ABSTRACT

This project concentrates on developing the ZPC Automated Network Logs and ICT Support Ticket Tracking System which was seen necessary after it was discovered that the manual system that was being used for ticket tracking and network logging had weaknesses. Poor communication through the use of multiple communication mediums led to difficulties in tracking the support tickets raised by users at Zimbabwe Power Company. Also the manual system was also not effective in checking the status of servers since the ICT personnel would sometimes forget to manually ping the servers to check the availability. A feasibility study was carried out to assess if the project was technically, economically and operationally feasible. It was then seen favorable to continue with the project since to be feasible. Information was gathered using interviews, questionnaires and background reading to gather functional requirements of the system and problems faced by users with the old system. The design phase was conducted which included the system dataflow design, interface as well as database tables design. The Automated Network Logs and ICT Support Ticket Tracking System was developed using ASP.Net and C# with SQL Server Database. The system developed was tested thoroughly using unit testing, sub system testing, acceptance testing, validation and verification. This was carried out to see that system was working without errors whilst the specifications and objectives of the system were met. The system conversion methodologies were evaluated and a parallel changeover was recommended to install the system as it gives users time to familiarize with the system. Also this means that anomalies can be rectified during this period. The organization will have backup from the old system so it can revert to the old system if the new system fails. Maintenance strategies were discussed and it was seen necessary to use them to ensure the continuity of the system, efficiency and effectiveness. Recommendations were made so that the system will make ZPC a good environment for work through introducing a chat facility.

DECLARATION

I Tinashe Mahlabvani (R146757W) do 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 **ZPC Automated Network Logs and ICT Support Ticket Tracking System** by **Tinashe Mahlabvani** meets the regulations governing the award of Bsc Information Systems Honours degree of the Midlands State University, and is approved for its contribution to knowledge and literary presentation.

Supervisor……………………………………………………………

Date…………………………………………………………….......

ACKNOWLEDGEMENTS

DEDICATION

I dedicate this piece of scholarly to my father Mr. T. Mahlabvani and my mother Mrs. E. Mahlabvani who have been with me all the way. They constantly funded the project and they had enough faith that it will be a success and it will be my ticket to the industrial world.

Table of Contents

LIST OF ACRONYMS

ZPC   Zimbabwe Power Company

CBA   Cost Benefit Analysis

I.T   Information Technology

ICT   Information Communication Technology

DFD   Data Flow Diagram

EER   Enhanced Entity Relationship Diagram

MSU   Midlands State University

CAPTCHA   Completely Public Turing Test to tell Computers and Humans Apart

ROI   Return on Investment

SQL   Structured Query Language

ASP   Active Server Pages

ZESA   Zimbabwe Electricity Supply Authority

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Introduction

ZPC Automated Network Logs and ICT Support Ticket Tracking System is a computerised solution for most of the manual procedures at Zimbabwe Power Company in the ICT department. The system will enable users to send their requests through a web interface and the system will automatically notify ICT Personnel. Users can also track the status of each issue. In addition, vital ICT reports and procedures can be uploaded and downloaded in the system. The network logs section automatically checks the status of servers and automatically produce a network availability report which will highlight when the servers were down. The system will therefore simplify the complex procedures in network logs management, documents sharing as well as issue (ticket) tracking.

1.2 Background of study

The development of the system is as a result of complaints by users since most of their issues were not being resolved in time. This has therefore led to the development of an issue tracking platform so that requests can be easily tracked. Also the manual system used for network logs management is prone to errors so this has contributed to the development of the automated network logs platform which will automatically check the servers and produce network availability reports.

1.2.1 Background of Organization

Zimbabwe Power Company is a subsidiary company of Zimbabwe Electricity Supply Authority (ZESA). It was incorporated in 1996 to generate electricity. The company started its operations in 1999. It has five power generation stations. These include Harare Power Station, Bulawayo Power Station, Munyati Power Station, Hwange Power Station and Kariba Power Station. It is therefore responsible for electricity generation in Zimbabwe.

ZESA has four subsidiary companies which are ZPC, ZESA Enterprises, Zimbabwe Electricity Transmission and Distribution Company (ZETDC) and Powertel Communications. Zimbabwe Power Company is the one which manages all the power generation operations. The company therefore has an obligation of generating electricity for the domestic market.

1.2.2 Organizational Structure

An organizational structure shows the hierarchical structure of the organization's management structure. It therefore defines how various company activities are directed so as to attain organizational objectives.

The diagram below shows the ZESA Subsidiaries.
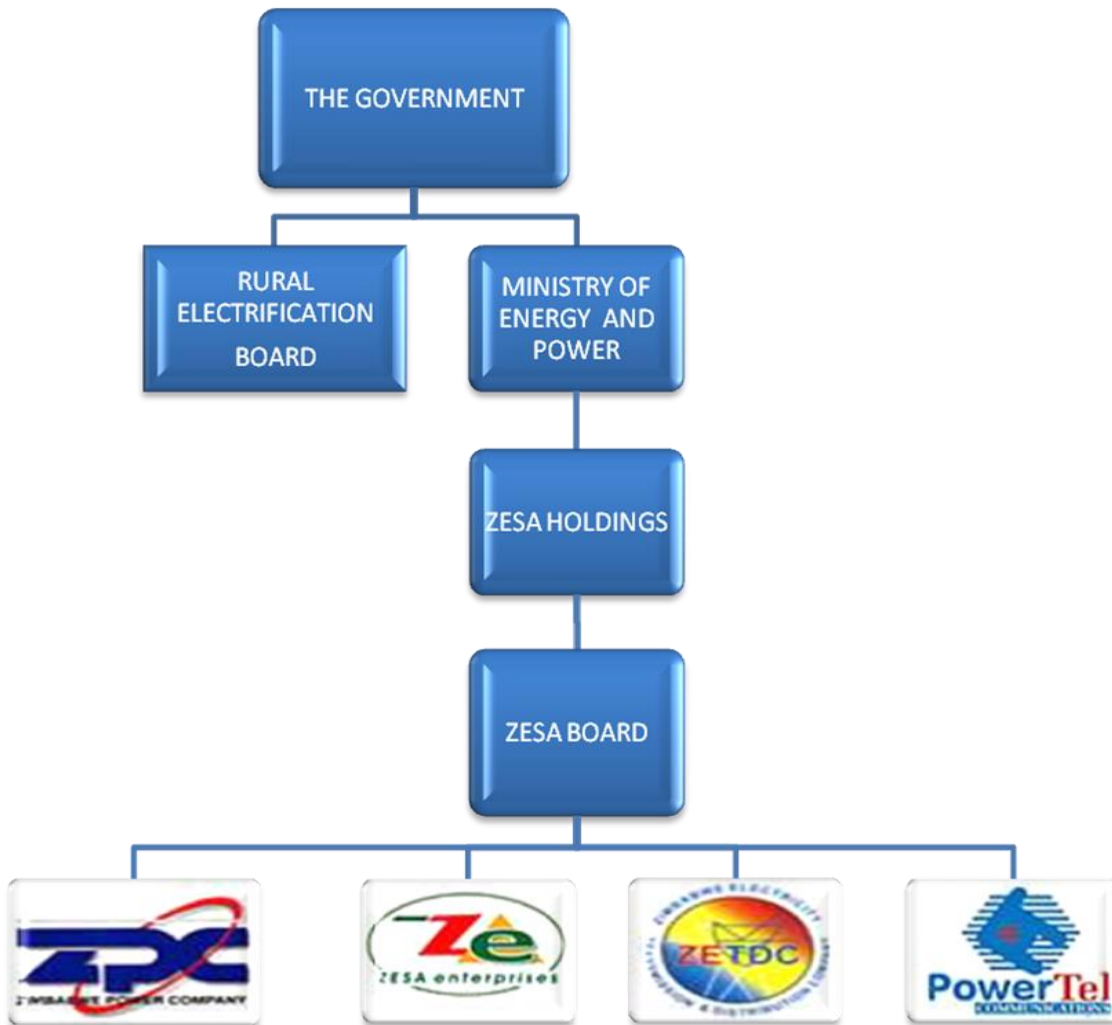
Figure 1.1 ZESA Subsidiaries

1.2.3 Vision

To be the leading supplier of energy and other related services in the region.

1.2.4 Mission Statement

In generation and supply of energy related products, we are committed to delivering reliable service to exceed stakeholder expectations.

> ➢ Core Purpose

To boost development by making electricity readily available.

1.3 Problems definition

Current manual systems in companies may pose problems in the organizations. McQuain (2012) suggested that these problems are known as the problem statement. The analysis that has been made especially in the ICT department calls for the development of a computerised solution for the company. This is to address the following loop holes.

- It is also difficult to track the status of each issue request since requests are not written down by the ICT Personnel usually because they is no guideline enforced in issue tracking and in this case there would be no record for tracking the issue.
- The network and server check is done manually that ICT Personnel have to periodically perform a ping test to check servers and in most cases they may forgot to check the network status at specified time intervals thus leading to incorrect results being produced.
- Since records are hand written and placed in files, it is difficult to update and retrieve information when needed.
- The current system requires more stationery and this has a negative impact on the company since the financial resources will be strained.
- In addition, the current manual system requires large storage space which may also result in loss of information and also straining the company's resources.

