(11)	Fault info
Date_reported	Date	Posted time

Table 4.4: Faults report

4.5.2.5 LOGIN TRAILS DETAILS

Login trails made by users

FIELD NAME	DATA TYPE	DESCRIPTION
Trail Id	Int NOT NULL	Primary Key
EC_Number	Varchar(100)	Foreign key
Operation	Varchar(100)	Login trays
Time	Timestamp	Logon times

Table 4.5: Login trails

4.5.3 ENHANCED ENTITY RELATIONSHIP DIAGRAM

An enhanced entity relationship diagram is an extended diagram of the database showing the extended relationships that exits within the system tables (Umanath and Scamell, 2014). The EER diagram is also known as the high level conceptual model. It contains entities and their attributes, the relationship set and unique attributes underlined as primary keys. The **Fig 4.6** below shows the EER diagram

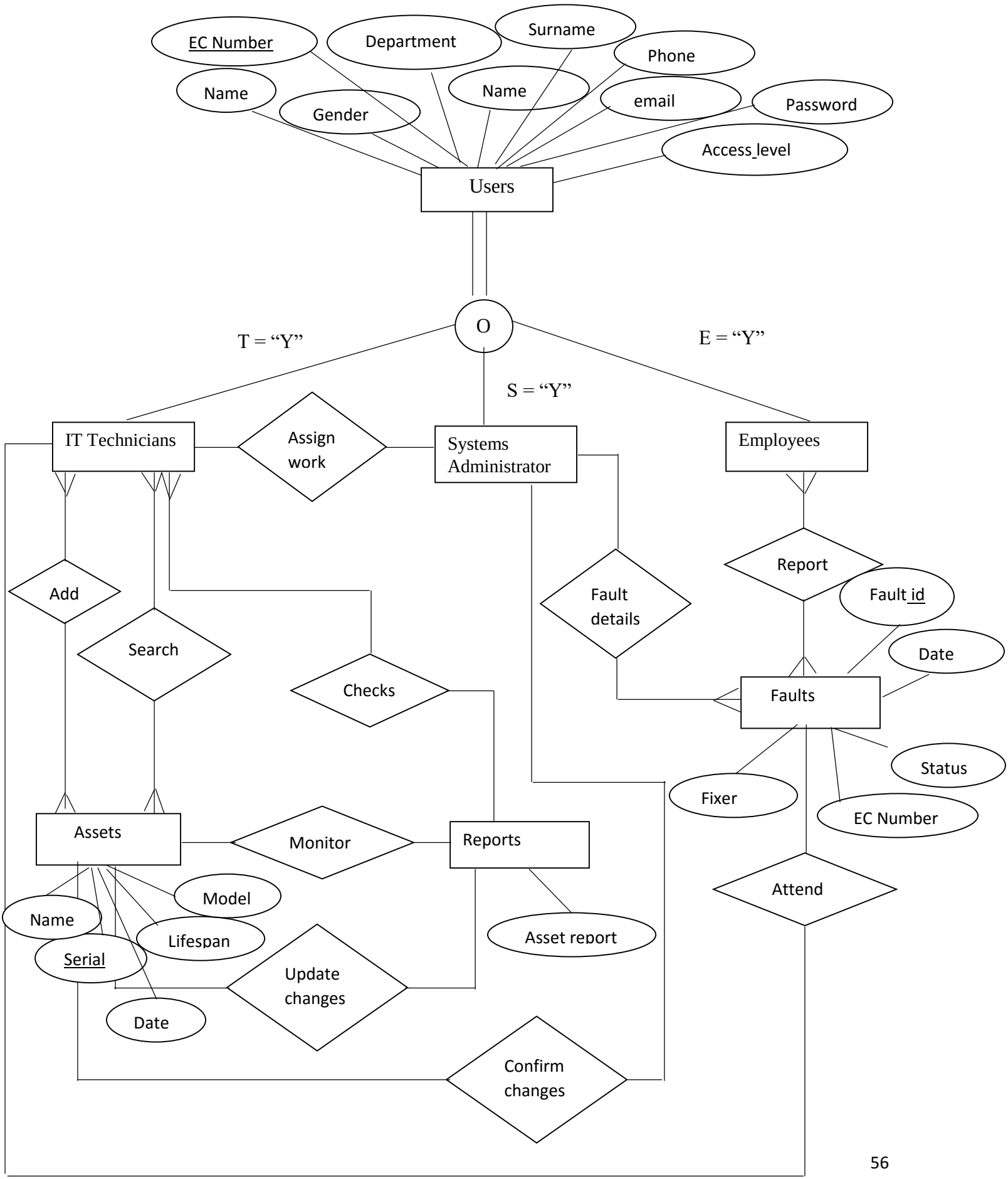


Fig 4.6: Enhanced entity relationship diagram

4.6 SEQUENCE DIAGRAM

A sequence diagram epitomize a channel of events and draws attention on symbolizing the system objects (Popovic, 2016). The **Fig 4.7** below shows the ZETDC assets management and fault rectifying system sequence diagram

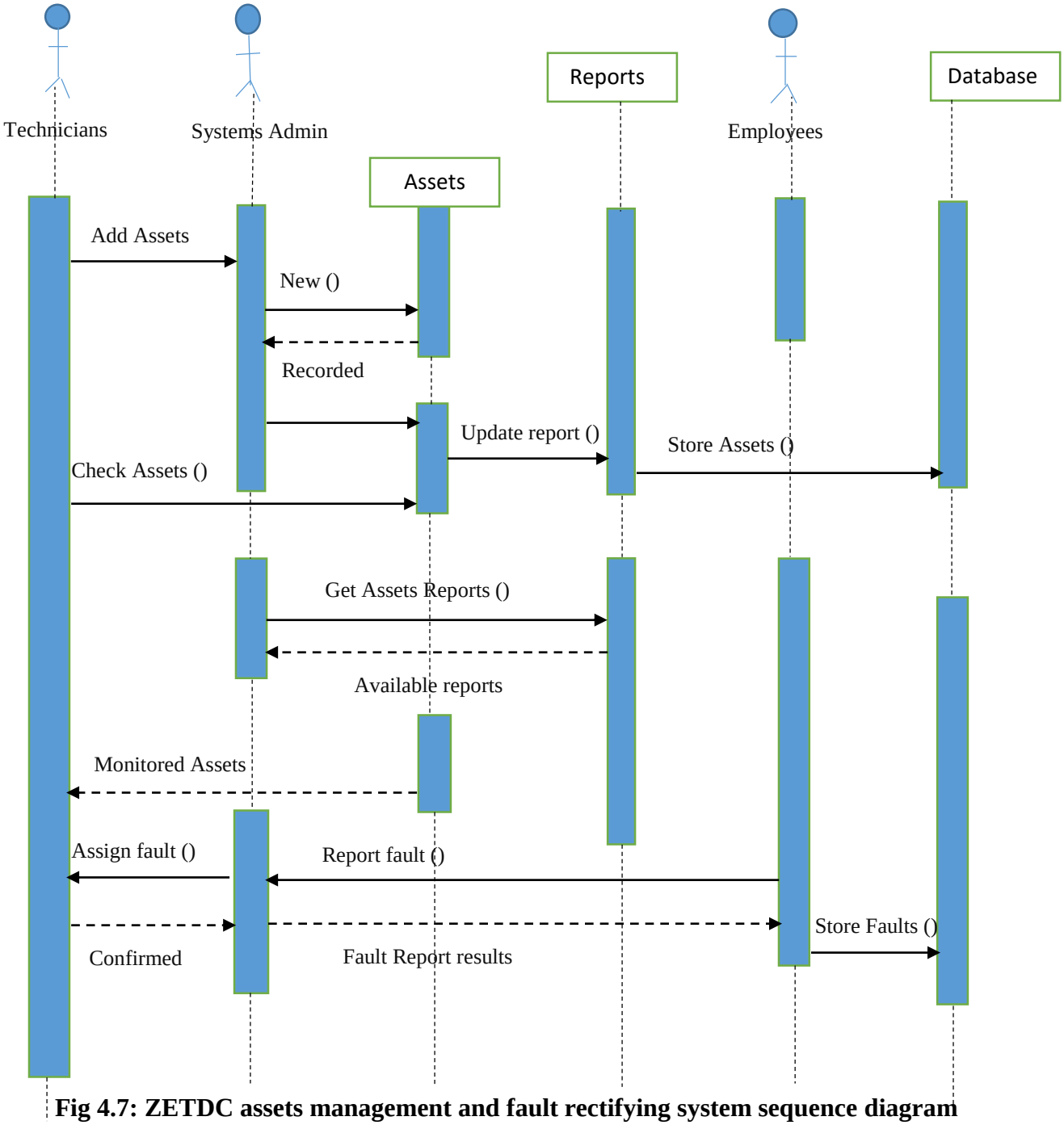
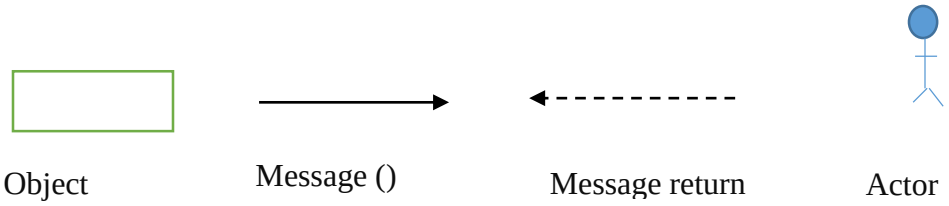


Fig 4.7: ZETDC assets management and fault rectifying system sequence diagram

Key for the sequence diagram



4.6.1 CLASS DIAGRAM

A class diagram is described as a cohesive modelling tool cast-off to display the relationship between objects denoted as entities. The class diagram uses Unified modelling notation and contains the three parts namely, the attributes, name and operations. **Table 4.8** below shows the class diagram.

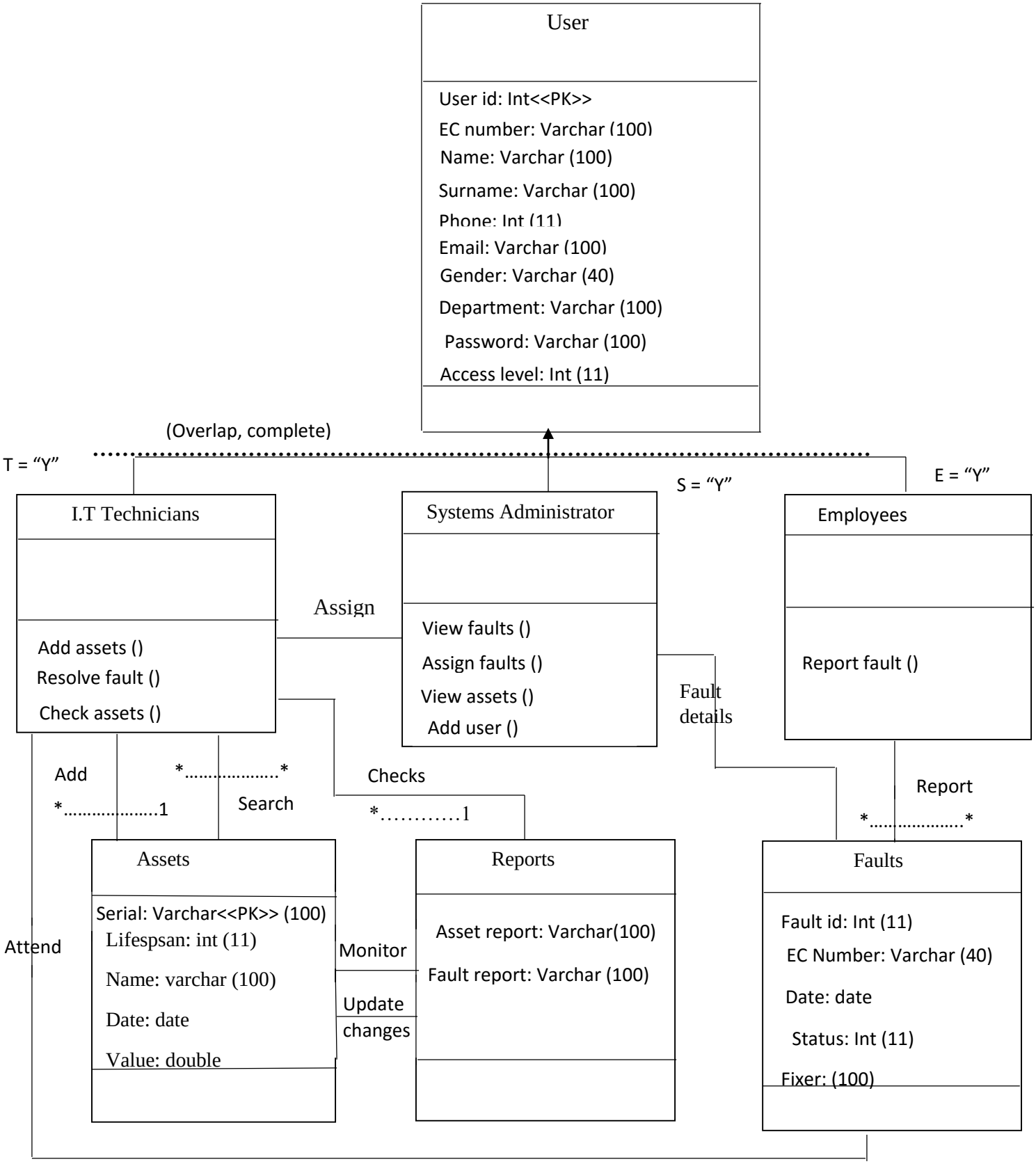


Fig 4.8: ZETDC Asset management and faults rectifying system class diagram

4.6.2 PACKAGE DIAGRAM

A package diagram is described as a cohesive modelling tool which illustrates the structure of the designed system at the packages level (Delligatti, 2013). It is the demonstration of how numerous classes are assembled into packages .The package diagram consists of the following elements; the package, packageable element, dependency, element import, package import, package merge. **Fig 4.9** shows the asset management and faults rectifying system package diagram.

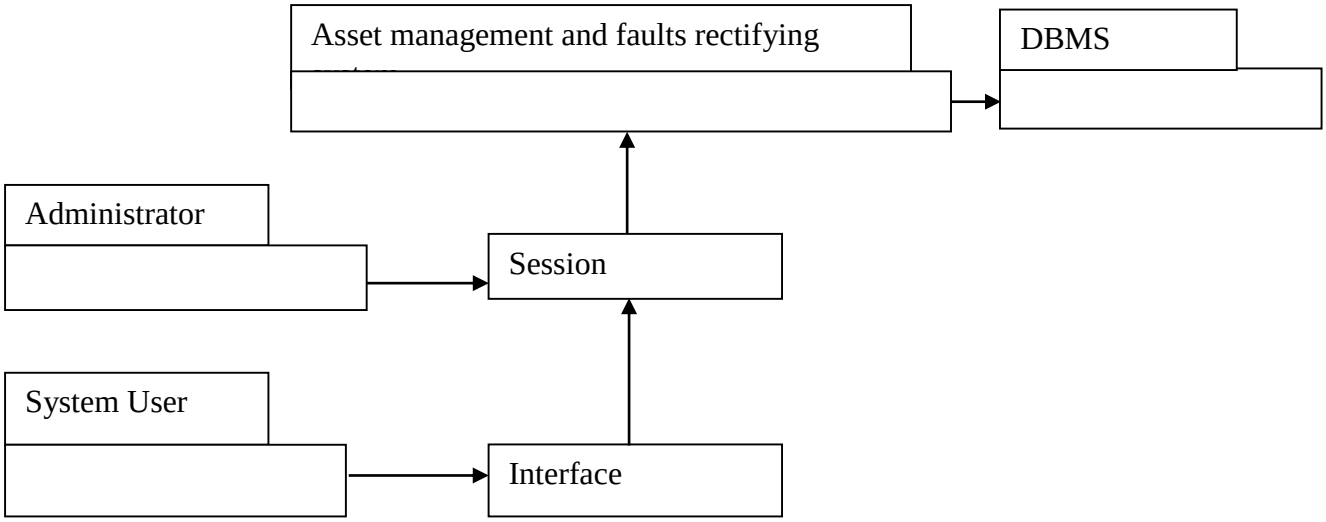


Fig 4.9: Package Diagram

4.7 INTERFACE DESIGN

The interface design of the proposed system is described as the multi-punitive workout for creating operational interfaces as well as making an allowance for various properties which include the ease of use, transparent, the splendor of execution and design adaptability (Wood, 2014).