1.4 Aim

To develop ZPC Automated Network Logs and ICT Support Ticket Tracking System.

1.5 Objectives

In accordance to Berndtson *et al.,*(2013), an objective refers to a measure of unit which can be attainable. In this case, it therefore refers to goals that the system seeks to achieve. The objectives of developing the system are:

- To enable users to submit and track tickets.

- To notify ICT personnel in real time via SMS once a user has send a ticket.

- To systematically collect questions and answers for knowledge base.

- To check the status of servers and generate a network log report.

- To automatically create ticket if a server is down.

- To automatically calculate servers availability.

1.6 Instruments and Methods

For development of the software, there are tools and various procedures used. These are artefacts which are used in the development and implementation process. For the development of the Ticket Tracking System, the following tools will be used:

- Internet.
- ASP.Net.
- C# Programing language.
- SQL Server Management Studio.
- Visual Studio 2017.
- Research Assistants.
- Statistical Tools.
- IIS (Internet Information Services).

SQL Server Management Studio

It is an application which has been developed by Microsoft. It is used in database design, configuration as well as administration.

ASP.Net

This is a platform used for web application development. It has been introduced by Microsoft and is compatible with a vast number if platforms which include Linux, Unix as well as Windows. It therefore works on top of the HTTP Protocol that is the Hyper Text Transfer Protocol. The application developed using ASP.Net can be written in any language below:

- C#
- J_script
- J#
- Vb.net

C Sharp (C#)

This is an object oriented programming language. It is strongly typed which makes it highly secure. It has a vast of libraries and modules.

Visual Studio 2017

This is the latest complier from Microsoft which will be used to run, test as well as debug the application.

IIS Express

This is a web server that has been developed by Microsoft. This will be used to host the Web Application as it serves requested HTML pages and files.

1.7 Justification and rationale

The ZPC ICT Ticket Tracking System will provide many advantages to the organization. The following benefits will accrue due to the development of the system.

- ➢ Since the system is fast in processing, there is likely to be a boost in productivity and efficiency. This will reduce time wastages and will therefore increase productivity thus promoting efficiency.
- ➢ The system will also keep track of all issue requests which will aid the department to attain its goal of serving user requests and adhering to Service Level Agreement (SLA).
- ➢ By creating a paperless environment, the company is likely to practice good housekeeping procedures.
- ➢ Also the system will enforce security at the work place due to the use of usernames, passwords and CAPTCHAs. Unauthorized access is therefore prohibited.
- ➢ In addition, the system automatically creates an ICT Support database or knowledge base and in this case, the ICT personnel will quickly solve problems since the resolutions will be saved in the system.
- ➢ Also computers are error free therefore all calculation done will be error free as well as reports produced. This means that there is likely to be efficiency in network logs management.
  The automated network logs section enables the ICT Personnel to depict the availability of servers thus being able to find ways to boost network availability.

1.8 Conclusion

The system has been introduced and the background of the study has also been highlighted. The background of the organization has also been explained. The problem statement, aim as well as the system objectives have been clearly spelt out as well as the tools that will be used in developing the system. In addition, benefits of developing the system have been explained. The next phase is the planning phase which will be geared on the planning of the system. The feasibility study will be carried out in the next phase to ascertain whether the system is worthwhile developing.

CHAPTER 2: PLANNING PHASE

2.1 Introduction

According to Dennis (2009), planning refers to the process of approximating all the resources required to carry out a project successfully. It is therefore a road map to all the project phases and the resources required on each phase. In this chapter, the reasons for developing the system are outlined, the feasibility study, risk analysis as well as the project work plan will be highlighted and the Gantt chart will be used to show a pictorial view of the project phases.

Planning assist the firm to take corrective action if the real output differs from the desired output. The feasibility study will ascertain if the system is worthwhile developing by accessing the economic, technical as well as operational benefits to the company. This means that the risks associated with developing the system will be clearly spelt out. This chapter will evidently rule out if the proposed system is worth developing.

2.2 Reasons for building the system

- Since users will be able to raise their issues (tickets) on the web application, they will be able to track easily the status of each issue. This will means that users' issues can be resolved quickly.

- The system's ability to notify ICT users in real time enables issues to be resolved as quickly as possible. This will enable the ICT department to meet SLAs (Service Level Agreement) since ICT users can quickly note if an issue arises.

- Since the system will systematically generate a knowledge base, issues can be quickly resolved by first consulting the knowledge base. This also enables retention of knowledge in the company and therefore resulting in quality ICT Services.

- The system also eliminates the manual work of performing a ping test to check servers by automating the procedures thus resulting in more realistic results being obtained and saving time.

- Also the proposed system will reduce stationery costs as its main thrust is to eliminate the use of paperwork therefore this will be a positive contribution to the company as its financial resources will not be strained.

Security measures have been enforced in the system therefore unauthorised access is prohibited. This ensures that the right user access the right information as will be set by the administrator.

2.3 Business Value

Wiley (2015) highlighted that a business value refers to the contribution that the proposed system will bring to the company. Systems should be developed in order to address certain problems in organizations. This means that a highly prized contribution should be experienced as a result of developing a system. The following are the values that the system is ought to contribute to the company.

2.3.1 Employee's Value

Wiley (2015) propounded that employee values are those benefits that employees accrue as a result of the adaption of a new system. The proposed system will therefore have a positive contribution to employees. This means that they will be motivated since they will be now able to send their requests using an online platform and be able to track the status of their issues or tickets. In this case, it will mean that they will be able to acquire the best services by the ICT department.

Also employees in the ICT department will be notified instantly when users raise tickets and also the automated network log section will simplify their task and they will be able to concentrate on other tasks. Calculations are systematically done thus there is likely to be reduced errors resulting in high quality reports being produced. All these merits will result in increased productivity thus promoting efficiency at the workplace.

2.3.2 Organizational Value

These are merits that accrue directly to the organization as a result of the introduction of the new system. The organization is likely to benefit a lot since most of the ICT users' tasks will be automated. This means that they will be now able to focus on other vital issues thus promoting efficiency.

Also as the system is creating a paperless environment, company costs are likely to be reduced. In addition, users will be notified when the network servers are down therefore it enables ICT users to quickly resolve network problems quickly if they occur which will promote smooth flow of day to day business operations resulting in efficiency and effectiveness in company operations.

2.4 Feasibility Study

According to Satzinger, Jackson and Burd (2012), the technical feasibility is an analysis to check if the company has the technical prerequisites and expertise to adopt to a technological change. For the system to be successfully developed and implemented, certain hardware and software as well as expertise should be put in place in order for the project to be a success. It will be not be feasible to carry out the project if the company do not have the technical requirements since they are key to project success.

Availability of technical skills

This access whether the company has the technical expertise to carry out the project. In this case, the company has a developer who have developed recent projects using the .Net platform. The developer is also familiar with SQL Server database so the project is going to be a success. This means that the technical skills required to carry out the project are available. Also the users have a basic understanding on how to operate computerized system so it will be easy to train them.

(i)   Hardware

Certain hardware resources should be put in place in order to successfully develop and implement the project. Following is a diagram depicting the hardware and software required as well as the quantities required. The hardware and software specifications are also highlighted.

Table 2.1 Hardware Requirements

Item	Specification	Quantity	Available	Comment
Hardware				
IIS Server and Database	Ram 2.00GB , Intel 2 GHz processor , 500 gig hard drive	1	No	The company is willing to buy
Internet	56k/s or above	1	Yes	The company has internet already installed
Printer	HP LaserJet Pro P1108 Printer(CE655A)	1	Yes	The company already has a printer.

Laptop	6GB RAM, 4GB Graphic Card, 500GB HDD, Core i5	1	No	The company is willing to buy

The diagram clearly shows that all the other hardware resources are available except an IIS and Database server which should be purchased in order to run the system and the database.

(ii)   Software

There are certain software packages which are required in order to develop the software. These are key in the development and installation of the software. These include the visual studio compiler which shall be used to develop the software. The compiler consists of four major programming languages and C# Language shall be used to develop the system using the Active Server Pages (ASP.Net) platform.

In addition, SQL Server 2017 will be used for the creation and management of the system database. This is more secure and highly professional database which is mostly used for developing enterprise databases.

All these applications will run on Windows 10 Enterprise Edition. Other software like ESET antivirus have been chosen to safe guard the computer from viruses. Telerik Rad Controls and DevExpress will also be installed for development.

The Rationale of choosing each software.

The researcher has chosen Visual Studio 2017 which is the latest version from Microsoft. The software has a wide range of changes and improvements as compared to other earlier versions. It now supports unparalleled productivity for any application and platform. These and other advantages have resulted in the selection of Visual Studio 2017 as the best compiler for development.

Microsoft SQL Server 2017 have been chosen as the ideal database management system as it more secure than other databases like MySQL and also it is also a professional DBMS usually used by many companies to develop their databases and manage them.

ESET Antivirus has been chosen since it has the latest virus signatures therefore it is ideal to use the software. Also it has other added advantages that it has internet security as well as other features.

Microsoft 2016 will be used to compile the system documentation. It is ideal since it is a latest version from Microsoft and it also has capabilities to publish documents as pdf documents (portable document format). Also it is easy to design diagrams using the software therefore the researcher also chose it.