4.7.1 MENU DESIGN

Menu design infers numerous interpretations for the users of the system. These users include the systems administrator, I.T technicians and the employees. A Menu consists of a list of selections offered to the users of the system. It gives users access to various options that the system is capable of performing. Such design of menus is employed in-order to give users a variety of selections upon clicking. The ZETDC asset management and fault rectifying system is designed with the main menu and sub-menus that follows below.

4.7.1.1 MAIN MENU

The ZETDC main menu consists of several choices offered to the users upon clicking any selected text-word. Several icons in text-words are available as they offer choices to the users. These icons are in the form of; the home icon that displays the current main menu, the about us icon that presents information necessary to define the organization, the contacts icon for detailed information and the login icon to grant access only to those privileged.

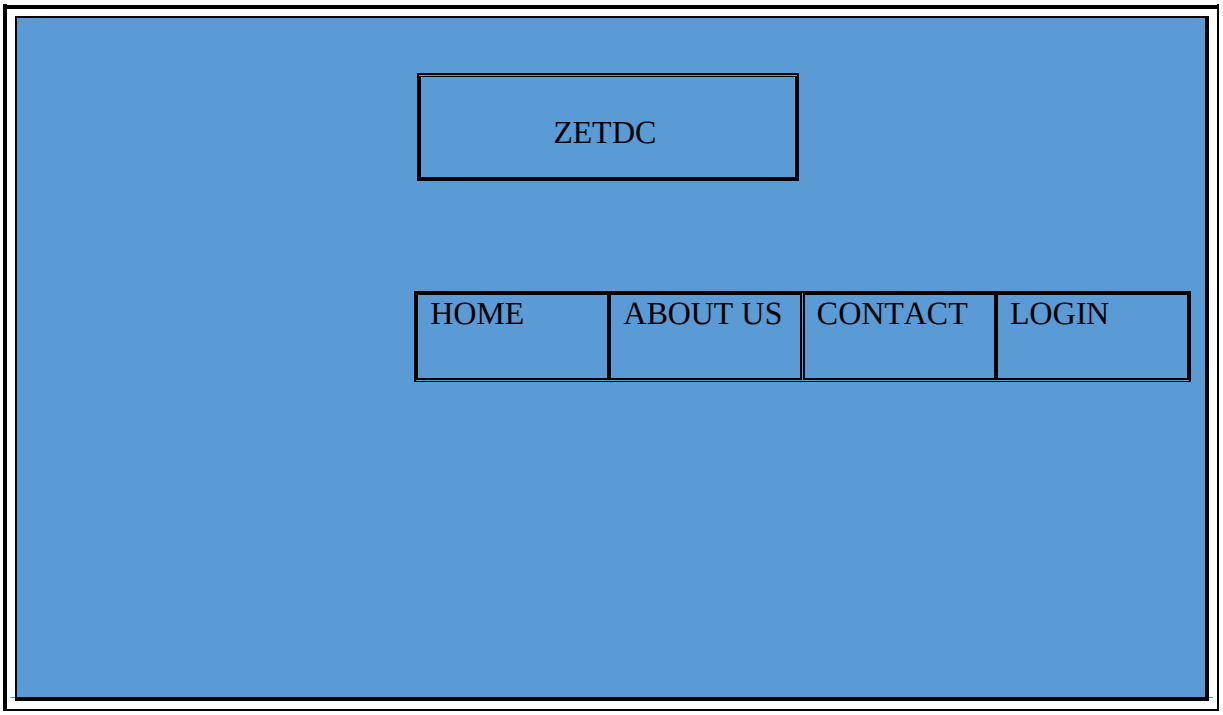


Fig 4.10: Main menu

4.7.1.2 SUB-MENUS

The sub menus are those menus displayed when privileged users are granted access to the system upon logging in. Those menus appears in different choices offered to the users depending on the task necessary to be undertaken. Choices made by the user depends on the selected icon. It might be the fault icon that include all information relevant to the faults, the asset icon that also include all information relating to the assets and so forth. Below shows the sub menus with several choices relevant to the I.T Technician and the systems administrator.

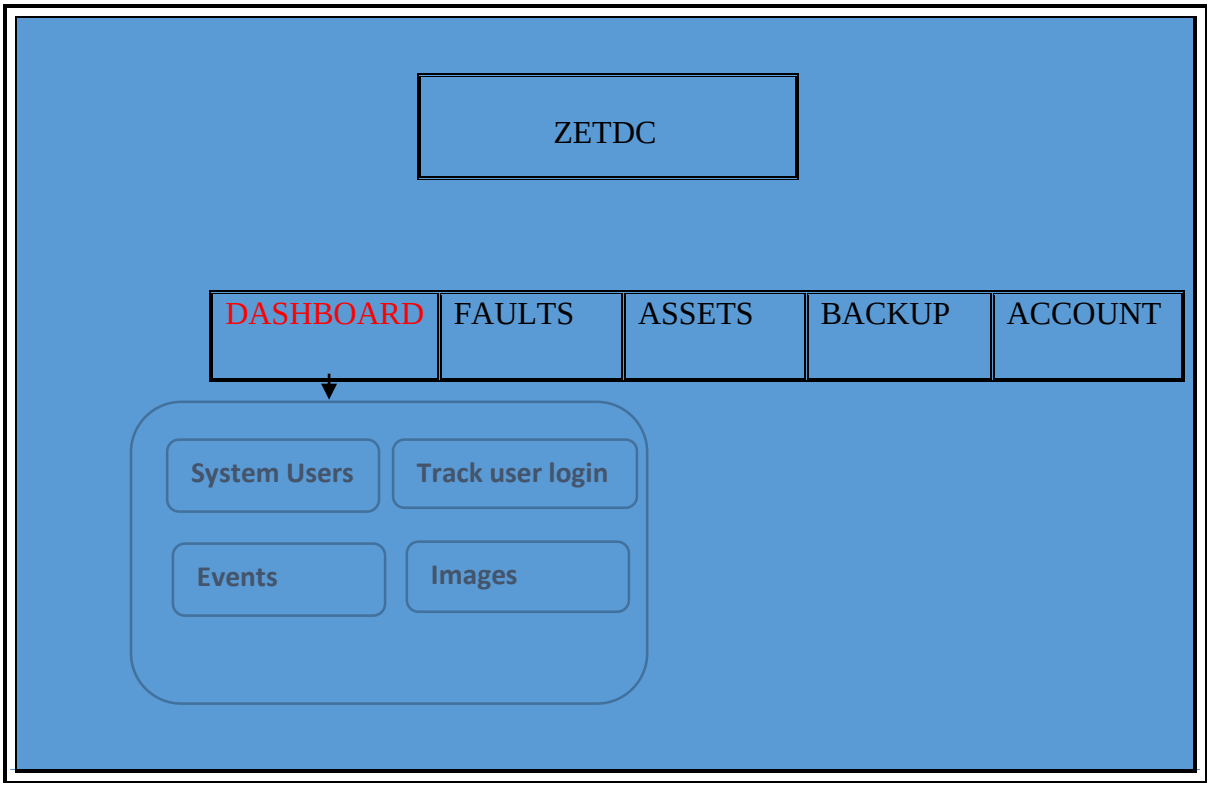


Fig 4.11: Sub menus

4.7.2 INPUT DESIGN

The input design is a process that transform the user leaning drawing process of inputs to a digital-based system into a programmer oriented requirement (Somerville, 2016). The input design process must be characterized by the subsequent: The field span need to be documented; the data setup need to be known to the data entry user; the instruction of the field must match the instruction of the fields on the source document. The Fig 4.10 displays the system input design chart.

4.7.2.1 LOGIN PROCESS CHART

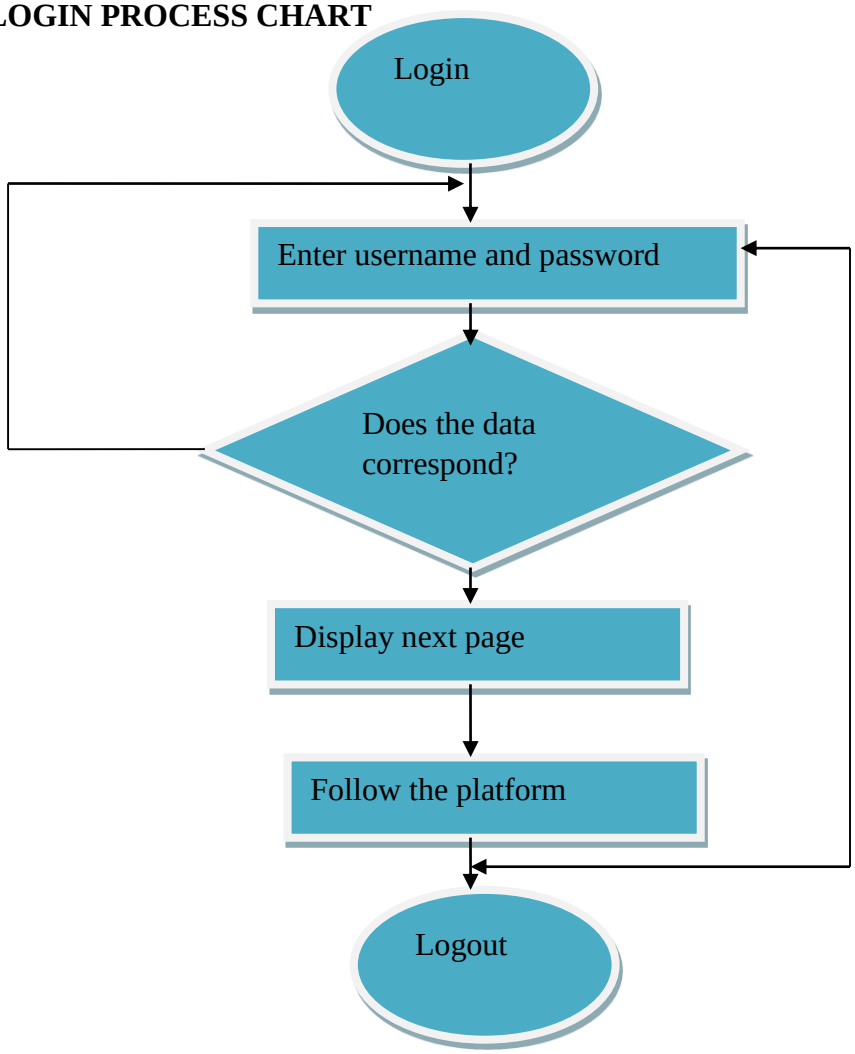


Fig 4.12: Login Process Chart

4.7.2.2 USERS SIGN-IN FORM

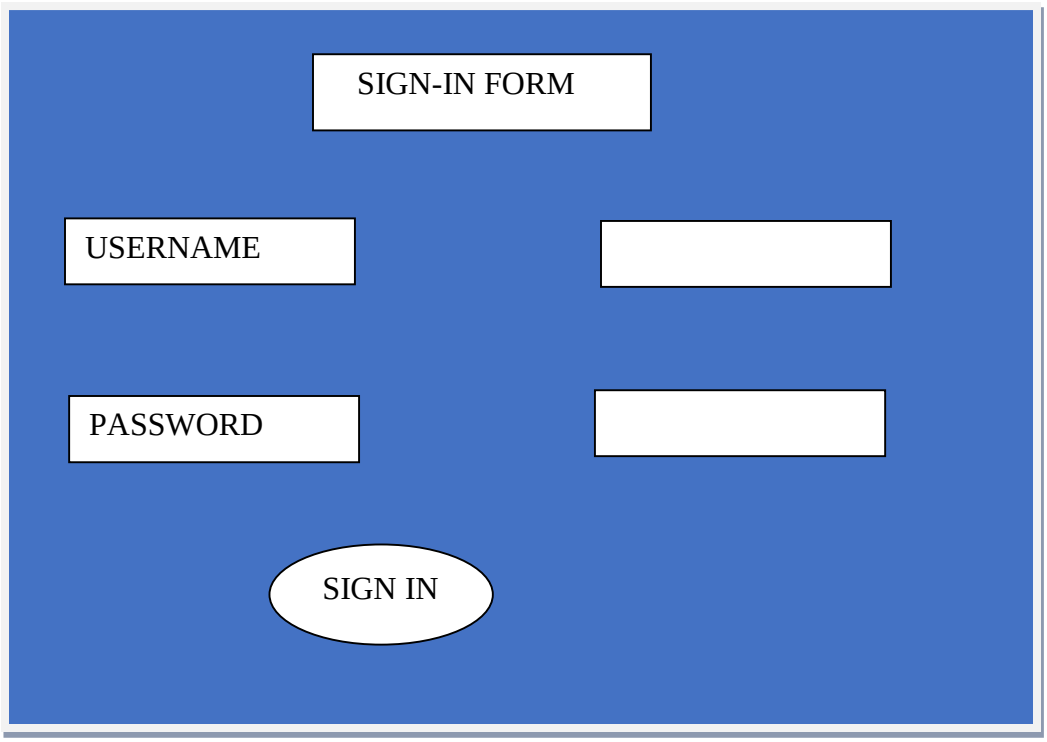


Fig 4.13: users sign-in form

4.7.2.3 ADD ASSETS FORM

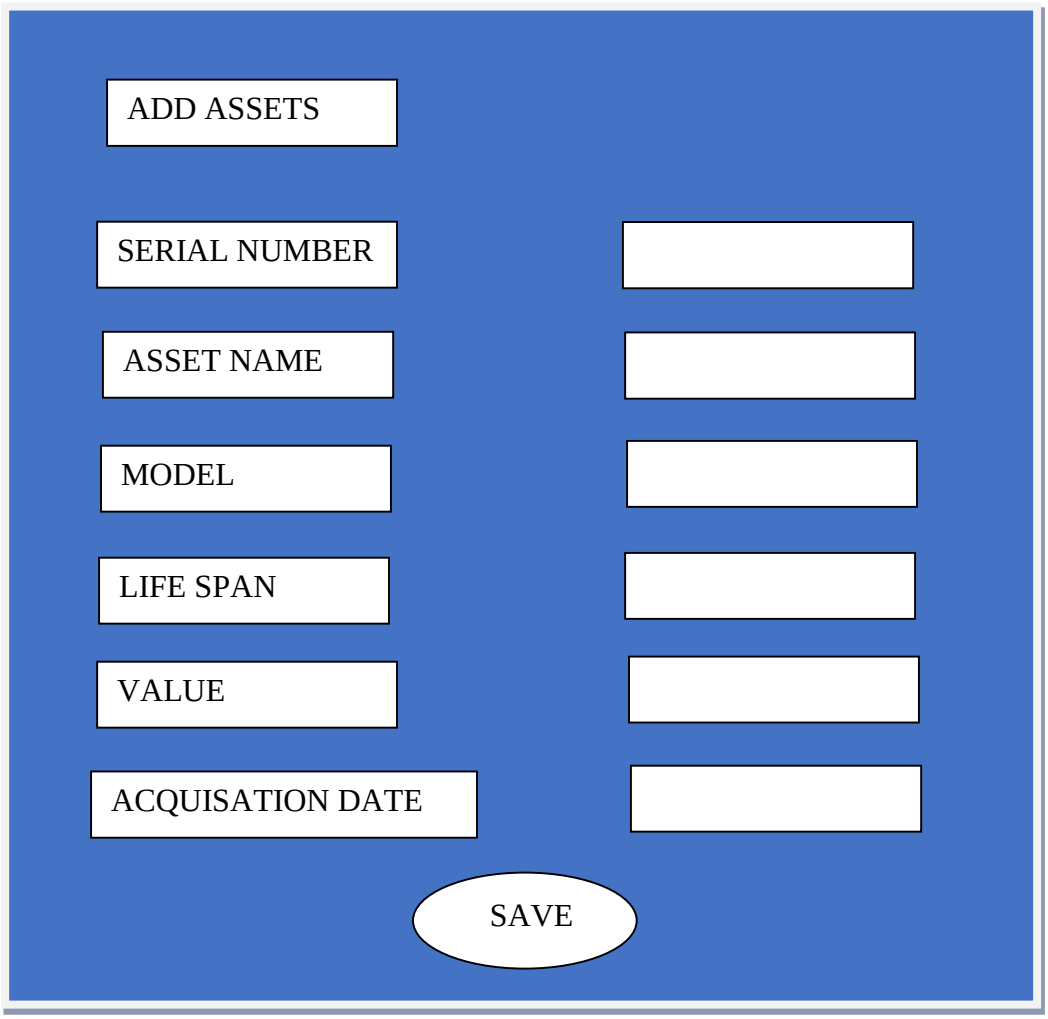


Fig 4.14: Add assets form

4.7.2.4 SEARCH ASSET FORM

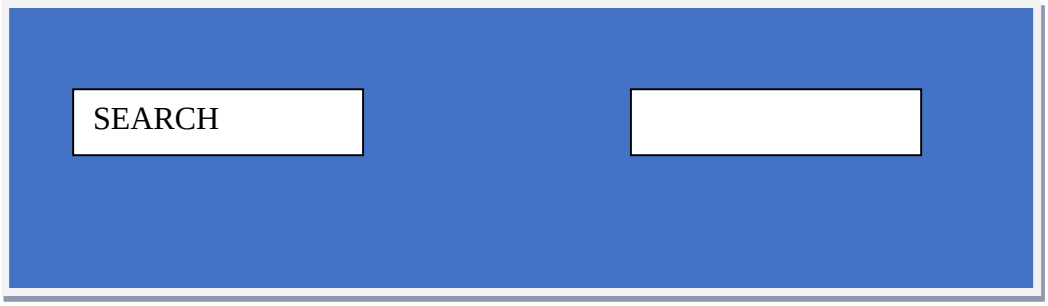


Fig: 4.15: Search asset form

4.7.2.5 EMPLOYEE FAULT REPORT

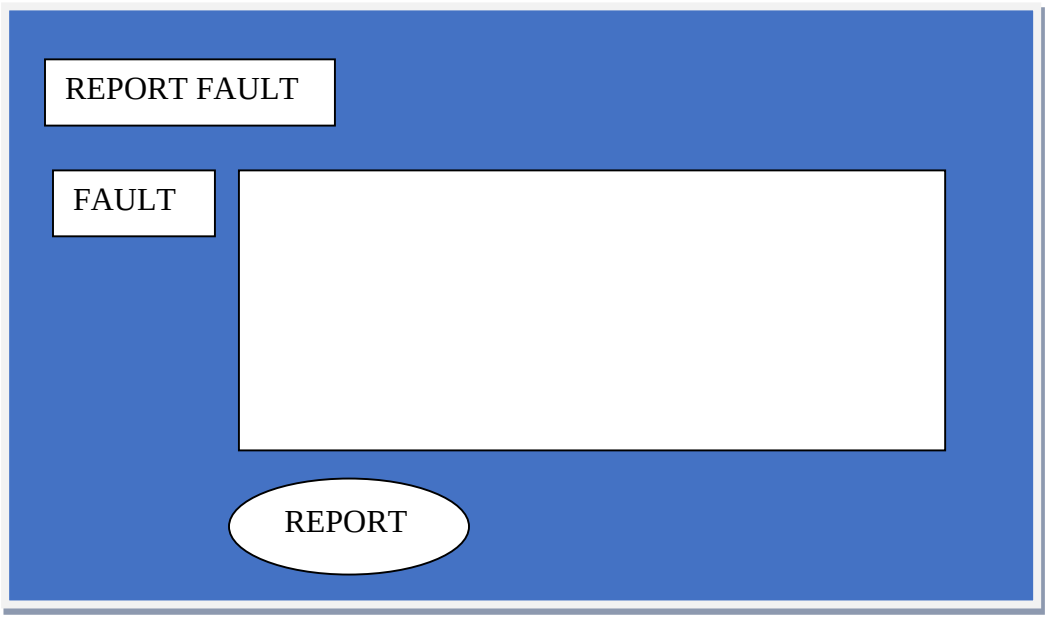


Fig: 4.16: Employee fault report

4.7.2.6 ADMIN ASSIGN FAULT FORM

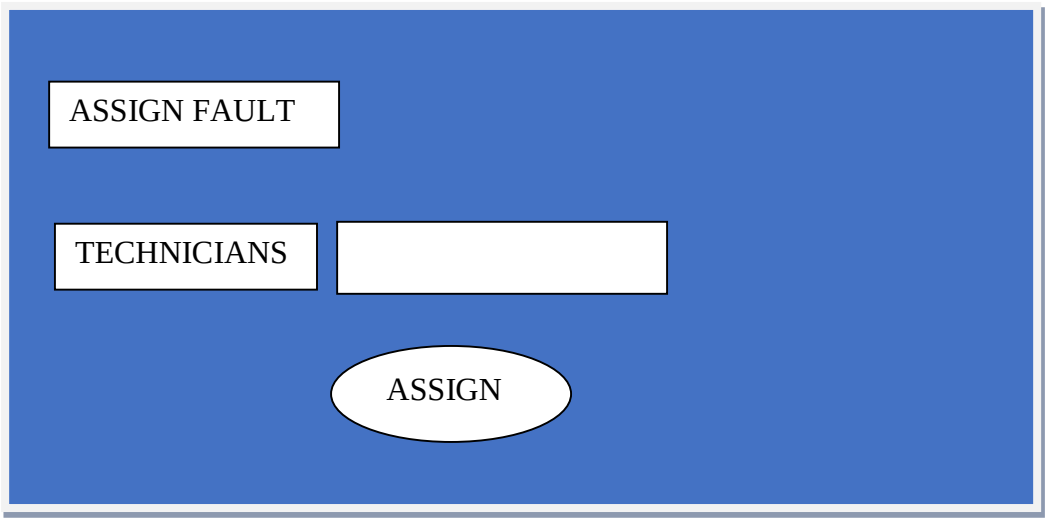


Fig: 4.17: Assign fault form

4.7.2.7 CHANGE PASSWORD FORM

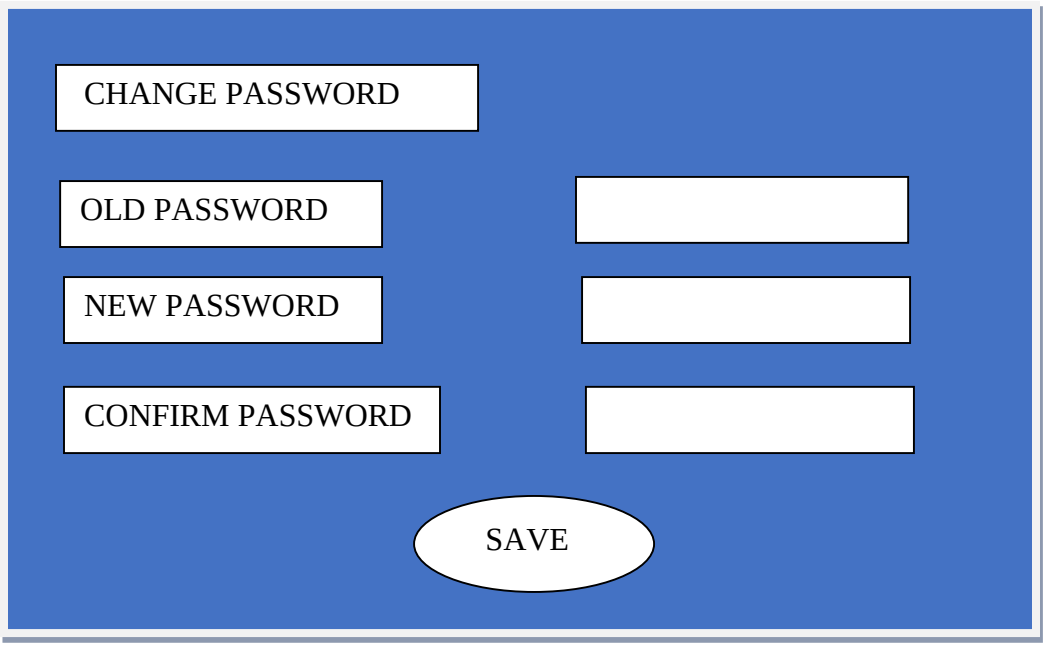


Fig: 4.18: Change password form

4.7.3 OUTPUT DESIGN

Rosenblatt (2013) defined output design as a formally corresponding outcome feature to the input information generated by the system. Output design is regarded as the chief aspect measure in determining how the system behaves when populated with the relevant behaviours. Its central objective is to discharge pertinent, valid and precise output at the right time. Below shows the output design of the system.

4.7.3.1 USERS INCORRECT SIGN-IN DETAILS

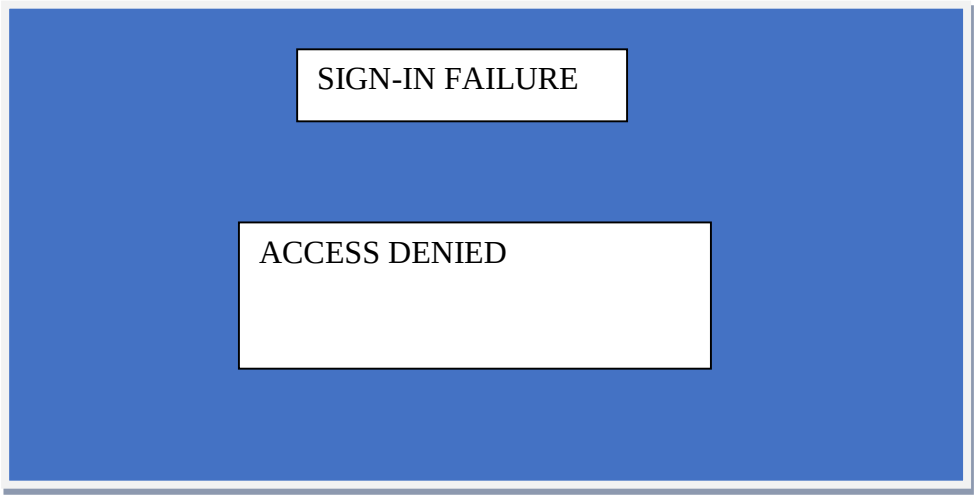


Fig 4.19: Users incorrect sign-in details

4.7.3.2 ASSETS SAVED

Fig: 4.20: Assets added successfully

4.7.3.3 EMPLOYEE FAULT ASSIGNED REPORT

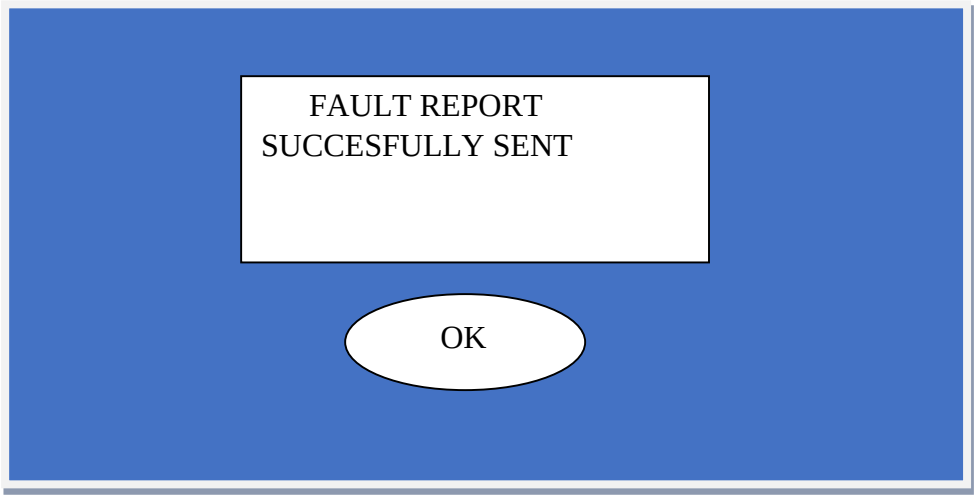


Fig: 4.21: Fault assigned

4.7.3.4 ADMIN FAULT ASSIGNED REPORT

Fig 4.22: Admin fault assigned report

4.7.3.5 PASSWORD CHANGED SUCCESSFULLY

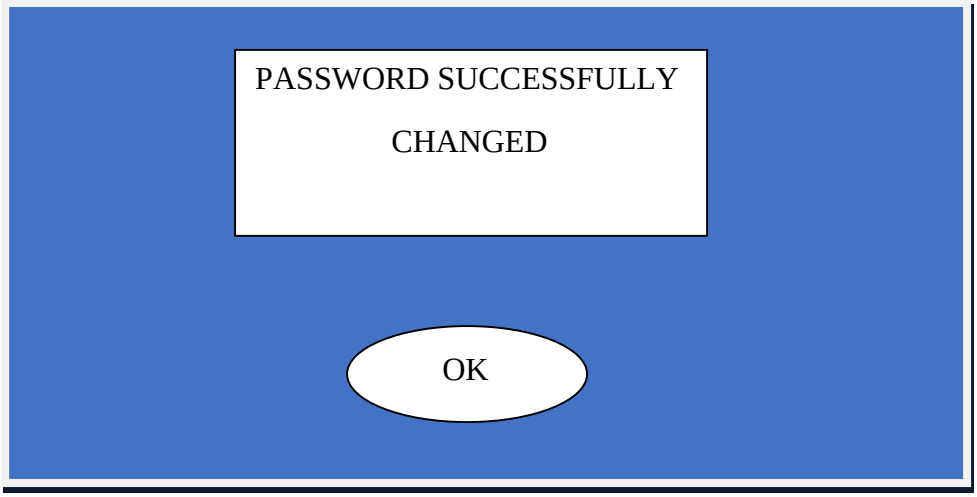


Fig 4.23: Password changed successfully

4.8 PSEUDO CODE

The translation of program specifications into system instructions (programs) by the programmer is referred to as the coding. System instructions are then transformed into control specifications through the processor language support. These instructions manipulate the movement of data and manages the entire program. Pseudo code will then succinctly climax the execution process of the modules. The pseudo code is described by its readability depiction of how a computer algorithm must behave and is officially expressed in a designed accepted language that is comprehensible. Below shows the pseudo code (Goel, 2013).