In addition, Windows 10 is already installed at most of the company computers therefore it will be advantages to use a version which is already in use and also it is a latest version thus is more secure.

Telerik Rad Controls and DevExpress are other software plugins that will be used in integration with Visual Studio 2017 to provide more advanced controls which are not available in the Visual Studio Compiler. These provide rich interfaces which are user friendly and eye catching.

Table 2.2: Software Requirements.

Item	Specification	Quantity	Available	Comment
Software				
Microsoft Visual Studio	Visual Studio 2017 Enterprise Edition	1	No	The company is willing to buy
Microsoft SQL Server	2016 or 2017 Edition	1	No	The company is willing to buy
DevExpress	Version 17.5	1	No	The software will be downloaded for free
Microsoft SQL Server Management Studio	2017 Edition	1	No	The company is willing to buy
Microsoft Office	2016 Edition	1	Yes	The company already has office 2016 installed
Telerik Rad Controls	Version 17.1	1	Yes	The software will be downloaded for free
ESET Antivirus	2018 Version	1	Yes	The Antivirus has already been purchased
Windows 10 (Operating System)	Windows 10 64bit Enterprise	1	Yes	The software is already Installed

2.4.2 Economic Feasibility

According to Cohn, (2014), the economic feasibility study identifies the overall benefits and costs that will be brought through the development of the system. It therefore aid in deciding whether the system should be developed or not. For a system to be economically feasible, the benefits accrued through developing the system should be more than the costs incurred.

There are a number of techniques which can be used for economic feasibility study which include the cost benefit analysis, payback period and return on investment.

Cost Benefit Analysis

As propounded by Ness, (2016), the cost benefit analysis is a tool used in project management that is used to assess the overall performance of the project. It is a tool used to evaluate a project by weighing the benefits of the project against its costs. It is therefore a project analysis tool that is used widely for the evaluation of projects to see if a particular project is worthwhile undertaking. If the benefits outweigh the costs, the project will be worthwhile undertaking however it will not be ideal to take a project in which the costs are greater than the overall benefits. The ZPC Automated Network Logs and ICT Support Ticket Tracking System is worthwhile developing since the benefits of the system outweigh the costs.

Development Costs

According to Cohn, (2014), developmental costs are those costs that are directly incurred in researching, production and introduction of a new system. They suggested that these costs are therefore incurred in setting up the new system and improving it that is including maintenance costs. The following table highlights the estimated costs for all the hardware equipment which will be purchased.

Table 2.3 Development costs

Item	Quantity	Amount(USD)
Hardware		
Core i5 Laptop	1	500
Network Switch	1	60
Backup Server	1	180
Printer	1	250
Software		

Windows 10 Professional	1	200
Microsoft SQL Server Management Studio	1	60
Microsoft SQL Server 2017	1	75
Microsoft Visual Studio 2017	1	25
Total		**1350**

Operational and Setup Costs

The costs involved when setting up a new system are referred to as setup costs. This is in accordance to Cohn, (2014). A good example of setup costs include installation costs which are costs incurred to get the equipment ready for the use of a new system.

Table 2.4 Operational Costs

Operational Costs	Amount (USD)
Labor	400
Consumables	100
Maintenance Costs	150
User Training	100
Other Expenses	50
Total	**800**

Tangible Benefits

These are the things that can be categorized in monetary values. This is according to Ness, (2016). The following table shows the tangible benefits that the system will contribute.

Table 2.5 Tangible Benefits

Tangible Benefits	2017	2018	Total
	$	$	$
Reduced Labor	100	150	250
Reduced Stationery	100	250	350

Reduction in Operational Expenses	500	700	1200
Total	**700**	**1100**	**1800**

Intangible Benefits

According to Wang and Wang (2012), intangible benefits are all the benefits that the system will brought to which cannot be classified in monetary values. These benefits are often unseen and organizations usually enjoy such type of benefits in the long run for example improved customer satisfaction.

Table 2.6 Intangible Benefits

Intangible Benefits	2017	2018	Total
	$	$	$
Good will	1000	1500	2500
Shorter service times	400	600	1000
Increased employee morale	800	1000	1800
Total	**2200**	**3100**	**5300**

Table 2.7 Cost Benefit Analysis

Benefits	2017($)		2018 ($)
	Benefits		
Intangible benefits	700		1100
Tangible benefits	2200		3100
Total benefits	**2900**		**4200**
	Costs		
Costs on operations	800		500
Development costs	1350		____
Total Costs	**1550**		**500**

Benefit / Loss	1350	3700

In this case, be benefits of developing the project are exceeding the cost. This has been clearly shown above. The company will enjoy a profit of $1350 in the first phase. As time progresses, the profits will therefore increase by $2350 that is up to $3700. The increase is a result of the development costs which will not be incurred by the company.

Payback Period

Another factor which is of prime importance is to consider the time taken to recover the initial project outlay. According to Crosson and Needles (2008), this is known as the payback period. This means that in this case, if a project has a short payback period, it will therefore be considered viable. Projects which have a long payback period are considered as risky projects. The major disadvantage of this technique is that it ignores the time value of money.

Table 2.8 Payback Period

Year	Annual Cash flow	Cumulative Cash flow
0	(1350)	(1350)
1	2200	850
2	3100	3100
3	4000	4000

Cost of Investment

Payback Period $= \underline{\quad} \times 12 months$

Annual Net Cash Inflows

Payback Period $= (^{1350}\underline{\quad} \times 12 months)$

Therefore Payback =7 months

It is therefore ideal to carry out the project since it has a very short payback period of seven months. This means that the company can therefore quickly repay its initial outlay.

Return on Investment

It is also important to consider the profit that can be obtained in relation to the capital employed. This technique is known as the return on investment (ROI). Randall (2001) outlined that it is vital to calculate the ROI since it aids in estimating the amount that an investor will gain in relation to the investment that would have been put in place. This means that investing

where the percentage is higher will be considered a good practice since it would mean that there is also a higher percentage of profits gained.

ROI = (Net Profit / Capital Employed) * 100

Return on Investment = 1ˢᵗ Year

$(\mathbf{1350/}1550) \times \mathbf{100} = \mathbf{87\%}$

The return on investment for the initial year will be 87%. This is mainly because there are more costs in the first year than in the second in which it is higher. This therefore concludes that the project is worthwhile undertaking.

2.4.3 Operational Feasibility

The Operational feasibility study is geared on the effectiveness of the system after implementation. It is therefore the willingness of the various stakeholders in supporting the new system.

These major elements should be considered.
- If there are major barriers which can affect the system implementation?
- Are the end users going to accept the system if installed?

Management
- With the current system, it is difficult to track the status of issue requests. The new system will therefore make it easy to quickly track the status of each issue therefore employees are more likely to adopt the new system.
- The system is likely to be accepted since it is efficient in data processing therefore the management is likely to accept as the system will add value to the overall business procedures.
- In addition, the system eliminates paperwork thus reducing company expenses. In this case, the system is more likely to be accepted.

Employees
- Employees are eager to experience the support service which the system is going to offer since nowadays there is no computerized system put in place for issue tracking. With the advances in technology, the system is likely to be accepted.

- Employees will be able to track their issue and or even consulting the knowledge base to gain technical knowledge thus the system will therefore be accepted.

Based on the merits of the system through its features which benefit the employees, management and company as a whole, it can be concluded that the system is operationally feasible.

2.4.4 Social Feasibility

An analysis of the possible effects of the system to the community should be carried out to make sure the system or project is socially acceptable. This study focus on the possible implications of the new system to the community. A project which is socially unacceptable, that is violating the social norms and values will not be worthwhile developing.

- The project is socially feasible since does not affect the company as well as the societal values and norms.
- In addition, the system will reduce the employees' workload. This means they will have time to socialise with their families.

In this case, the system is socially feasible.

2.5 Risk Analysis

According to Cohn, (2014), the study of the possible dangers or likely uncertainties that may be experienced is known as the risk analysis. A risk is therefore an uncertain occurrence caused by an unpredictable phenomenon. According to Oxford dictionary (2015), risk analysis is a process of removing threats to reduce chances of danger. It is therefore essential to carry out a risk analysis on every project since this aid in developing high quality secure software.

The following factors should be considered:
- One of the major aspects in software development is to make the best use of time (project time management). If time is not properly managed, this can pose a risk to the project since the project will not be completed in time. This means that it is essential to timely complete the system design phases. The developer will ensure that everything is done in time according to the project calendar.
- In addition, virus attacks are a major threat to software. The system database server can be attacked by a virus resulting in loss of information. There is therefore need to update

antivirus software regularly. A virus update shall be done constantly to safeguard the system.

- Also hardware failure can pose problems to the system development and installation process. This can result in delay of system phases and even loss of information. A backup shall be made regularly to ensure that data is not lost.
- Electricity cut-outs can also be another problem. This can delay the projects and may lead to overall project failure. This means that a backup plan should e put in place to address the problem.

2.6 Project Work Plan

According to Wang and Wang (2012), a project work plan is an activity calendar which depicts where the various project phases and the duration for each phase.

Phase		Start	End	Duration(Months)
Introduction		26.10.17	28.11.17	1
Planning		29.11.17	29.12.17	1
Analysis		01.01.18	02.03.18	2
Design		03.03.18	01.04.18	1
Coding		01.04.18	01.05.18	1
Testing		02.05.18	30.05.18	1
Implementation Maintenance		06.05.18	---.18	On-going

Fig 2.1 Project Work Plan

2.7 Gantt Chart

A Gantt chart as a horizontal bar which illustrates time and on its vertical axis it shows the list activities to be done in the project.