4.8.1 STAFF LOGIN

The Systems Administrator, I.T technicians and employees are prompted by the pseudo code to input their correct username and password for them to be granted access to the menus otherwise access may be denied.

If password and username equals **then**

Access to the menus granted.

4.8.2 INCORRECT LOGIN DETAILS

The system may deny access to the staff in the event that the aforementioned username and password is incorrect. The pseudo code will be represented as follows.

Else

Access denied (incorrect password and details).

4.8.3 ASSET RECORD UPDATED

The system will update the asset record in regards to the conditions set in the pseudo code as follows.

If assets lifespan equals number of years stated **then**

Remove asset and update the record

Else

Save asset information.

4.8.4 DATABASE CONNECTION

Confirm whether the database connection is set. Pseudo code below showing database connection.

If connection is unreadable **then**

Set the connection

Else

Administer

4.9 SECURITY DESIGN

Security design is referred to as the architecture artefacts that entails the positioning of the security controls and how well do they relate to the overall security design (Norman, 2014). Security controls main objective is to maintain eminence attributes of the system. These attributes may include confidentiality, availability and integrity. The enforcement of authentications when logging to the system is so vital and the safeguarding of information to the non-privileged. The security rule is a declaration that summaries how entities access each other, the different operations

undertaken by each entity, the protection level essential to the system and the procedures enforced when none of the requirements are met (Evans, 2010).

4.9.1 PHYSICAL SECURITY

Physical security reveals the measures intended to safeguard the physical safety of I.T assets like services, equipment, employees, resources and other related possessions from impairment and unconstitutional physical access (Kizza, 2017). In regard to the asset management and fault rectifying system a backup of assets records might be necessary and encrypted with passwords on the network to prevent unauthorized access to the non-privileged. Maintaining locking of devices responsibly can also be done. Failure to enforce physical security, information, software, user access and network security will be challenging if not impossible to initiate. Security is of vital importance and a key fundamental to all security efforts. Physical security measures are undertaken in order to guard the I.T assets from threats that may be in the form of theft, fire, vandalism and natural disasters.

4.9.2 NETWORK SECURITY

Network security involves monitoring, controlling and protecting the usability and integrity of the network and data itself (Kizza, 2017). A network is regarded as a set of interlinking lines resembling a network of roads therefore authorizing security access of data to a network is valid. The system administrator might be responsible for ensuring authentications to employees when accessing data in the local network through improvising E.C id numbers as their username and encrypted password of their own choice given specified parameters. All network traffic passing in and out maybe monitored by the system administrator. Therefore each network security layer implements rules and controls. As a result only authorized users gain access to the network resources and restrict those who are less privileged from carrying out exploits and threats.

4.9.3 OPERATIONAL SECURITY

Operational security involves the protection of unclassified information that can be used to pose threat to the organization (Norman, 2014). The protection of information must be a mandate and thereby denying the adversary an ability to act. Its core objective is to safeguard and ensure a secure working environment on a daily bases. These information should be best secured on a daily basis. The communications made by the organisation using emails, telephones, posts on social network site and blogs must be secured against an adversary. Operational security is also employed

best to cover accidental misconfigurations that are likely to occur when a network route is mistyped.

4.10 CONCLUSION

Conclusively this phase highlighted all the fundamental features of how the proposed system will work and reviews all its associated database design and program structures. The dataflow diagram showing the flow processes of the proposed system. The architectural design described in its contextual format. Security design features of the system also enforced. This stage proves to be the guide in the assembly of the ideally proposed system. The testing will be initiated in the implementation stage to follow.

CHAPTER FIVE: IMPLEMENTATION PHASE

5.1 INTRODUCTION

Implementation phase involves building processes originated from the design phase. This implicates the moving of an idea from concept to reality. Major steps that are to be covered include the coding, testing, installation and maintenance strategies. Coding will incorporate the writing of computer software code by the programmer. Testing carried out in-order to do away with the unnecessary bugs. Data migrated, system changeover strategies put in place as part of the installation. Actions performed (that is faults correction, system performance improvement) to keep the system functioning or in service as part of ongoing maintenance.

5.2 CODING

The translation of program specifications into system instructions (programs) by the programmer is referred to as the coding (Goel, 2013). System instructions are then transformed into control specifications through the processor language support. These instructions manipulate the movement of data and manages the entire program. Pseudo code will then succinctly climax the execution process of the modules. The pseudo code is described by its readability depiction of how a computer algorithm must behave and is officially expressed in a designed accepted language that is comprehensible.

5.3 TESTING

Testing gradually entails performing a test to examine a session in the system product under extreme conditions to evaluate its durability and experimentation to determine which unit cause effects when executed (Jawadekar, 2013).This is the practice by experiment and observations to verify a causal relationship between units. A test plan is executed right after the translation of program specifications into system instructions (programs) that is codification. Output of a given trial run must equal the projected results. Several testing strategies are compiled to assess the system functionality. These strategies include the unit testing, module testing, integration testing and acceptance testing. **The Fig: 5.1** below shows the testing methods.

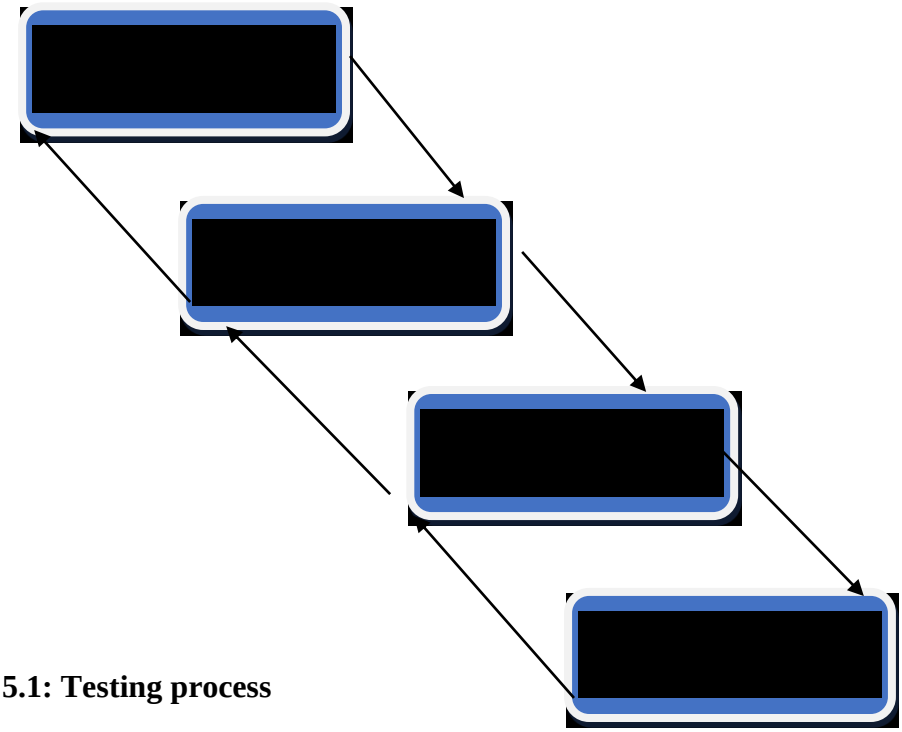


Fig 5.1: Testing process

5.3.1 UNIT TESTING

Unit testing requires a test performed to examine a session in the system product of a singular cluster of interconnected units (Jawadekar, 2013). Unit testing strategy is classified under white box testing. This is the practice by experiment centered on inspecting the inner system structure. Output of a given trial unit run must equal the projected results. Verification to the code is checked against the design specifications. The system programmer is the one responsible for the checking and monitoring that a unit trial run is yielding or equaling the anticipated results. The **fig 5.2** below demonstrate the password changing unit of the login process. The password was successfully created with a strong password consisting of not less than 8 characters including special characters.

Fig 5.2: Change password created

5.3.2 MODULE TESTING

Module testing is the experimentation to determine which module of the proposed system cause effects when executed (Jawadekar, 2013). A section of a program is checked .Module testing surpass the unit testing in that the process involves a group of combined elements checked together. The testing process is interchanging. Therefore output of a given trial module run is checked against the projected results. The module run test must equal the projected results and its measurement is performed in accordance with the objectives of the proposed system. The module test run on fault reported by employees was tested and equals the anticipated results. Fault reporting managed to reach to the intended recipient. The **fig 5.3** below shows the results of the reported fault made by employee on the window form of the systems administrator.

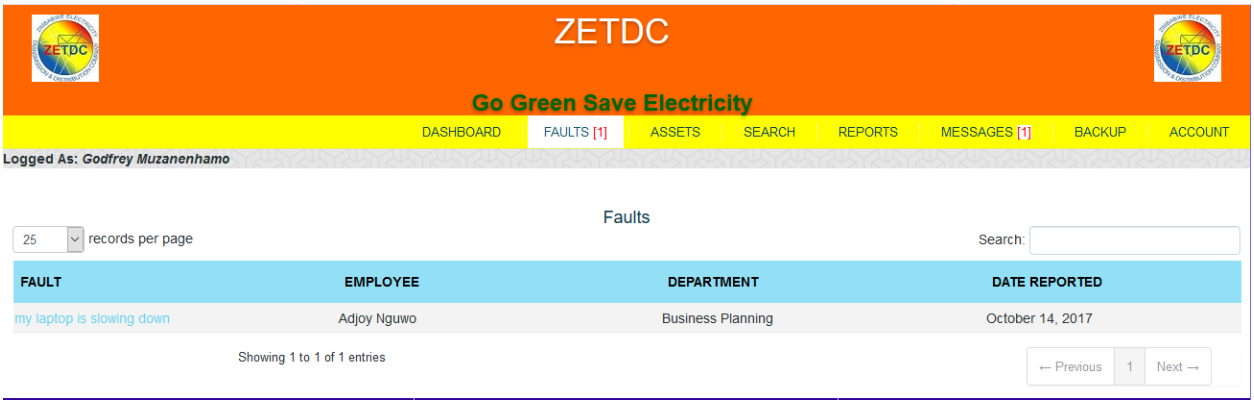


Fig 5.3: Fault reporting

5.3.2.1 TESTING ASSET LIFESPAN

The specified asset life span was tested against the number of years the asset has survived and the following anticipated results were obtained. The results shows that the asset is now ready to be disposed.

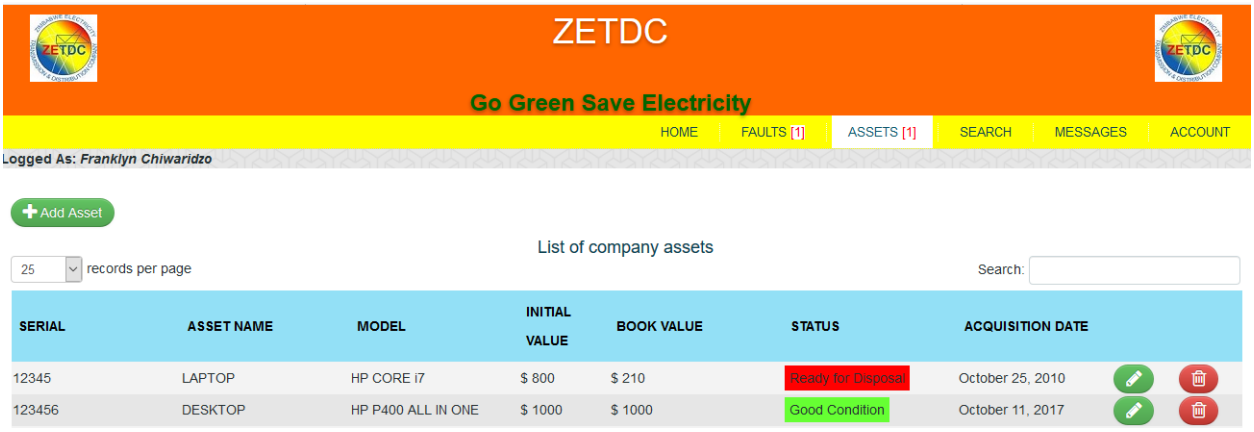


Fig 5.4: Testing asset lifespan

5.3.3 INTEGRATION TESTING

Integration testing gradually involves performing a test to examine a session in the system product under extreme conditions to evaluate the relations among a section of modules and observing whether these modules are yielding the anticipated results in-order to ensure system interoperability (Jawadekar, 2013). Its primary objective is to assess and observe whether a section of modules wield well when mutually executed.

5.3.4 ACCEPTANCE TESTING

Acceptance testing requires a test performed to examine a session in the system product of both functional and non-functional requirements of the system (Kendall and Kendall, 2013).It is the ultimate strategy that conclude the testing process of the system. System users discourses remarks on the product before its implementation. An ideal system is then worked out. Acceptance testing strategy is classified under black box testing.

5.3.5 SYSTEM TESTING PROCEDURES

System testing is described as a testing procedure undertaken to certify that a total engagement of the system product in diverse environments proves the system workability. This argument simply state that the system still works after being introduced in diverse environments. The system testing process incorporates two essential activities which are the validation and the verification. The verification and validation processes ensures that the product meets the requirements and ensures that the product is an ideal product anticipated by users respectively. These two processes are then used to determine the well-being of the system, its proper functioning. The validation and verification processes will be shown below.

5.3.5.1 SYSTEM OBJECTIVES SOLUTION

System objectives are anticipated finale results adhered to be achieved by the system (Pettinga, 2014).The figs below shows the proposed system objectives as they were meet accordingly.

5.3.5.1.1 OBJECTIVE 1

Monitoring and maintaining assets record by adding new acquired assets by name, value, serial number and acquisition date.

Solution (a)

Testing the system by observing and checking assets regularly over a period of time and keeping them in good condition.

Fig 5.5: Screen shot for objective 1

5.3.5.1.2 OBJECTIVE 2

Calculating the current book value of assets over their depreciating period for the purpose of disposing them. As well as monitoring the life span of assets by displaying automatic alert messages and searching assets according to periods.

Solution (b)

Testing the initial book value of any asset over its depreciating period in-order to determine whether any asset can be removed or kept. As well as displaying automatic alert messages on assets that require attention before their lifespan expires and also on those that are ready to be disposed.

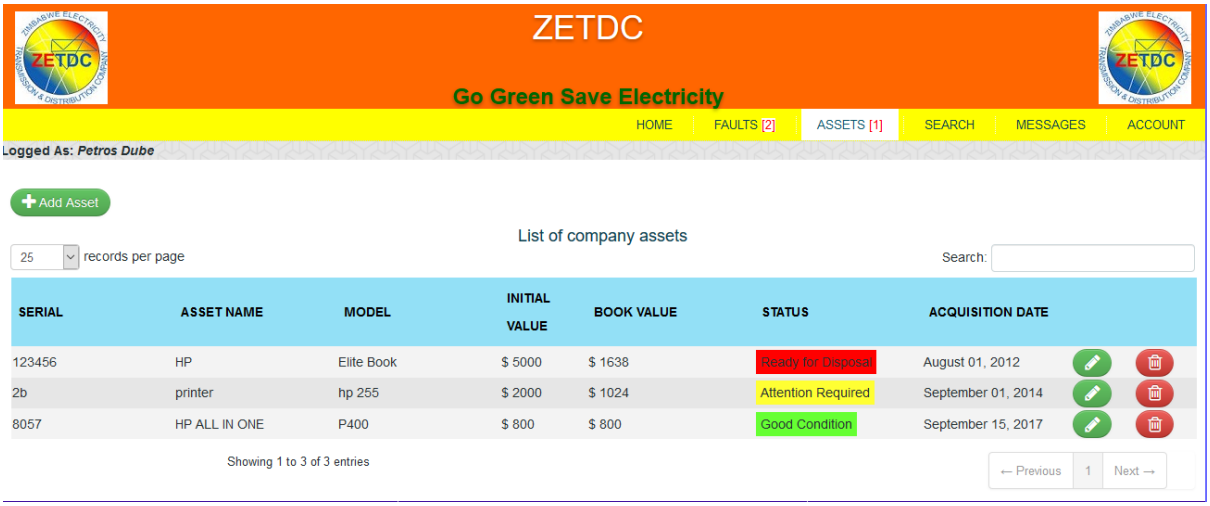


Fig 5.6: Screen shot for objective 2

5.3.5.1.3 OBJECTIVE 3

Displaying automatic alerts messages on assets ready for disposal in-order to transform maintenance and operational performance and enabling file sharing on assets records.