PHASE	1	2	3	4	5	6	7	8	9
Introduction	■								
Planning		■							

Analysis			███	███					
Design					███				
Coding						███			
Testing							███		
Implementation and Maintenance								███	
Documentation	███	███	███	███	███	███	███	███	███

Fig 2.2 Project Gantt chart

Key

███   = 1 month

2.8 Conclusion

This chapter's main focus was on the feasibility study and the reasons why the system has been built. A feasibility analysis was carried out which included the operational feasibility, economical, technical and social feasibility. After carrying out all the phases, it was seen that the project was feasible therefore it can be developed since the benefits outweigh the coats. A risk analysis was also conducted to identify the possible threats or risks that are likely to affect the project and measures have been put in place to minimize the risks. The project Gant Chart was drawn to show the various project phases which will be carried out and the duration. The next phase will focus on analyzing the current system reflecting how it works, the merits and demerits of the system. In addition, dataflow diagrams will be drawn to show how the current system operates.

CHAPTER 3: ANALYSIS PHASE

3.1 Introduction

According to Gupta (2005), the systems analysis phase is a process of examining the current system that is how it works as well as identifying its strengths and weaknesses. This chapter therefore mainly focus on the information gathering techniques, the current system analysis, new system requirements, as well as well as the merits and demerits of the methodology that will be used in development of the new system. An in-depth analysis of the system will therefore be carried out. This will highlight the inputs, processes as well as the outputs of the system. Also there are various techniques used to develop system which include in-house development, outsourcing and upgrading the legacy system. In this case, the most appropriate methodology will be used.

3.2 Information Gathering Methodologies

Kumar, (2014), propounded that information gathering is the process of accumulating data from the field. The information collected will aid in the development of the proposed solution. According to Gupta (2005), there are many methods used to gather information which include interviews, observations, focus groups and questionnaires. To select the right techniques, time as well as the cost was considered. The information gathering techniques that were then used are background reading, interviews as well as questionnaires.

3.2.1 Interviews

Manual (2012), defined an interview as a discussion which involves asking questions on a particular field of study and getting answers form the participant. It is a form of information gathering in which the interviewer will be asking the interviewee what he or she thinks about the particular field of study. There are structured and unstructured interviews. Interviews were conducted for the ICT personnel at Zimbabwe Power Company and the employees in other departments who would be raising requests.

- Structured Interviews

Kielhofner (2012) highlighted that this type of interview is the one in which each panel of interview will be given the same questions and in same order. In this case, there is nothing which will change from one interview to the other as it is research administered. The interviews can be open or closed ended questions. The analyst therefore conducted the interviews at ZPC Head Office in Harare. A

series of questions were asked to employees which included ICT Management as well as other departments. A fixed range of answers were possible on each question. This was done in order to find out the correct data which will then be used in the development of the system.

- Unstructured Interviews

An unstructured interview is the one in which the interviewer will ask questions in mind however will be guided by the particular scope of study. This means that an interviewee will have a certain area of concern but the questions asked from one interview to the other may not be the same. This is in accordance to Kielhofner, (2012). The interviewer used this approach to acquire information the exact system scope from the ICT Manager as well as the Systems Administrators. The interview was therefore a conservation since the interviewer and interviewee were free to explain the various system processes.

Advantages of Interviews.

- It was possible to adjust questions so as to acquire more information during the interview. This assisted in having a clearer picture of how the system should work.

- Through unstructured interviews, employees were able to honestly reflect the weaknesses of the current manual system.

- Through interviews, the analyst was able to find out new functions which were being highlighted by the employees. This assisted in having a clear picture of the project scope.

- Interviews also have assisted in collecting detailed information from respondents. This also assisted the analyst to better understand the current system.

- Misunderstandings in questions presentation and also mistakes were easily corrected since the interviewer and interviewee were present. Adjustments to questions were done in areas were respondents suggest that the questions be adjusted.

Disadvantages of Interviews

- The major disadvantage was that the process required more time. This means that the exercise was to be done when employees were free and in most cases employees were occupied.

- Also other employees were reluctant to provide information.

3.2.2 Questionnaires

According to Stanislaw (2011), a questionnaire refers to an information gathering technique in which a series of questions are written down and answered in written form on a particular field of study. The questions can be open and or close ended and the respondents will simply write down the answers on the answer sections which will be provided on the questionnaire. The analyst will therefore gather the exact information that would be required through the use of a series of questions.

The analyst used open and close ended questions since some of the questions were straight forward while others required the respondents to express their views. The questionnaires were given to the ICT Management as well as other employees so that high quality information can be gathered.

Open ended questionnaires

This type of questionnaires are those which are not limited in terms of response. This means that they do not have specific responses therefore allows respondents to express their thoughts in a way they like. It therefore gives room to the respondent to express how they think about the current system and what they suggest. This therefore aid to avoid biased suggestions that may be given by employees. One major disadvantage is that they are difficult to analyse as it will be difficult to compile scores as the responses are not uniform.

Closed ended questionnaires

In this case, the respondent had a set of answers to choose from. This means that the respondent was limited to answers. A number of types fall under this category which include ranking scales, close ended, multiple choice and dichotomous questions. Dichotomous questions are limited to responses since the respondent can only select between a yes or a no. These vary from ranking scales where the respondent had be asked and answers and ranked. Multiple choice questions were those in which respondents selected an answer from a given set of responses.

Advantages of questionnaires

- The respondents were comfortable to express themselves since they answered the questions alone.

- Since there was enough time to answer the questions, well thought responses were obtained thus quality information which was crucial in the development of the system.

- The use of closed ended questions enabled easy analysis of information since scores were easy to assign.

- The use of questionnaires also enabled the analyst to collect more information in as short time period.

Disadvantages of questionnaires

- 2% of questionnaires have not been answered since some employees were self-supervised.

- Other questionnaires were not completed since other users required clarification on other aspects which they did not understood.

- Also some were not willing to answer the questionnaires as they considered it a waste of time.

3.2.3 Background Reading

This refers to the acquiring of an organization's information through reading the various documents that the organization has. This is in accordance to (Isrd Group, 2007). It therefore assist the analyst to have deep knowledge about the organization that is the various practices that the organization have put in place. The analyst used documents such as the organizational charts, the ICT objective document, the organization's IMS Policy documents as well as the procedure document that outline how the legacy system works.

This assisted the analyst to know how the business processes are conducted and the various processes involved.

Advantages of background reading

- This was the cheapest technique as it did not require money or other resources. The documents were available in the company library.

- Also this assisted in retrieving information which would not be disclosed through interviews. This assisted in having a more clear view of the organization's processes.

- Also the information was acquired without employees' participation therefore the analyst was efficient in digging out the information.

- It was easy to gather information such as the background of the organization, the organizational history as well as the vision and mission statement of the company using this technique.

Disadvantages of background reading

- Other sensitive documents were not accessible since they were considered confidential.

3.3 Analysis of the existing system

The current manual system is inefficient since most of the procedures require complex calculations which are time consuming and subject to errors. When a user want to raise an issue, he or she have to call the ICT department and explain his or her issue. The first problem is that at times, the ICT management will not be available in the office fixing another issue. This will mean that the user have to wait then try to call again and again which is ineffective. In this case, issues cannot be resolved quickly since ICT users cannot be notified in real time. This means that the ICT department will not be fulfilling its objective of serving users' requests as quick as possible.

If a call is received, the ICT department will then write down the issue in a counter book and the time at which the call was answered. Users cannot therefore track the status of their issues. They have to call again to know if the issue have been attended to. The ICT will then go to fix the issue. After fixing the issue, the next step would be of updating the record that would have been written. Calculation will be done using a calculator to calculate the duration taken to solve each task. This process is also time consuming and subject to errors.

The ICT personnel will perform a weekly review to check which issues have been raised frequently. This is done by counting the number of requests according to the request category

finding out the cumulative figures then denoting which issues have been frequently raised. This is a tiresome process and results produced usually will have a lot of errors.

On the other hand the ICT personnel have to continuously check the status of the network servers by performing a ping request after regular time intervals. The ICT personnel will then record the status in a counter book that is if the server is down or up. To calculate the weekly network availability, the ICT management will count the number of periods when the server was up and then compare to the periods when the server was down. The result is then calculated in percentage which will be the weekly availability of the network servers for that week.

Once one of the servers is down, the ICT personnel have to write down the name of the server as well as the time then fix the issue. After fixing the issue, the ICT personnel will then update the record that will be reflecting the duration taken to solve the task.

All these procedures are time consuming, prone to errors, inefficient, costly and therefore reports produced are unreliable.

3.3.1 Data Analysis

- Inputs

Issue or request details, details of the person attending each issue, network servers log data.

- Processes

Writing down requests, creation requests form, allocation of ICT user, issue solving, requests weekly review, network server checks, network server logging.

- Outputs

Request Logs, Network server logs and network availability reports.