Solution (c)

Testing whether maintenance operations are undertaken by reviewing alert messages on assets ready for disposal.

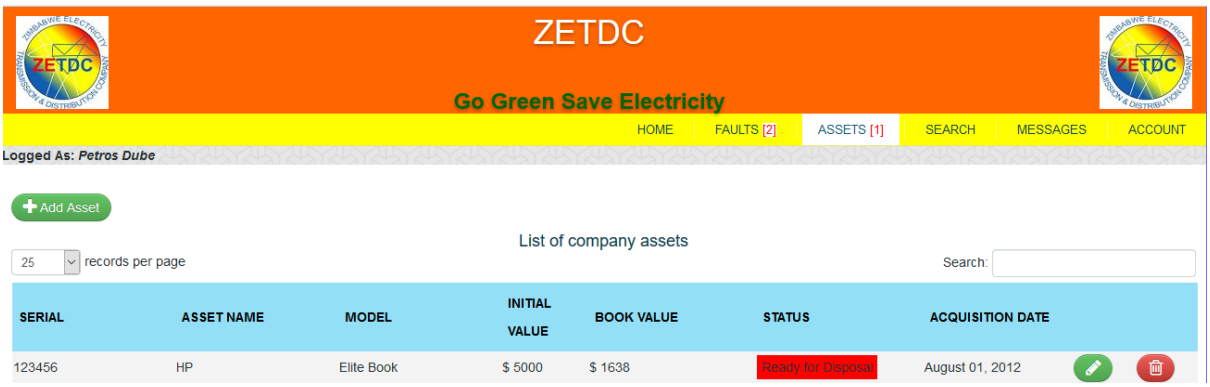


Fig 5.7: Screen shot for objective 3

5.3.5.1.4 OBJECTIVE 4

Facilitating fault reporting by users via web real time communication.

Solution (d)

Testing whether users can send requests on faults reported.

Fig 5.8: Screen shot for objective 4

5.3.5.1.5 OBJECTIVE 5

Assign and monitor fault teams to specific locations.

Solution (e)

Testing whether faults can be assigned to the available technicians by the system administrator.

Fig 5.9: Screen shot for objective 5

5.3.5.1.6 OBJECTIVE 6

Tracking login trails of users

Solution (e)

Testing login and logout trails by users.

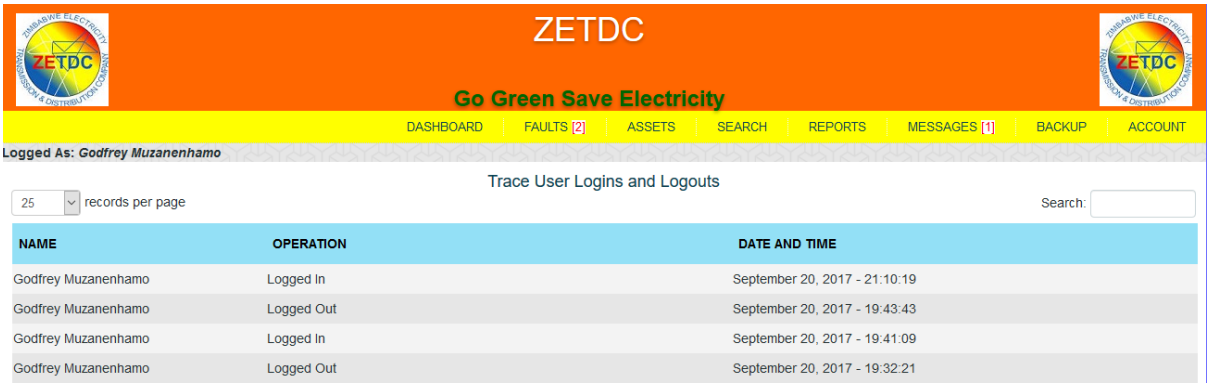


Fig 5.10: Screen shot for objective 6

5.3.5.2 VERIFICATION

The exercise that encompass identifying whether anticipated results are achieved in-line with the system objectives is referred to as verification (Patel, 2014). Its primary objective is to assess and verify whether the system product anticipate as scheduled by the projected results section. This is the act to verify whether the system programs are executing very well. Verification was done after checking the results of the modules in the module testing. Anticipated results obtained in-line with the system objectives.

5.3.5.3 VALIDATION

Validation ensures that the product is an ideal product anticipated by the users. The structure of the system product should epitomize the exact ideal product awaited by the users (Patel, 2014).The system layout must fit to the awaited standards to be discoursed by the users. The authentication of the system must be checked and tested .White box testing and black box testing prescribed to enrich the validation process. The process of validation is then used to verify that the output of a given test run must equal the proposed results.

5.3.5.3.1 PASSWORD VALIDATION

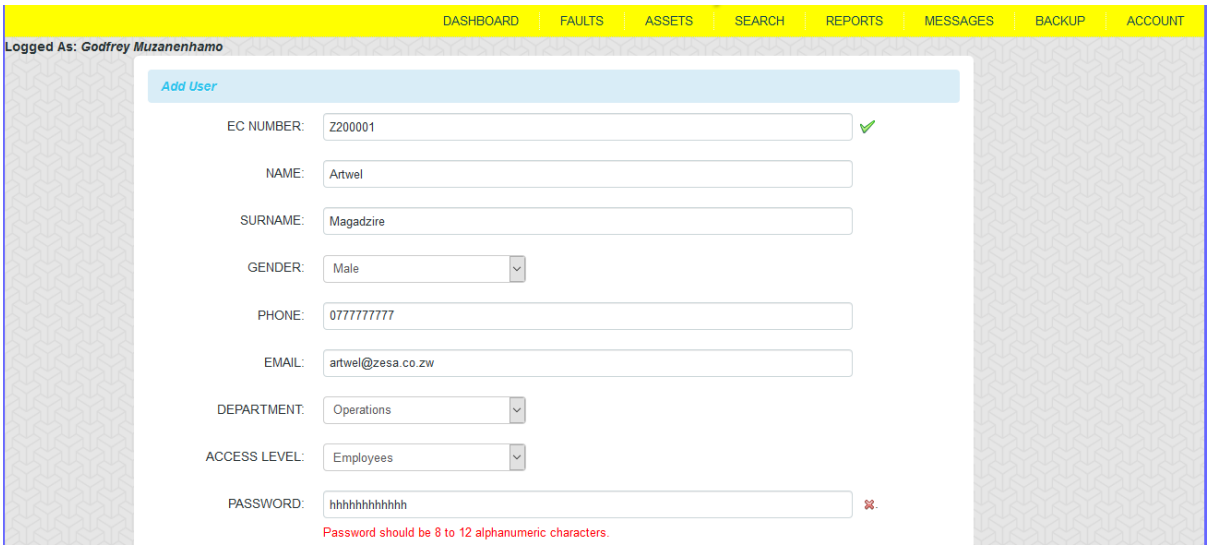


Fig 5.11: Password validation

The system validates the password by ensuring that only alphanumeric characters are accepted by the system.

5.3.5.3.2 DATE VALIDATION

Fig 5.12: Date validation

The system validates the date by ensuring a click on the date button shown by the calendar. The system do not allow the users (Technicians) to type the date.

5.4 INSTALLATION

The act of installing the whole software product is referred to as the installation. The progression process of installation arisen after a further test run of the system on diverse environments was performed and passed given the output test run results equaling the anticipated results. This qualified the software product installation process also known as the conversion arena (Kendall and Kendall, 2013). It involves the supplanting of the entire current system with the newly proposed software product. The installation process constitute system changeover strategies which comprises of the pilot changeover method, direct changeover method and the pilot changeover method. The pilot changeover strategy is the one preferred to be used within the ZETDC asset management and fault rectifying system. Procedures on how to install the package must be attentively adhered which include mounting of the disk first and the recording of files.

5.4.1 PILOT CONVERSION METHOD

Pilot conversion strategy is referred to as a changeover strategy that involves the proposed software product executing using sufficient data from part of the system and then compare results with those of the supplanted current system (Kendall and Kendall, 2013). The strategy implicates the rolling out of the lately new proposed system to the minor cluster of users (the management and system developers) who are then responsible for testing and assessing the results. The management and system developers then provide feedback on the product to ensure that a perfect match of the results equal the anticipated outcome. As soon as the management and system developers qualifies the system, the dissemination of the system across various departments of the organization is then conducted. Pilot changeover strategy also supplant the replacing of the old system at a diminutive level. The **Fig 5.13** below shows the pilot changeover strategy.

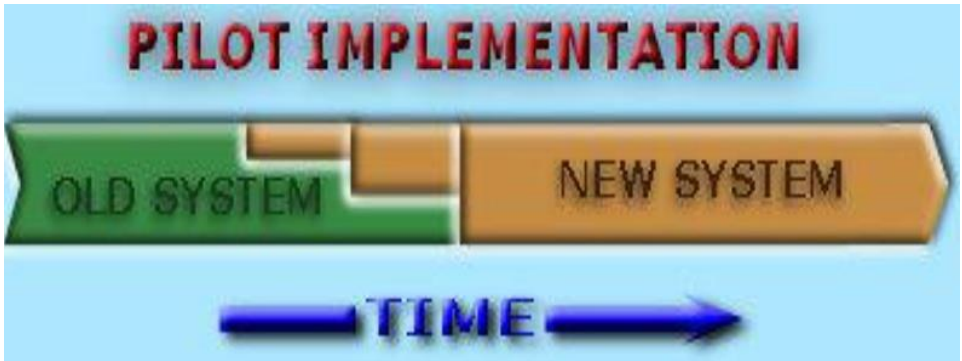


Fig 5.13: Pilot conversion method

5.4.1.1 ADVANTAGES

- Risk is at its minimum level as compared with direct changeover strategy and fear of the unknown by employees is also at its lowest level (i.e. employee resistance).
- The loss of data is abridged
- The edification room for assessed results is possible. An update can be made.

5.4.1.2 DISADVANTAGES

- Greater attention by the management and software developers is needed at its highest level when assessing the results obtained after installation.
- Pilot changeover strategy requires significant amounts of time.
- Liable to failure after proving its workability on the pilot ground.

5.4.2 DIRECT CHANGEOVER METHOD

Direct changeover strategy is denoted as a changeover method that involves the complete supplanting of the long-standing current system with the lately new proposed system (Kendall and Kendall, 2013).This is the complete removal of the long-standing current system. The lately new proposed system will supersede the old system. In other words that is to displace in favor of another. The **fig 5.8** below shows the direct changeover strategy.

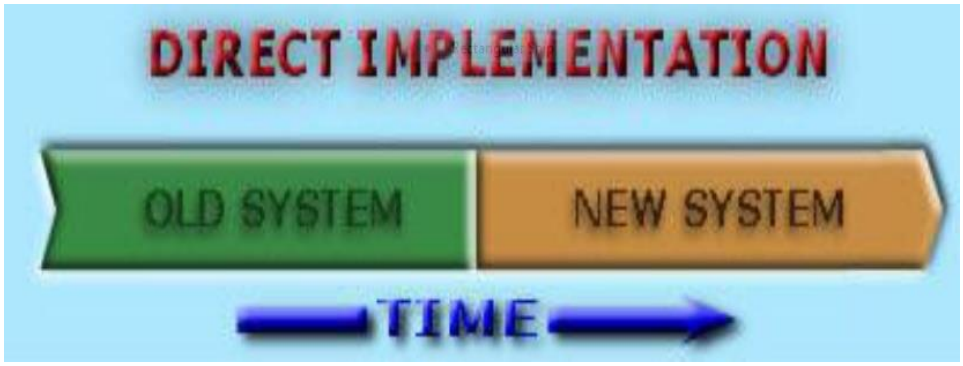


Fig 5.14: Direct changeover method

5.4.2.1 ADVANTAGES

- Direct transition method is associated with little misperception, everything is just new form the word start.
- Direct transition is also associated with low costs to the organization

5.4.2.2 DISADVANTAGES

- Direct changeover strategy does not give the room for the management and system developers to assess to the outcome, therefore the transition is prone to perform in blunders.
- In the event of a system failure data might be mislaid.

5.4.3 PARALLEL CHANGEOVER METHOD

Parallel changeover strategy is symbolized as a changeover method that encompasses the simultaneous executing of both the long-standing current system and the lately new proposed system for specific defined period (Kendall and Kendall, 2013). Performance of the two system is then assessed and a conclusion drawn forth (Rosenblatt, 2013).The **fig 5.9** below shows the parallel changeover method.

Fig 5.15: Parallel changeover method

5.4.3.1 ADVANTAGES

- The processing of equally multiple tasks at the same time can initiates the appraisal judgment of performance between the two systems.
- High level of low risk and promotes feedback.
- The instance of losing data is minimized, therefore no operations can be ceased.

5.4.3.2 DISADVANTAGES

- The parallel changeover strategy attracts huge sums of money. In other words the strategy is too cost to undertake.
- The parallel changeover strategy requires significant amounts of time and therefore they is a lot of efforts duplication. The involvement of two system operating at the same time with

the same data causes efforts to be duplicated and this consumes unnecessary time resource wasting.

5.4.4 RECOMMENDATION ON CHANGEOVER STRATEGIES

The pilot changeover strategy is the one preferred to be used during the ZETDC asset management and faults rectifying system deployment. It is very precisely and objectively to use pilot strategy after having obtained information (i.e. weaknesses and strength) from different changeover strategies mentioned above. With the pilot changeover strategy, the lately new proposed system can be tried out at the test ground before its dissemination across various departments of the organization. Pilot changeover is less expensive as compared to the other strategies and allows room for edification and the organization can run the lately new proposed system just next to their long-standing current system but on a lesser scale. In conclusion pilot operation is the most preferred strategy to undergo.

5.5 MAINTENANCE

Maintenance is defined as the actions performed to keep a continual perfections to the system functionality (Rosenblatt, 2013).The collection of organized modules tested and installed earlier after being assessed also requires to be monitored and checked for in the long run. These modules are capable of encountering blunders during their operational lifecycle, therefore to keep a constant checkup (i.e. maintenance) of the system in its working environment is of utmost importance. These blunders in form of errors, faults, requires to be addressed and solved-out. The maintenance phase is regarded as a continual process that cannot be dealt away with but enforced continually in the operational life cycle of the system. System reviews, examination and monitoring are done during the system operation. Maintenance scheduling starts just after the deployment of the ZETDC asset management and fault rectifying system. Three maintenance strategies are catered for which include the perfective maintenance strategy, the corrective maintenance strategy and the adaptive maintenance strategy.

5.5.1 ADAPTIVE MAINTENANCE

Adaptive maintenance is a maintenance strategy performed to keep a continual perfection to the system product by altering it in-order to counterpart nonconformities in the interminably changing environment (Rosenblatt, 2013). The altercations made include the transition of the physical units

and the changing of the functioning environment. The strategy to modify the product certify the conditions that suit the ever varying environment.