3.2.2 System Flow Chart

According to Adolph (2003), a system flow chart is a diagram that depicts the various system processes which clearly shows how data flows in a particular system. The current system flow chart diagram is as follows:
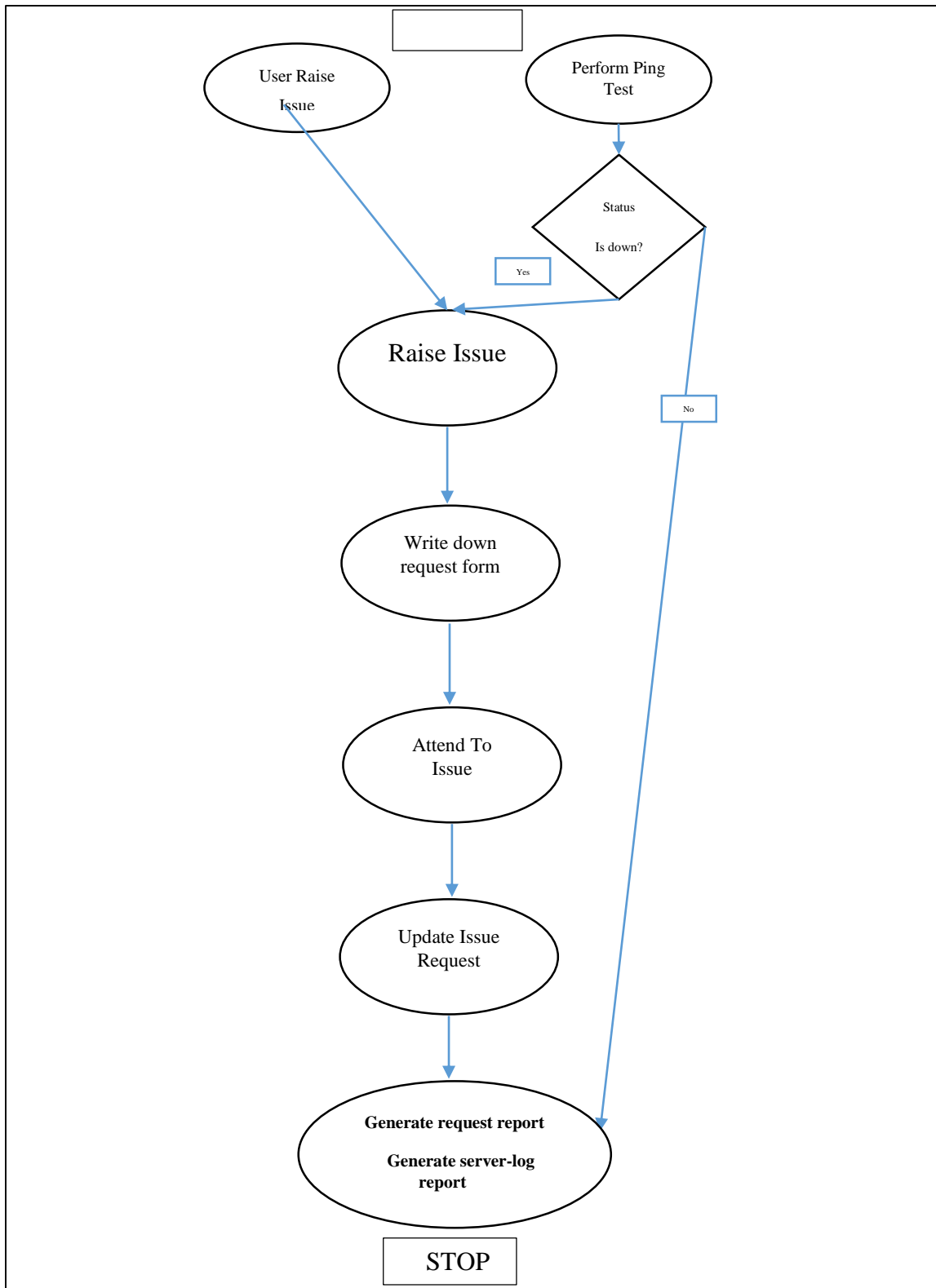
Fig 3.1 System flow chart

3.3.3 Context Diagram

According to Adolph (2003), a context diagram highlight the relationship or link between the system and the environment in which it operates in. It can be defined as a snap-shot of the system. As suggested by Bittner and Spencer (2013), it reflects the main system entities and highlights how the entities interact with the system showing the inputs and outputs. The following diagram is the context diagram for the current manual system.
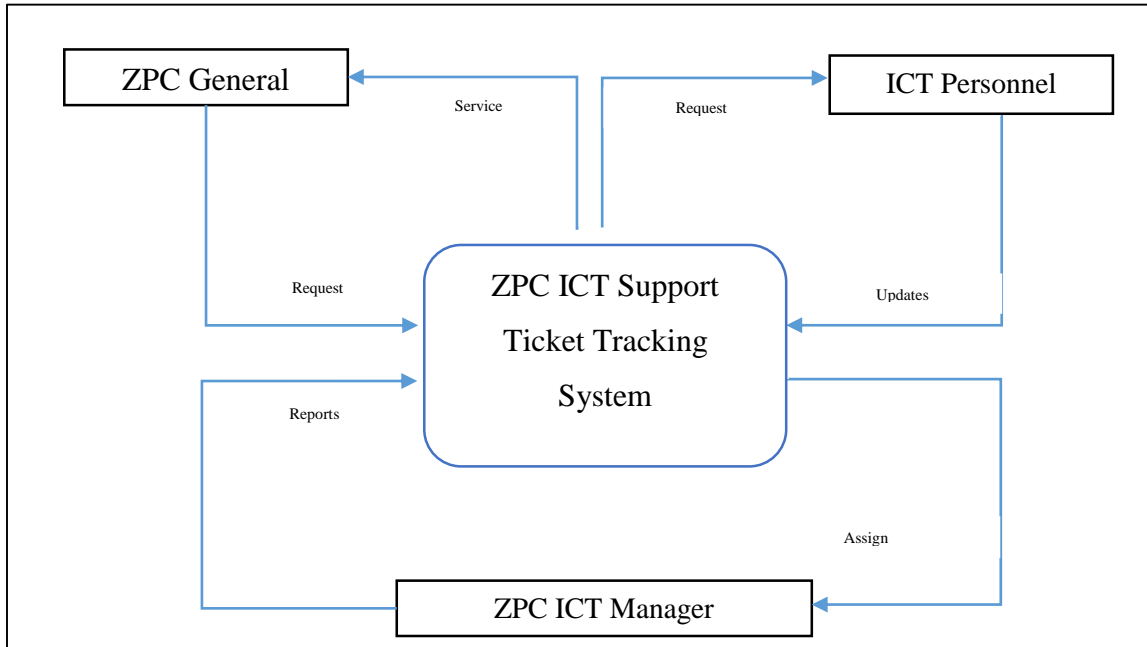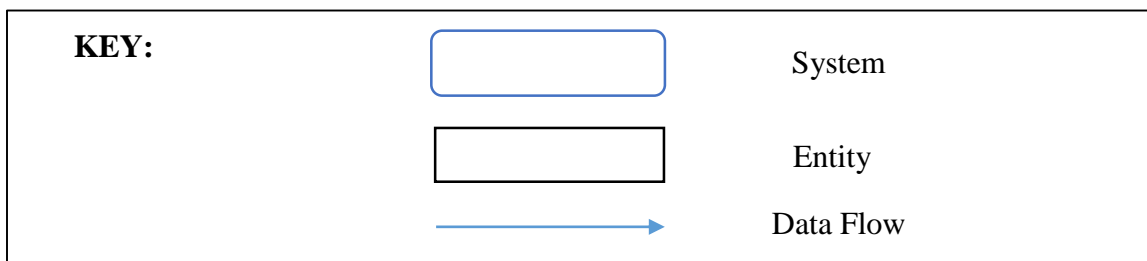

Fig 3.2 Context Diagram for the Current System

3.3.4 Data Flow Diagram

Bittner and Spencer (2013) a data flow diagram is a diagram which shows how data flows in a system. It therefore shows the various processes that are involved in the system, the entities and data stores. It therefore depicts the information using symbols which include processes, entities, data stores and data flow. The following diagram shows the dataflow diagram of the current system:
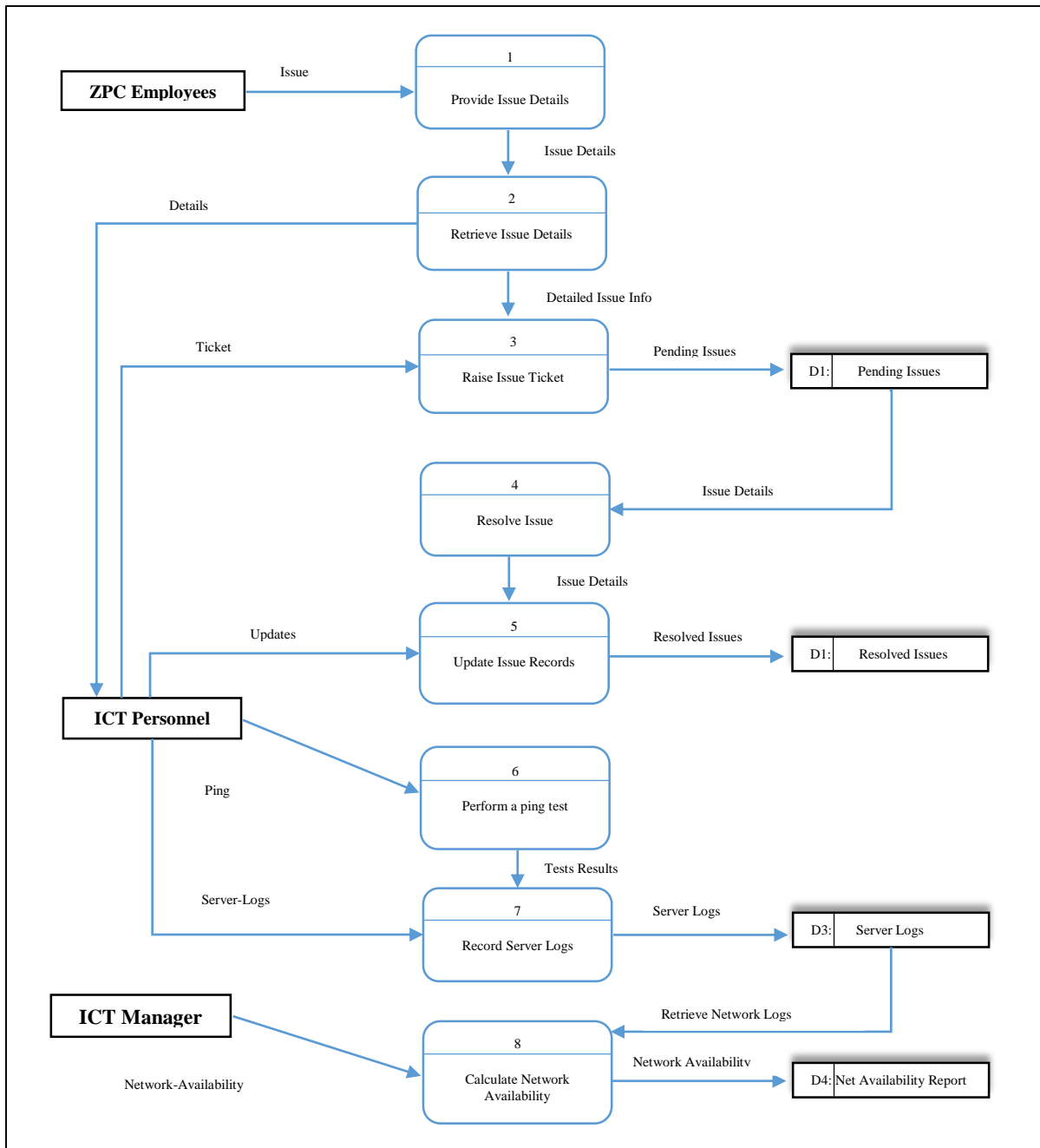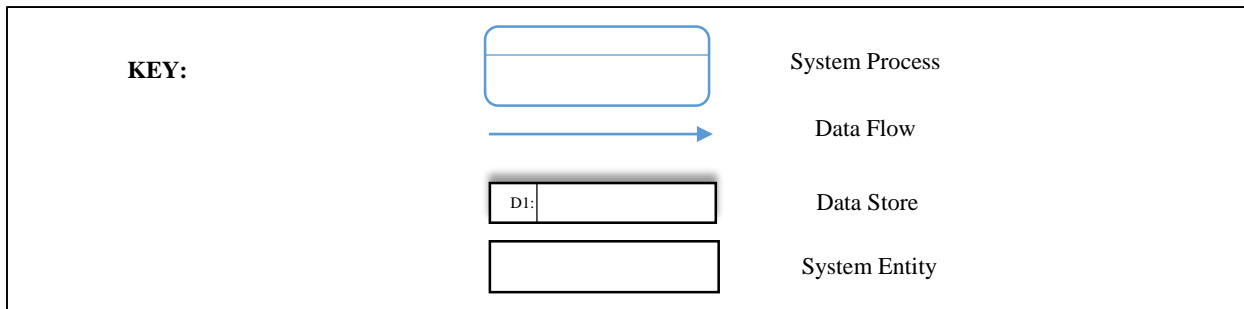
Fig 3.3 Data Flow Diagram of the current system

KEY:		System Process
	→	Data Flow
	D1:	Data Store
		System Entity

3.4 Weaknesses of the current system

• The current manual system is difficult to update and retrieve information when required since information is kept in counter books. This makes the searching process difficult for updates and reporting.

• The current manual system is time consuming and prone to errors since most calculations are done using a calculator.

• It is also difficult to track the status of each issue request since requests are not written down by the ICT Personnel usually because they is no guideline enforced in issue tracking and in this case there would be no record for tracking the issue.

• The network and server check is done manually that ICT Personnel have to periodically perform a ping test to check servers and in most cases they may forgot to check the network status at specified time intervals thus leading to incorrect results being produced.

• The current system requires more stationery and this has a negative impact on the

Company since the financial resources will be strained.

• In addition, the current manual system requires large storage space which may also result in loss of information and also straining the company's resources submit his/her log book and work-related learning report which is a cost to the student.

3.5 Evaluation of alternatives

There are many techniques that may be used by a company to acquire a computer system. These include in house development, outsourcing and improving the existing system. This means that these different types of alternatives are applicable in different situation and have advantages as well as disadvantages.

3.5.1 In-house development

This refers to the development of a completely new system from scratch. This is in accordance to Setende, (2012). This means that the organization will have full system ownership. It is therefore a merit to the organization since they will have the system source code and can edit easily the

system to add more functionality if needs be. This means that the system maintenance will be done by the internal programmers therefore this is cost saving. Also another major benefit is that confidentiality which is enforced since the source code is owned by the company developers.

However in-house development is time consuming because the system would be developed from scratch. This means that it requires expertise as well as more resources than to out-source the system.

3.5.2 Improve the system

In this approach the functionality of the old system is improved or upgraded rather than developing a completely new system. This approach is therefore applicable in a company where there is a computerized system which is already which only requires upgrades. This therefore cannot be used for system development since currently there is a manual system which have been put in place. The approach will be used after the development of the system to upgrade in case of future modifications which will be required by the company. This will be the best measure to cope up with the rapid technological advancement.

3.5.3 Outsourcing

The alternative measure that can be used by ZPC is to outsource the system. According to Hall (2003), system outsourcing refers to giving an external company or party the responsibility of developing as well as maintenance of the new system. This therefore refers assigning the development task to external programmers who will produce the system according to the specifications required by the company.

The major advantage of outsourcing is that a short period of time is required to develop the system since the development company will have all the required tools and expertise to develop the system.

However the major disadvantage of outsourcing is that huge costs are required to hire an external party for the development of the system. Also confidentiality is not purely confined in the business since the organization have to provide knowledge on the business functions to the external company hired.

3.5.4 Recommendation

The most applicable technique to use is in-house development. This is since the approach is less costly as compared to other approaches. Also there is good communication between the developer and the final system users so a quality software is likely to be developed. In addition, confidentiality is enforced by the company since the system will be developed internally. Also maintenance costs are less as compared to other approaches of development. This therefore results in high quality software produced which will be matching the needs of the final users.

One major disadvantage is that it takes a lot of time to develop the system from scratch. This is due to the lack of expertise on some aspects of the system which will require research.

The final approach which was chosen was the in-house development technique. This was chosen since the benefits outweigh the costs. It was concluded that the in-house development approach shall be used to develop the system at ZPC.

3.6 System Requirements

Grady (2012) outlined requirement analysis as an organized methodology that is carried out to determine the resources required for the development of the system to deliver high quality products. The facts that are available in the study are therefore going to be identified by the requirements analysis. This is helpful in assessing the processes, data requirements, information produced as well as the timing of processes. There are two major types of requirements include functional and non-functional requirements.

3.6.1 Functional Requirements

These requirements specifies how the system is supposed to work that is the various business processes, provision of information as well as the business values. Kendall and Kendall, 2014 highlighted that functional requirements specify the behaviour of the system or functions of the system for example add customer. These therefore include business processes, perceived information as well as the business rules.

Business Processes

Wang and Wang (2012) propounded that business processes are those processes or activities that human actors implement to achieve outcome. In the system, business processes such as the creation of network logs shall therefore be done by the system through an automated ping request that

would be sent at regular intervals. This will be automated in the system. The system shall also automatically calculate network servers' availability by matching the periods when the server was up with those in which the server was offline. Notifications will be sent directly to respective users through an SMS platform.

User perceived information

This refers to the measure of the effectiveness of a system usually on the end user's side. This include the various aspects such as the ability of the users to raise tickets in the system, output and information navigation. The input in this case refers to the issues, tasks or tickets raised by the users or employees at ZPC. The users shall also be able to track their issues in the system to check for progress as well as consulting the knowledge base for certain responses to issues or tickets. The output shall be the tickets logs reports as well as the network and servers availability reports.

Business rules

The business rules are the targets that the business seeks to achieve which guide how various business processes are carried out in an organization. In this case, one of the major goal of the business is for the ICT department to provide quality services and in this case, the automated ticketing system will help provide quality ICT help services thus improving efficiency at the workplace. The system shall be developed to align the organizational with its policies.