5.5.2 CORRECTIVE MAINTENANCE

Corrective maintenance is a maintenance strategy performed to keep a continual perfection to the system product by repairing mistakes that relates to the coding and design and other related breakdowns (Rosenblatt, 2013). A corrective measure is undertaken after errors in the design and coding is noticed. Errors can be noticed just after the employment of the system. The strategy can either undergo planned and unplanned procedures .The planned corrective maintenance is likely to occur as a result of a run to failure maintenance. The process encompasses preventive measures that can be planned in the event that the failure are likely to be encountered in the near time and it is less costly The main objective of corrective maintenance is to keep a constant check-up on errors once they occur in-order to restore the product to its operational condition as anticipated.

5.5.3 PERFECTIVE MAINTENANCE

Perfective maintenance is a maintenance strategy performed to keep a continual perfection to the system product by crafting enhancements to better performance, interface usability and smear preferred features that are not necessarily fundamental features of the system. The main objective of the perfective maintenance strategy is to enhance the response time, user friendly interfaces, system adeptness and consistency (Rosenblatt, 2013).

5.5.4 RECOMMENDATION ON MAINTENANCE STRATEGIES

The corrective maintenance strategy is a better strategy to consider since it consists of several benefits as compared to other maintenance strategies. It is performed to keep a continual perfection to the system product by repairing mistakes that relates to the coding and design, and other related breakdowns. .The strategy can either undergo planned and unplanned procedures .The planned corrective maintenance is likely to occur as a result of a run to failure maintenance. The process encompasses preventive measures that can be planned in the event that the failure are likely to be encountered in the near time and it is less costly. While the unplanned corrective maintenance could be a result of the breakdowns not stopped by preventive maintenance. In conclusion corrective maintenance is the most preferred strategy to undergo.

5.6 RECOMMENDATIONS FOR FUTURE/FURTHER DEVELOPMENT

Future development to software product is a continuing iterative process that requires greater attention throughout the life of the software. Therefore a framework is recommended that involves assessing the asset management and fault rectifying system to better improve the ways in which it operates in-order to cater for the improvements in the near future. Innovative ways for future development are suggested that consist of fault tracking software on assets. In the event that a newly requested or procured asset is made ready to be used in the organization, a fault tracking software can be installed on the gadget (e.g. Computer desktops). This software tracks the over-usage of a gadget, schedule attention on software repairs and checks whether the system is still working properly. This can minimize costs on over maintenance that can be made by the organization.

5.7 CONCLUSION

In conclusion, the testing strategies where performed successfully and gradually produced the anticipated results. Testing strategies that were examined consists of unit testing, module testing, system testing and acceptance testing. Validation and verification of the system enforced to assess the system objectives and the anticipated results respectively. The pilot changeover strategy among others where preferred to be used with competing benefits that where necessary for the better of system deployment .Maintenance strategies enforced also to keep a continual perfection to the system functionality. The ZETDC asset management and faults rectifying system deployment was made possible through the testing examinations that were made by the systems programmers together with the management.

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APPENDICES

APPENDIX A: USER MANUAL

The user manual is a high level view of the functionality of the system. Designed to help users cope up with the easy accessibility of the system. User's manual consists of all set of modules necessary to grant users the right or freedom to access the system. This User manual will presents all the functionality to be performed by the system.

GETTING STARTED

The ZETDC Assets management and faults rectifying system is an electronic system that provides an in-depth and detailed records of newly acquired assets and faults reports. Assets acquired are maintained and monitored by the system, automatically the system schedules attention on assets that needs maintenance and those that require to be disposed. Faults rectification process is instigated as a result of detailed work arising information from users. The I.T department are the ones liable for using the system and they keep a constant checkout on the system for assets and faults management purposes. The www.zetdcAssetsandFaults.co.zw is the ZETDC Assets management and faults rectifying system web address. Upon clicking the URL address, you are then redirected to our home page shown below.

ZETDC ASSETS AND FAULTS HOME PAGE **MENU BARS**

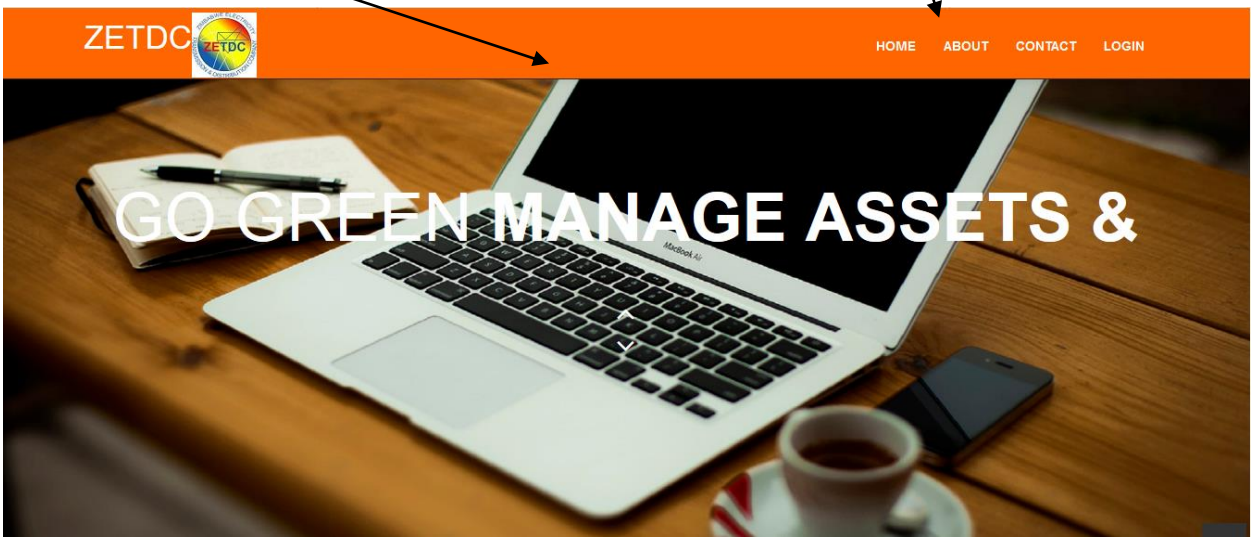

Fig A1: ZETDC assets and faults home page

- The homepage comprises of four platforms the login, contacts, about us and the home. Each menu bar serve a different functionality.

THE LOGIN

The login platform grant access only to those with privileges, for instance the staff members which constitute of the employees, technicians and the administrator. Access is limited to those without the privileges. Access is granted through authenticating users by providing passwords and usernames. The administrator and staff login form below

ADMINISTRATOR AND STAFF LOGIN FORM

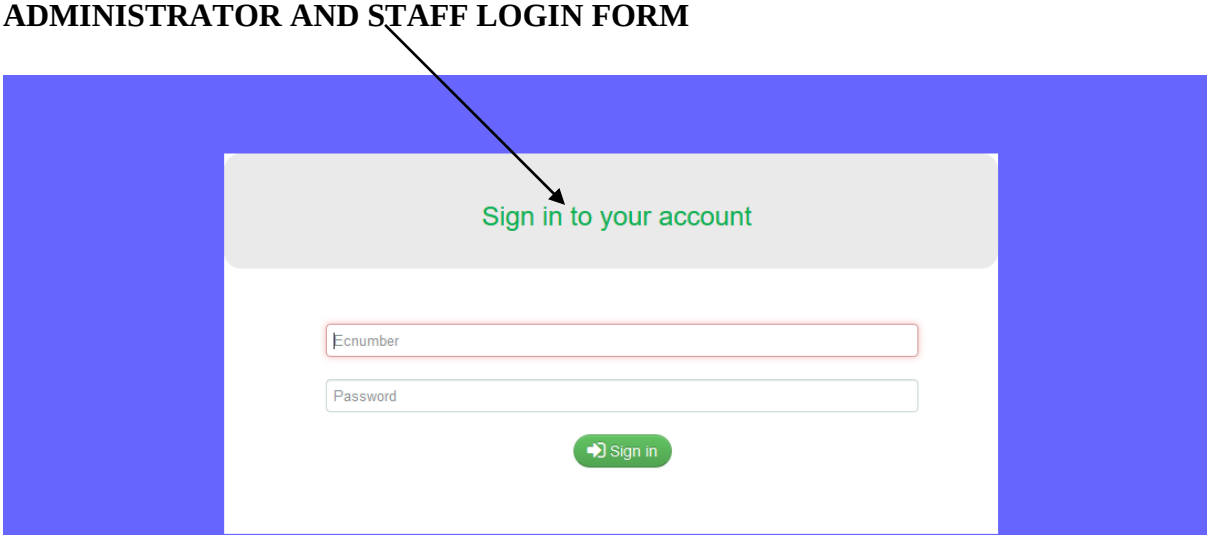

Fig A2: Administrator and staff login

- Upon clicking the correct EC-number and password credentials staff members and the admin are granted access into the system, with full access of all services given to the admin and staffs limited within given parameters.

ADMINISTRATOR HOME PAGE FORM

Fig A3: Administrator home page form

- The administrator controls and monitors all the services that are within the system and partakes full access to all those services offered. The administrator is liable in:
  - ✓ Adding the system users.
  - ✓ Checking faults reported and assigning a technician.
  - ✓ Monitoring assets and reports
  - ✓ As well as tracking user login trails and enable file sharing

ADDING SYSTEM USERS **EDIT** **DELETE**

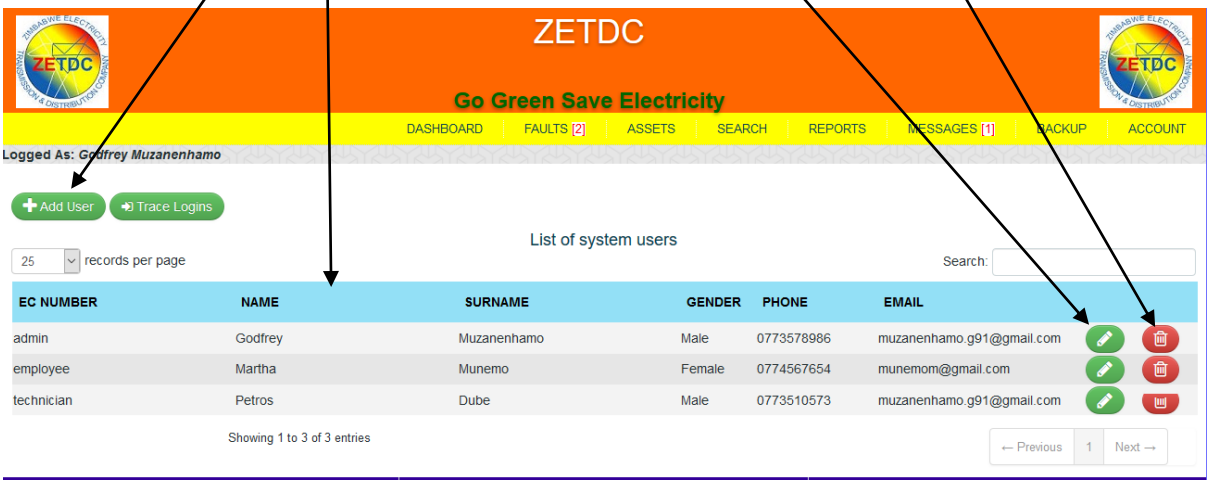

Fig A4: Adding system users

- The add user button consists of the aforementioned fields .i.e. the EC-number, name, surname, gender, phone number as well as the email. These fields can be altered either by editing the changes in phone number and email account or deleting the account of the user.

CHECKING FAULTS REPORTED

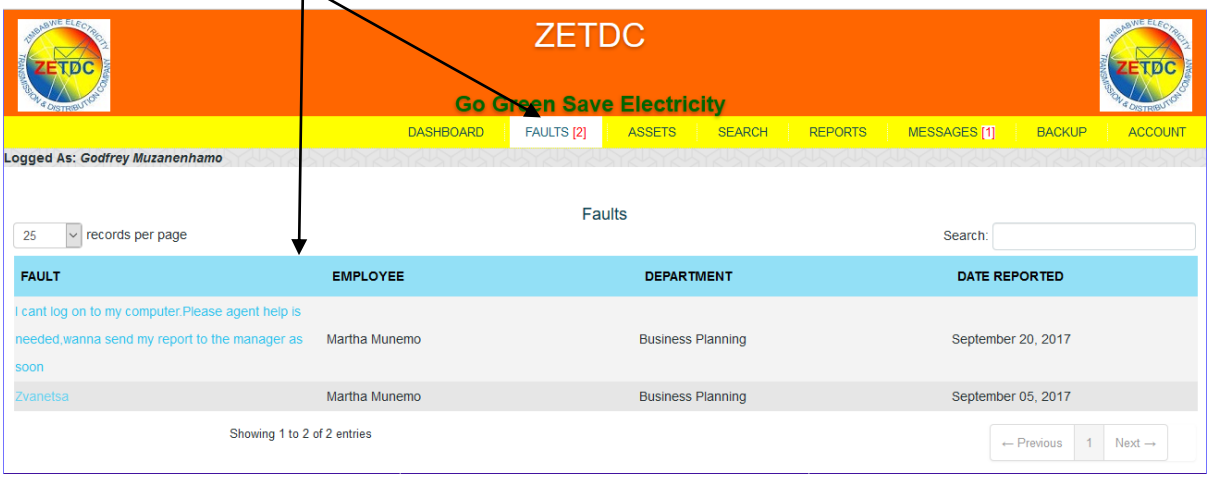

Fig A5: Checking faults reported

- All faults reported are checked by the administrator. This page shows a list of all faults reported by the employees detailing their employee names, department as well as the date reported.

ASSIGNING TECHNICIANS ON FAULTS REPORTED

Fig A6: Assigning technician form

- The administrator assign fault to a technician. The reported fault is the one that is then redirected to a technician available.

LIST OF ALL FAULTS REPORTED (FIXED AND NOT FIXED)

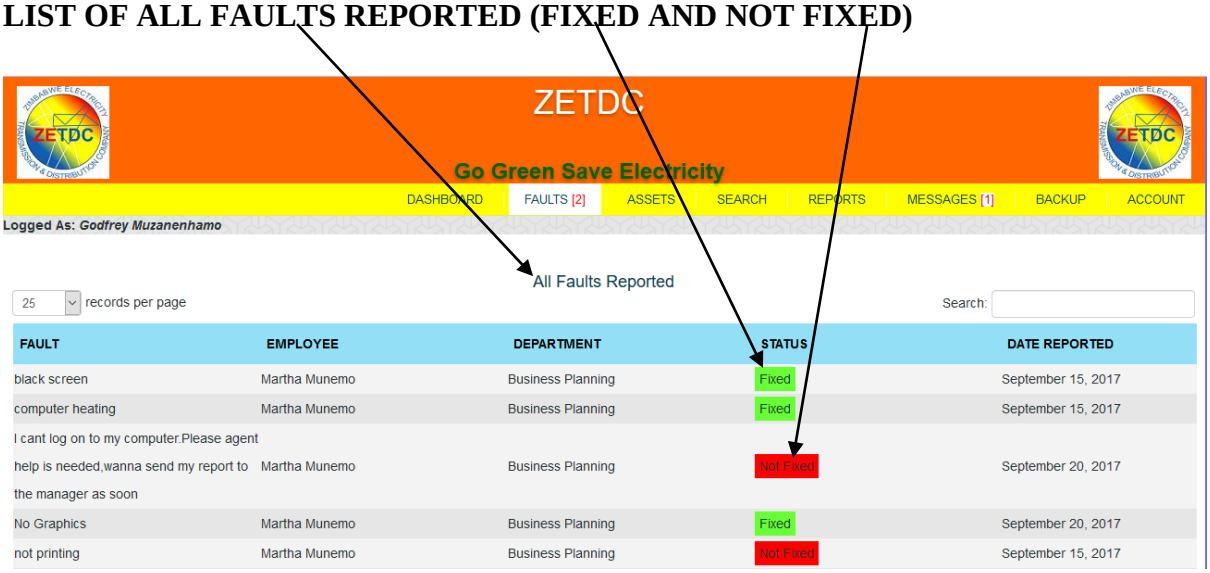

Fig A7:List of all faults reported form

- This page shows all the list of faults reported detailing their status(fixed or not fixed) of each single fault reported and specifying the date reported,employee name as well as the employee department.