Case Diagram

The case diagram shows the relations of actors in the system and how they operate in the system. The actors will therefore symbolizes people or system users. This is in accordance to the Isrd Group (2007. The main objective of the use of case diagrams is to help developers in the development of the system that is they will be able to know the system access rights of each user as they will have discovered the relations between actors and the relationships involved.
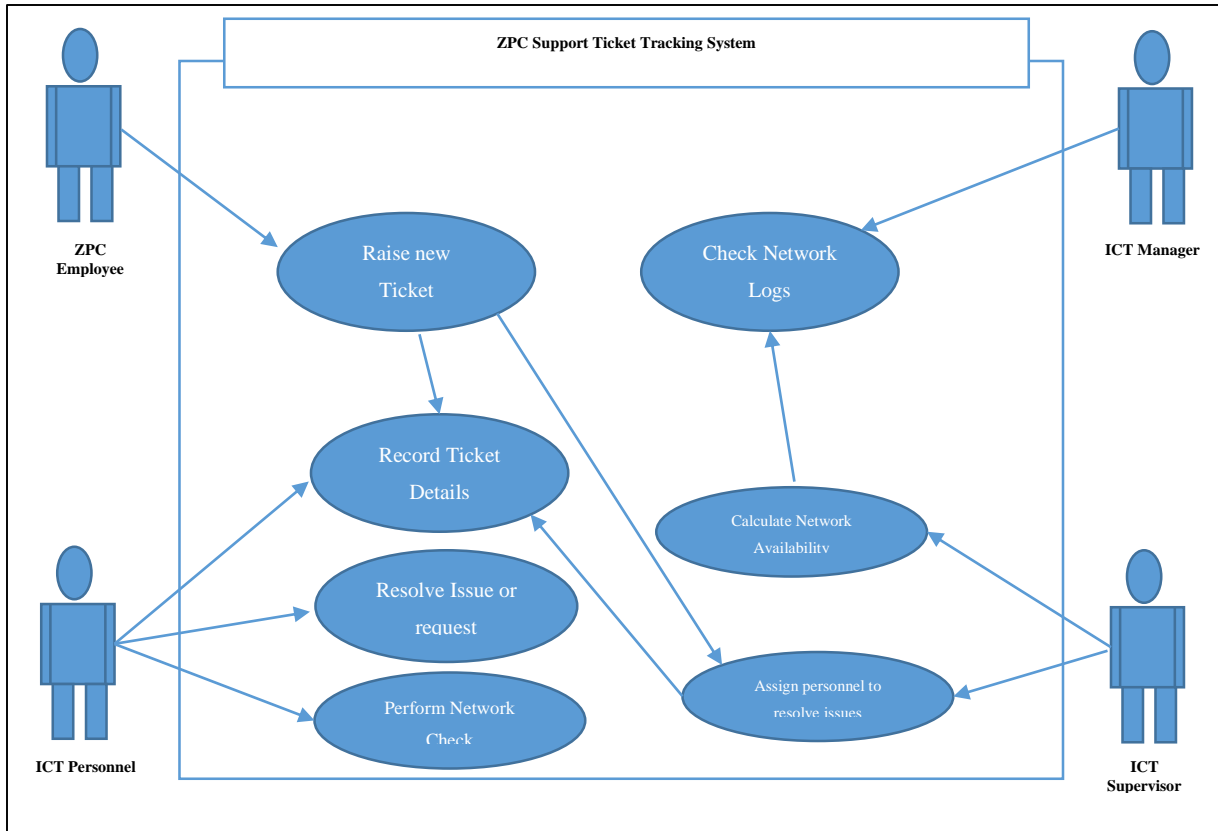
Fig 3.4 Use of case diagram on the current system

3.6.2 Non Functional Requirements

According to Aurum and Wohlin (2005), non-functional requirements are those requirements that are not measured by the functions of the system. They specifies the criteria that will be used to measure the system operation rather its behaviour that is the quality attributes of a system. This is in accordance to Rosenblatt, (2014).

Usability

In this case, the system functionality is on the use of the system that is how the users interacts with the application, how friendly the interfaces are and how easy to use the system is. The constant communication between the developer and the management will therefore aid in coming up with a system which is user friendly. In addition, the use of user manual will assist the management to effectively use the system. The system will also have informative dialog boxes which will enable users to interact with it effectively and efficiently.

Vendor

This is also another requirement which concerns the suppliers of the various hardware products that will be used in the development and implementation of the system. The vendor should have a good reputation with its customers so that the products obtained are reliable. The developer will ensure all the tools used are of high quality for example the visual studio development platform as well as the SQL server which will be provided directly from Microsoft which is reliable.

Performance

The system will also perform effectively and efficiently as it is one of its main reason for development. Operational quality seeks to measure if the system is reliable and scalable. This will be fulfilled since the system is going to work in an intranet based platform therefore will be accessed all over the company's network. As it is going to automate some of the manual procedures at the work place, this is likely to improve performance at the workplace.

Security

In addition, another non-functional requirement is the issue of security of the system. This is meant to protect the system from unauthorized access and malicious programs so that the system will be able to perform efficiently. The system should therefore be protected from hackers, viruses, Trojans as well as unauthorized access. As a measure to cope with such issues, updated antivirus software would be used to safe guard the system from malicious programs. Also the use of usernames and passwords as well as CAPTCHA (Computer Automated Public Turing Test to Tell Computers and Humans Apart) will safeguard the system from unauthorized access.

3.7 Conclusion

The analysis of the system was carried out and the various processes or activities to be carried out were outlined. The various information gathering methodologies were explained and the findings clearly reflected that the users were not satisfied with the current manual system. The company's current manual system was analysed that is the various processes, inputs as well as outputs. The data analysis phase was clearly explained as well as the data flow diagram of the current system which highlighted the flow of data in the current system. All the weaknesses of the current manual system have been outlined and it was chosen to use in-house development as a technique to develop

a new system which will address the current system weaknesses. In addition, a functional and non-functional requirements analysis was done which outlined the various system requirements. The next chapter will be geared on the design of the new system, its architecture, modules as well as the interface and data requirements.

CHAPTER 4: DESIGN PHASE

4.1 Introduction

The focus of this chapter is on the design or building of the new system. According to Wang and Wang (2012), the design stage will focus on the new system's architecture, the hardware involved, the people as well as the various requirements of the new system. The business requirements will be outlined, and the various system aspects such as the user interfaces, the various system inputs and outputs will be outlined. The proposed system will be explained in details, that is how it works, the flow of data through context and data flow diagrams as well as its architectural design. The system physical design will be drafted which will highlight the hardware components will interconnect with the software or system components. The system databases will be designed as well as an enhanced entity diagram. The system's abstract design will also be drafted which will show the various system modules.

4.2 How the system works

The system has been designed to automate the network logs management at ZPC as well as providing a platform for ZPC employees or users where they can create and track their support tickets. The system will automatically check the status of network servers by sending an SSL request or ping request after a certain time interval. If the one of the servers is down, the system will send an SMS message notifying the ICT Personnel to resolve the issue. The system will also automatically create a ticket if the server is not reachable which will also reflect in the ICT Tickets timeline. All the server logs are automatically recorded on daily basis except on weekends. The recorded logs will therefore be used to calculate the network availability or the network uptime. Also ZPC Employees can also create their ticket or requests in the system. The employees can therefore be able to track the issue and check the status of each issue in the system. The ICT Team is notified in real time once an issue has been send. The ICT Administration can therefore extract reports of issues that would have been raised by the ZPC Users. Vital ICT documents such as ICT Procedures as well as reports can also be uploaded and downloaded by the ICT Personnel in the system.

4.2.1 Context Diagram

This refers to a tool which is used to depict the relationship between the system and its environment in which it is operating in. This is in accordance to Bittner and Spencer (2003). The diagram shows