MONITORING ASSETS

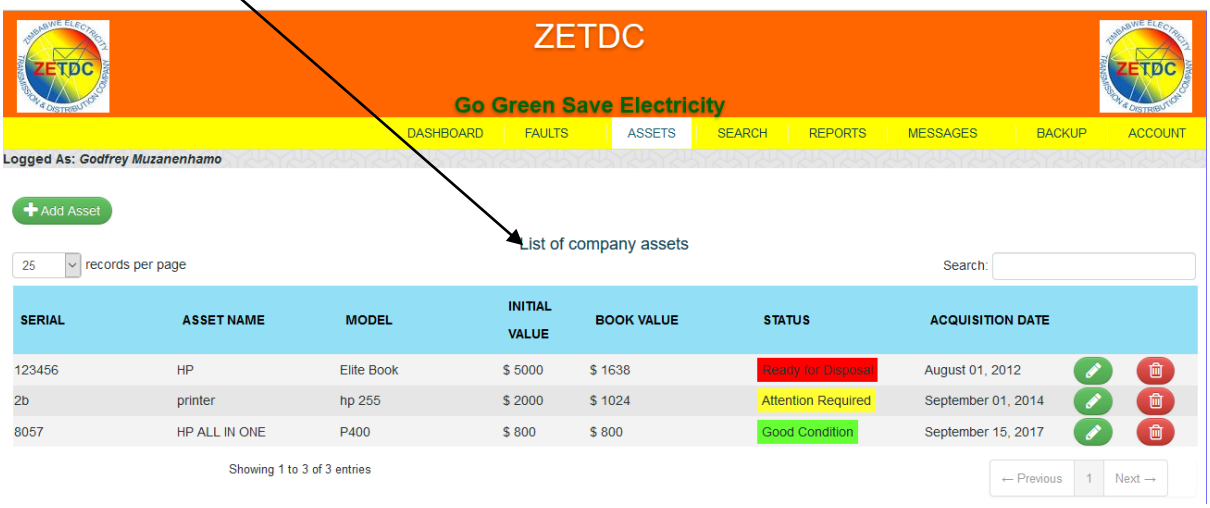

Fig A8:Monitoring assets

- A constant check up on all company assets is done.The system automatically schedule attention on those assets that require to be disposed and those that need a pre-arranged plan.The duty of the adminstrator is to organise a strategic plan on those assets monitored.

ASSETS REPORT

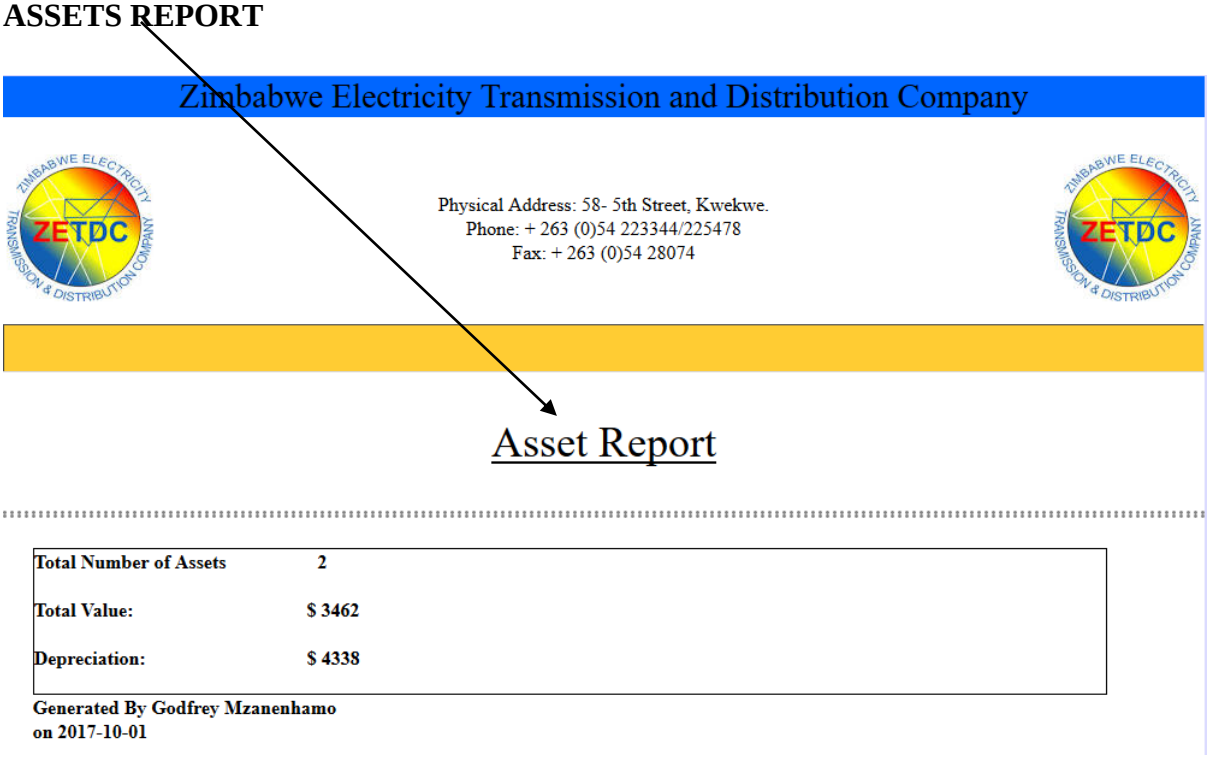

Fig A9: Assets report

- Report of assets showing the number of assets and their value after depreciation.

FAULTS REPORT

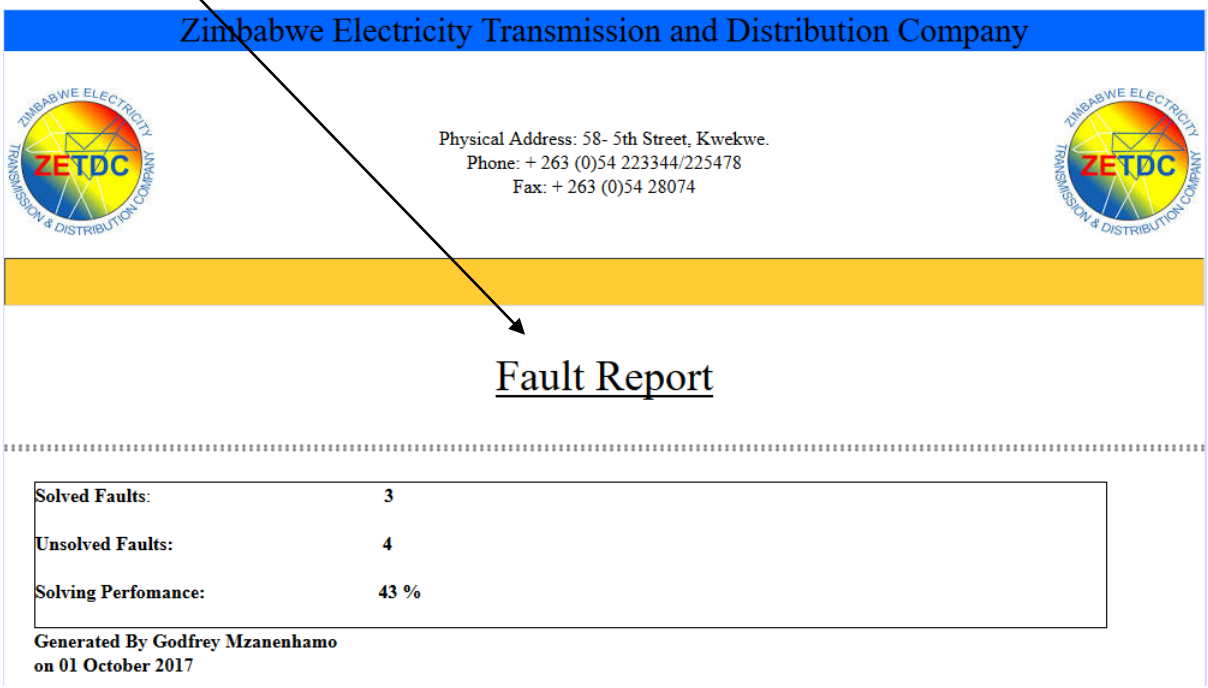

Fig A10: Faults report

- Fault report showing the ratio of solved and unsolved faults, detailing the solving performance in accordance with the number of faults reported in a monthly or yearly basis.

TRACKING USER LOGIN TRAILS

Fig A11: Tracking user login trails

- User login trails can only be checked by the administrator. The dashboard contains the track user platform. By simply clicking the field you will be then directed to the page.

ENABLING FILE SHARING ON DOCUMEMENTS

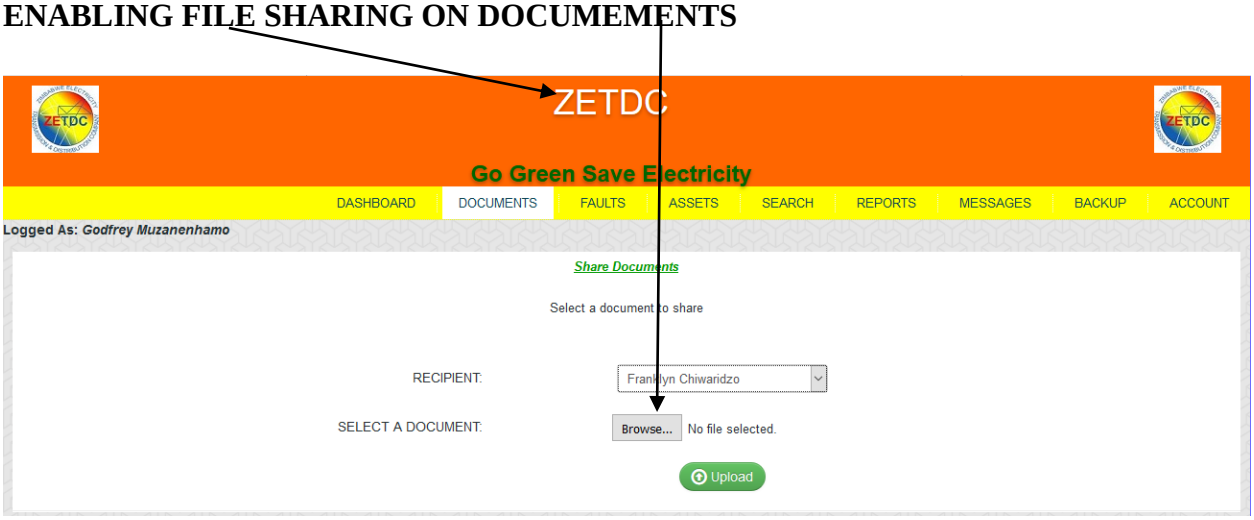

Fig A12: Enabling file sharing on documents

- The administrator can upload a document and share it to the Technician for management purposes. The document is simply shared by clicking the upload button on the documents section.

TECHNICIAN HOME PAGE FORM

Fig A13: Technician home page form

- The technician performs the following responsibilities i.e.:
  - ✓ Resolving assigned fault
  - ✓ Adding assets acquired and keeping a constant check up on them
  - ✓ Searching assets and faults by period
  - ✓ Enabling file sharing on documents.

RESOLVING ASSIGNED FAULT

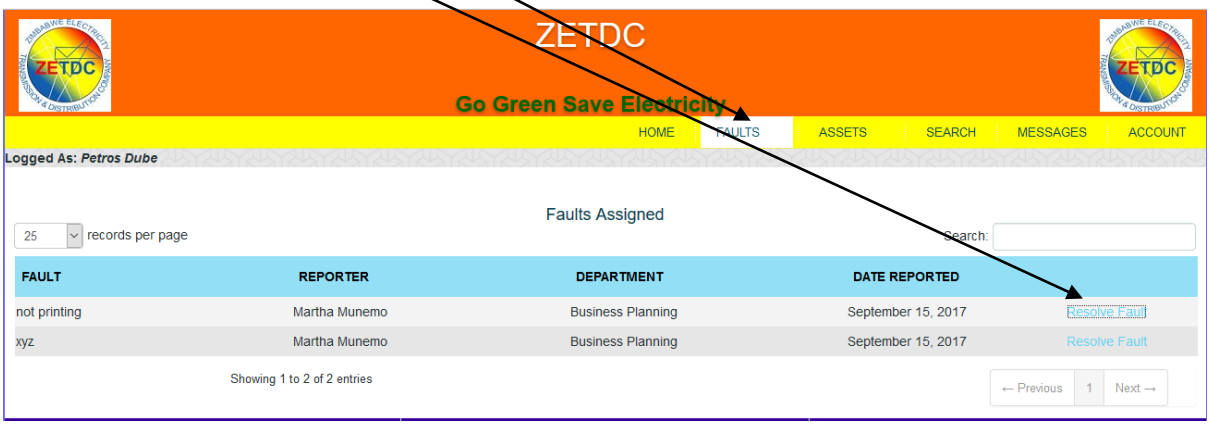

Fig A14:Resolving assigned fault

- The technician attend the fault assigned to him by the systems administrator.Once the fault is resolved the resolve fault button is clicked and a post notification status written fixed is sent to the employee page.

ADDING ASSETS

Fig A15: Add assets form

- The technician is responsible for adding assets acquired. Assets are added with their aforementioned details on the form.

MONITORING ASSETS

Fig A16: monitoring assets form

- A constant check up on all company assets is done.The system automatically schedule attention on those assets that require to be disposed and those that need a pre-arranged plan.The technician together with the administrator then organise a strategic plan on those assets monitored.

SEARCHING ASSETS

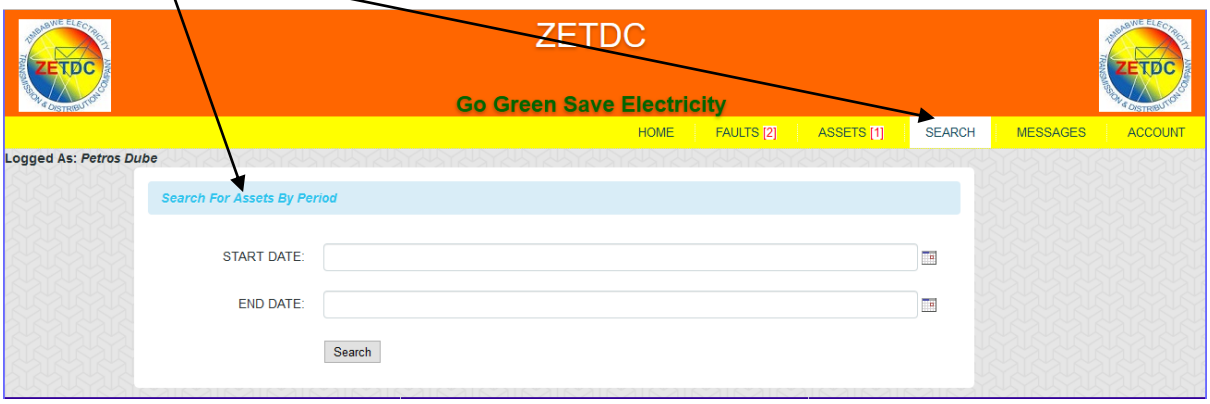

Fig A17: Search assets form

- Assets recorded are either searched by mentioning the name of the assets or by period .The search by period is much more unique in that, assets can be searched according to the number of years or month stating the start date and end date.

SEARCHING FAULTS

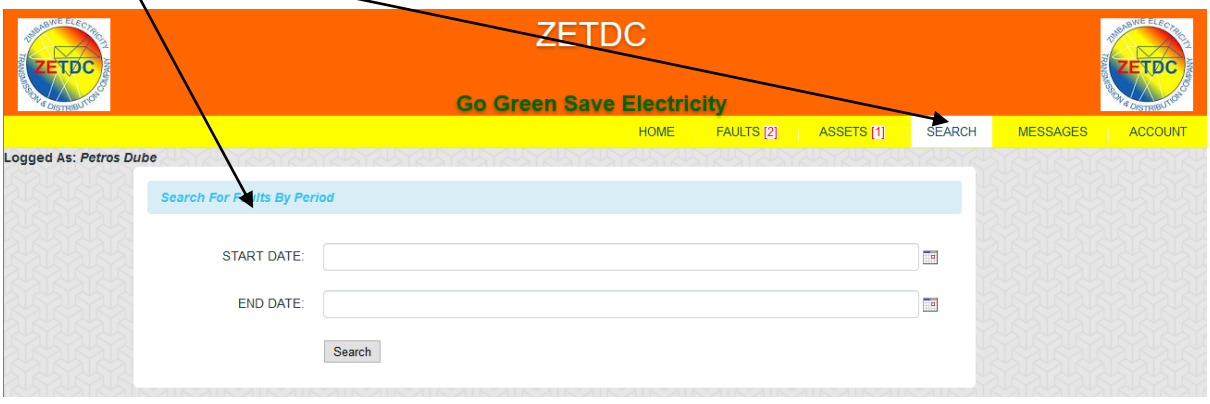

Fig A18: Search faults form

- Faults reported are searched by period .The search by period is much more unique in that, faults can be searched according to the number of years or month stating the start date and end date.

EMPLOYEE HOME PAGE FORM

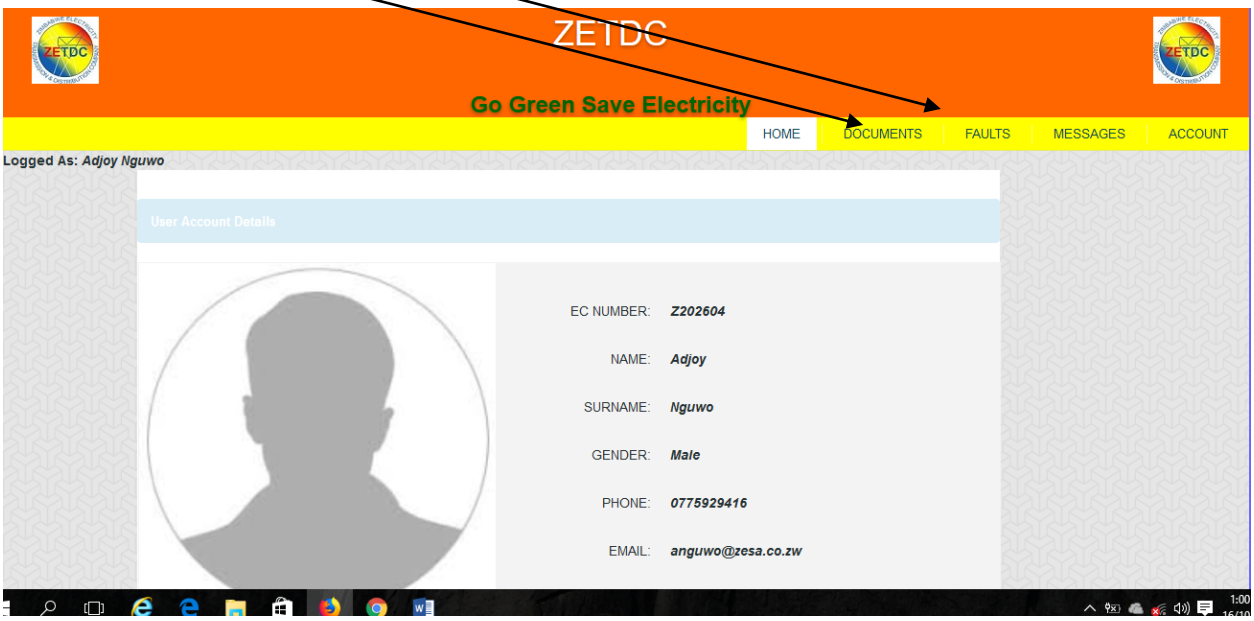

Fig A19: Employee home page form

- The employee's responsibilities are to report on faults to the I.T department. Faults are reported by simply clicking the faults platform. They is also real time communication, employees can send a message of their choice either to the Technicians or the system administrator and share a document.

EMPLOYEE FAULT REPORT

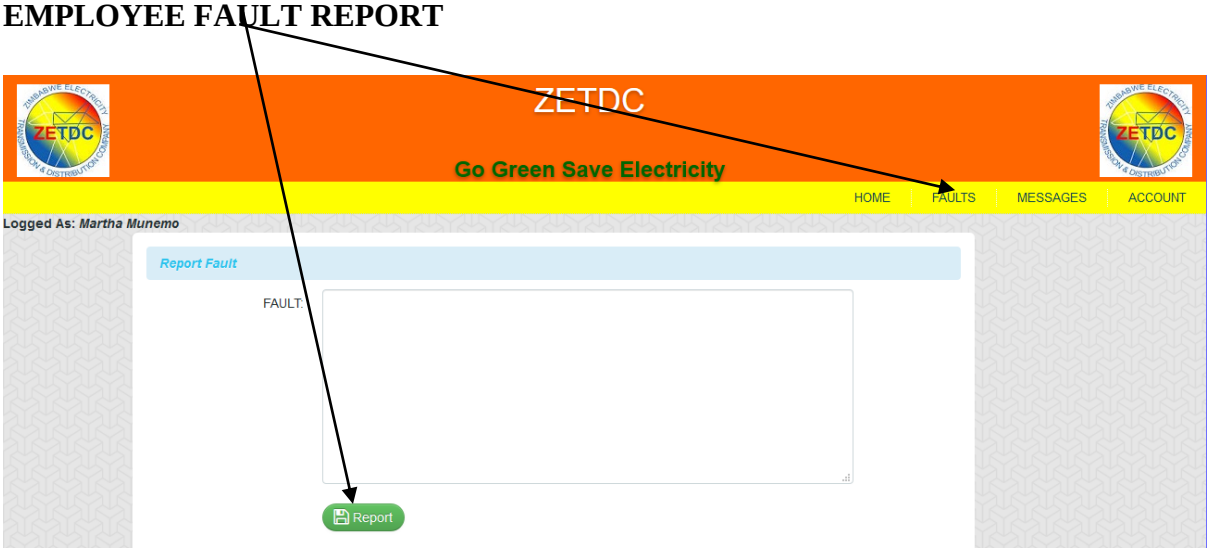

Fig A20: Employee fault report form

- Faults are reported on this platform. Once the fault is reported, a fault page with information containing the sent report, assigned technician, the status as well as the date reported is shown on the employee fault page. Below is shows the page.

FAULTS REPORTED STATUS

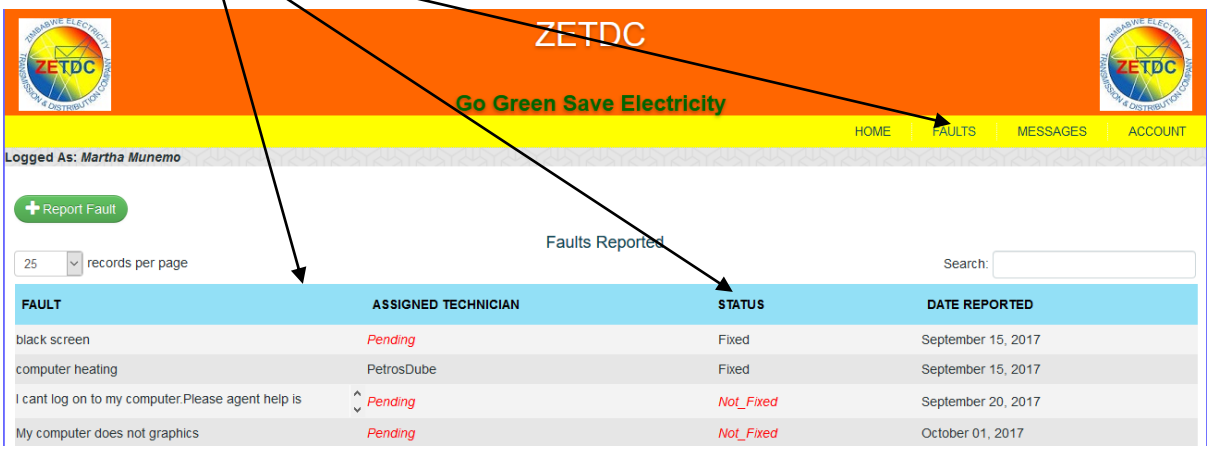

Fig A21: Employee faults reported status

- All faults reported are shown on the employee faults page. When a technician is assigned, the employee is notified and also when the fault is fixed the status changes.

ABOUT US

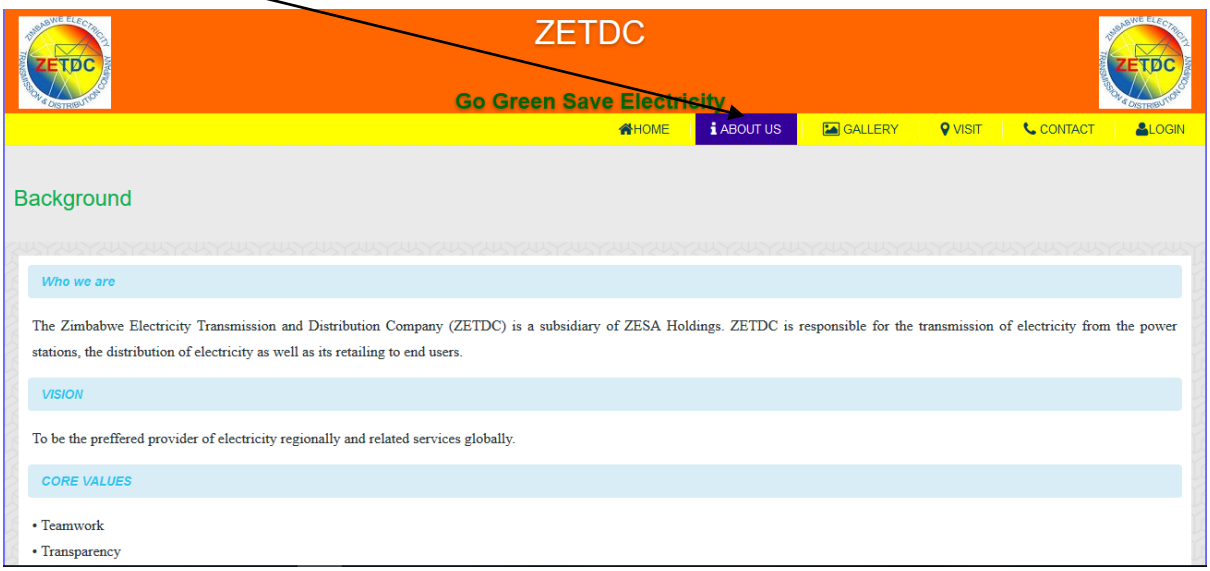

Fig A22: About us

- The **About us form** presents the ZETDC core values, mission statement and vision.

APENDIX B: INTERVIEW QUESTIONS

I.T department and Systems Administrator

1. How do you record, monitor assets and carry-out fault rectifying procedures?

……
……
……
……

2. How are you coping with the current system? Are there any predicaments that you are encountering with the system?

……
……
……

3. How do you rate the current system performance?

……
…..……
.....
.....

4. Are there any precautions in place to safeguard against unauthorized access of organization information?

……
……
……

5. Do you support an idea of building a computerized system?

……
…….....
.....

6. What are your expectations from the new system?

……

…….....

APPENDIX C: QUESTIONNAIRE CHECK LIST

Please tick where it is applicable

1) What kind of a system is used in your organization when keeping assets record and fault rectifying procedures?

Computerized system ◯ **Manual system** ◯

2) Is the current system efficient?

Yes ◯ **No** ◯

3) Is the system performance slow or fast?

Slow ◯ **Fast** ◯

4) Describe the current system

……

……

……

……

……

5) How does the I.T department handle keep track of assets once recorded?

……

……

……

6) Are there any problems associated with the current system?

……

……

APPENDIX C: questionnaire check list

APPENDIX D: OBSERVATION SCORE SHEET

OBSERVATION SCORE SHEET

NAME OF THE OBSERVER **…….**

DATE OF OBSERVATION **……**

TIME OF OBSERVATION **…….**

PLACE OF OBSERVATION **…….**

WHO WAS OBSERVED **……**

WHY THAT PERSON WAS OBSERVED**…….**

OBSERVATION……

……

……

……

……

……

……

……

……

CONCLUSION

……

……

……

……

……

APPENDIX D: observation score sheet

APPENDIX E : SNIPPET OF CODE

```
<?php
include_once ('functions.php');

session_start();
$login_error='';

require('mydb.php');
$ecnumber = clean($_POST["ecnumber"]);
$pass = clean($_POST["password"]);
        $password = SHA1($pass);

        $query =  "SELECT * from users,employees where users.ecnumber=employees.ecnumber and users.ecnumber='$ecnumber' AND password = '$password'";
$result = mysqli_query($dbcon, $query);

        $rows=mysqli_fetch_array($result);

$id=$rows['id'];
        $name=$rows['name'];
$surname=$rows['surname'];
$pass=$rows['password'];
        $access=$rows['access'];
$full=$name." ".$surname;
$_SESSION['name'] = $full;
$_SESSION['msg'] = 0;

        $row = mysqli_num_rows($result);

if($row==1)
```

```
{
$query1 = "insert into audit_tray(ecnumber,operation) values('$ecnumber','Logged In')";
       $result1 = mysqli_query($dbcon, $query1);

          if($access==1)
          {

     $_SESSION['admin'] = $ecnumber;

      ?>
      <script language="javascript">
      parent.location = 'admin/'
      </script>
      <?php
           }

                elseif($access==2)
          {


     $_SESSION['technician'] = $ecnumber;



      ?>
      <script language="javascript">
      parent.location = 'technician/'
      </script>
      <?php
           }

                elseif($access==3)
```

```
        {

    $_SESSION['hr'] = $ecnumber;

     ?>
     <script language="javascript">
     parent.location = 'hr/'
     </script>
     <?php
          }

                elseif($access==4)
          {

    $_SESSION['employee'] = $ecnumber;

     ?>
     <script language="javascript">
     parent.location = 'employee/'
     </script>
     <?php
          }

          else
          {
      echo "<div class='alert alert-danger'>Access Denied</div>";
          }

}

else
```

```
{
echo "<div class='alert alert-danger'>Access Denied</div>";
}

        mysqli_free_result($result);
        mysqli_free_result($result1);
mysqli_close($dbcon);

?>
```