an overview of the whole system without much detail about other various system aspects such as system requirements. The major difference between the context diagram of the current system and that of the proposed system is that other processes will be automated in the proposed system solution. The proposed system's context diagram is as shown below:
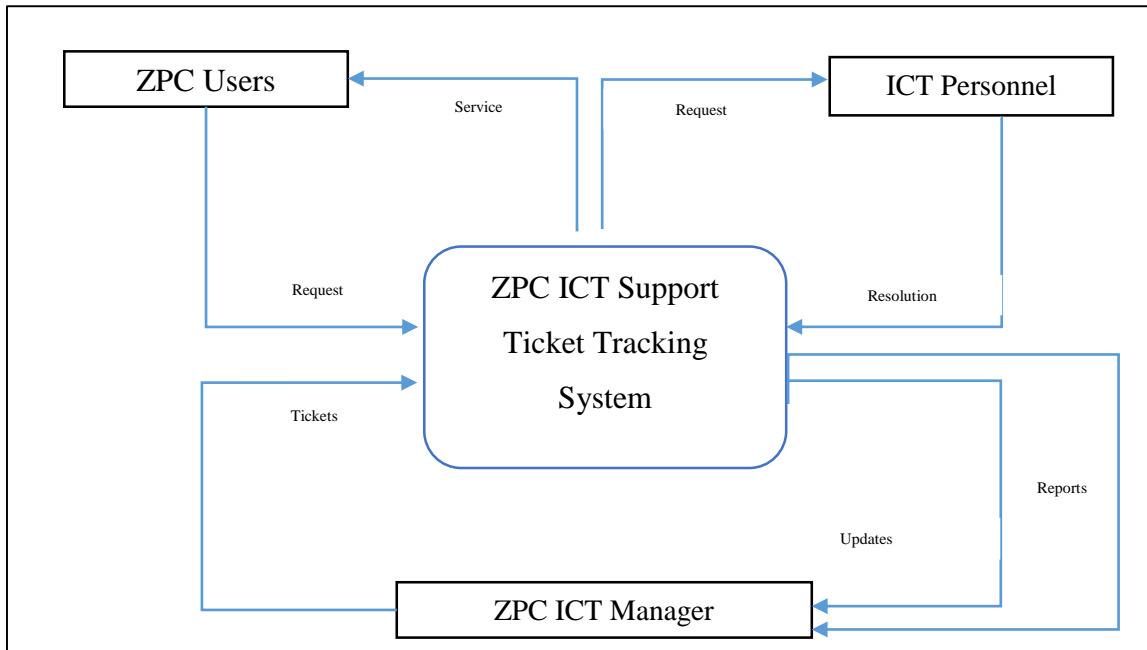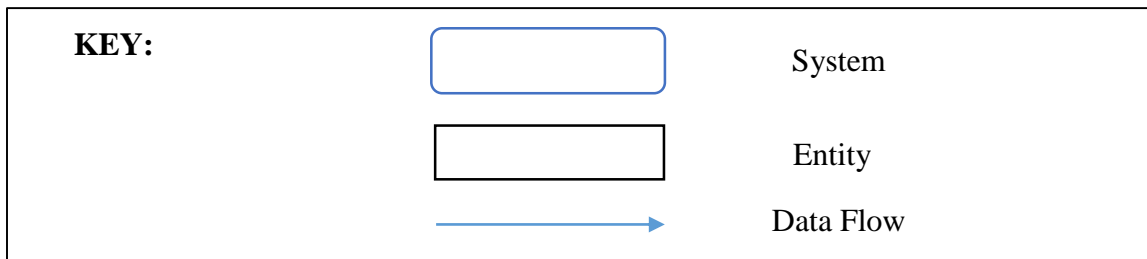

Fig 4.1 Context diagram for the proposed system

4.2.2 Data Flow Diagram

In accordance to Bittner and Spencer (2003), a tool which depicts the movement of data in the system is known as a data flow diagram. The data flow diagram does not highlight the program logic however it only reflects the flow of data in the system. It therefore uses four symbols to reflect data exchange in the system which are the entities, the processes, data stores as well as the data flow. The entities represent the individuals who will work with the system data. The processes are responsible for producing output given the data from data sources as well as the entities. The data flow will show the movement of data from source to destination and also the data sources are

37

responsible for the collection of data or data storage repositories. The following diagram shows the proposed system data flow diagram.
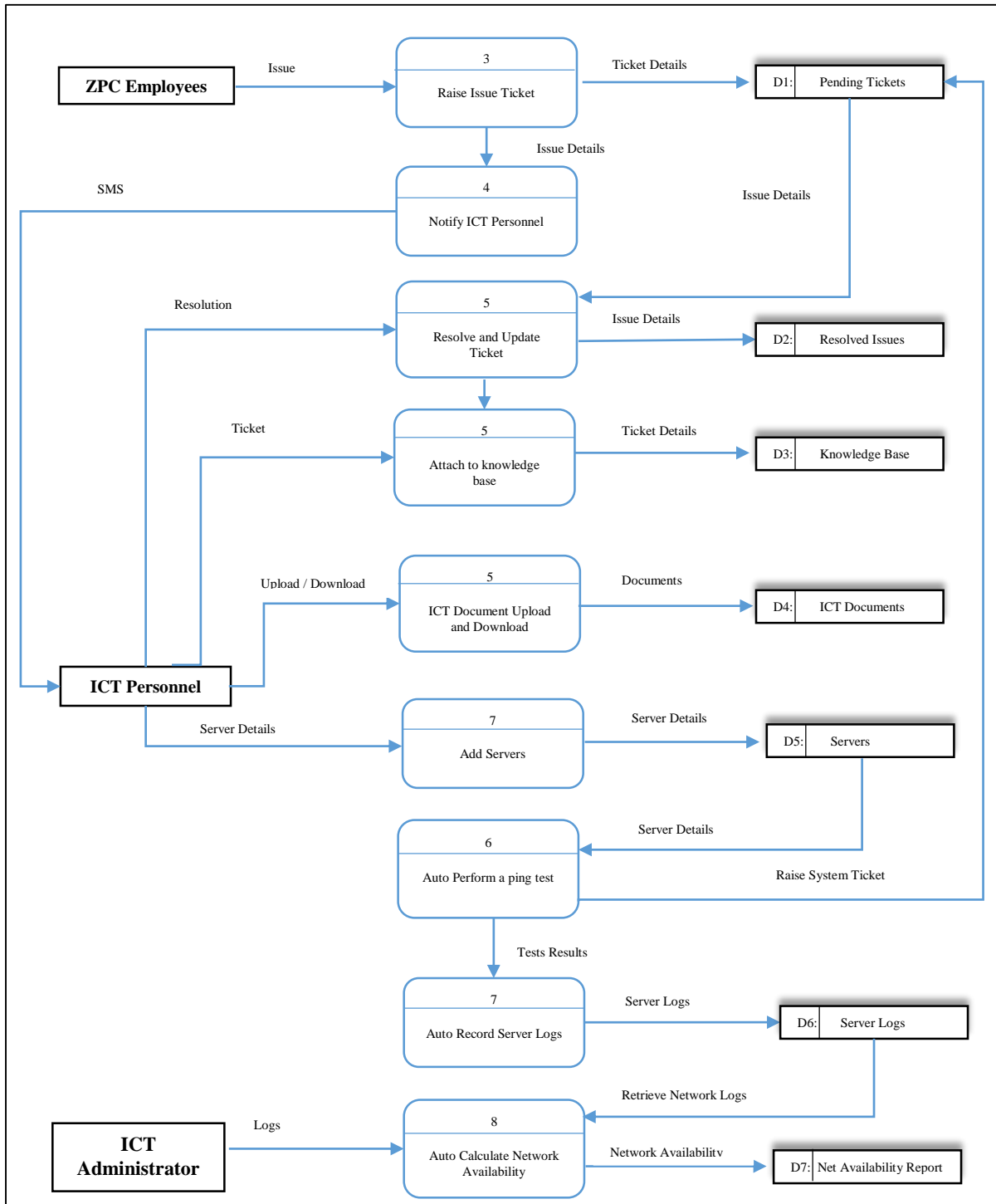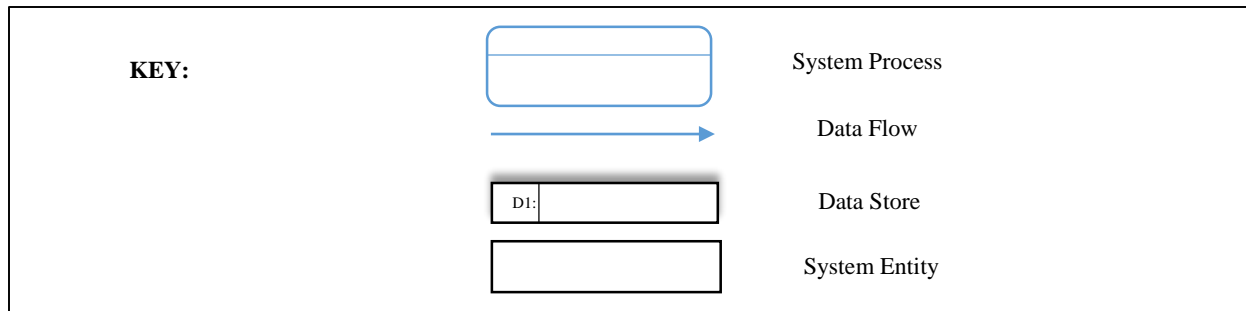

Fig 4.2 Dataflow Diagram for the proposed system

KEY:		
	(rounded rectangle)	System Process
	→	Data Flow
	D1:	Data Store
		System Entity

4.3 Architectural Design

The architectural design of the system refers to the overall system structure partitioned in terms of the system components as well as the interconnection of the various system components. This is in accordance to Bass and Kazman (2003). The hardware and software components are reflected in the system's architectural design. It therefore shows how the various system components will be connected. These include the clients, servers as well as the work station. The architectural design ensures that all the hardware and software requirements are put in place to ensure reliability and efficiency of the new system.

The following are the components that will be included in the architectural design of the ZPC automated Network Logs and ICT Support Ticket Tracking System.

- User Machines

These are the various computers (desktop and notebook) which will be used to access the system. The user interface will be displayed on the browsers since the system is web based.

- Server

The system will run on IIS (Internet Information System) Server which will be installed together with the windows server package.

- Network Cables

These will be used to interconnect the various network components such as network switches and routers.

- Printers

These will be responsible for printing various reports which will be produced by the system that is Tickets reports, User reports as well as Network Logs reports.

4.4 Physical Design

According to Goyal (2011), the system physical design is used to represent the system's internal and external entities. It therefore depicts the environment in which the system operates in, its structure as well as the physical components involved. It also involves the network configuration, physical data security, storage devices, structure of data as well as the input and outputs as well as other physical aspects of the system. The diagram shows the system physical design.
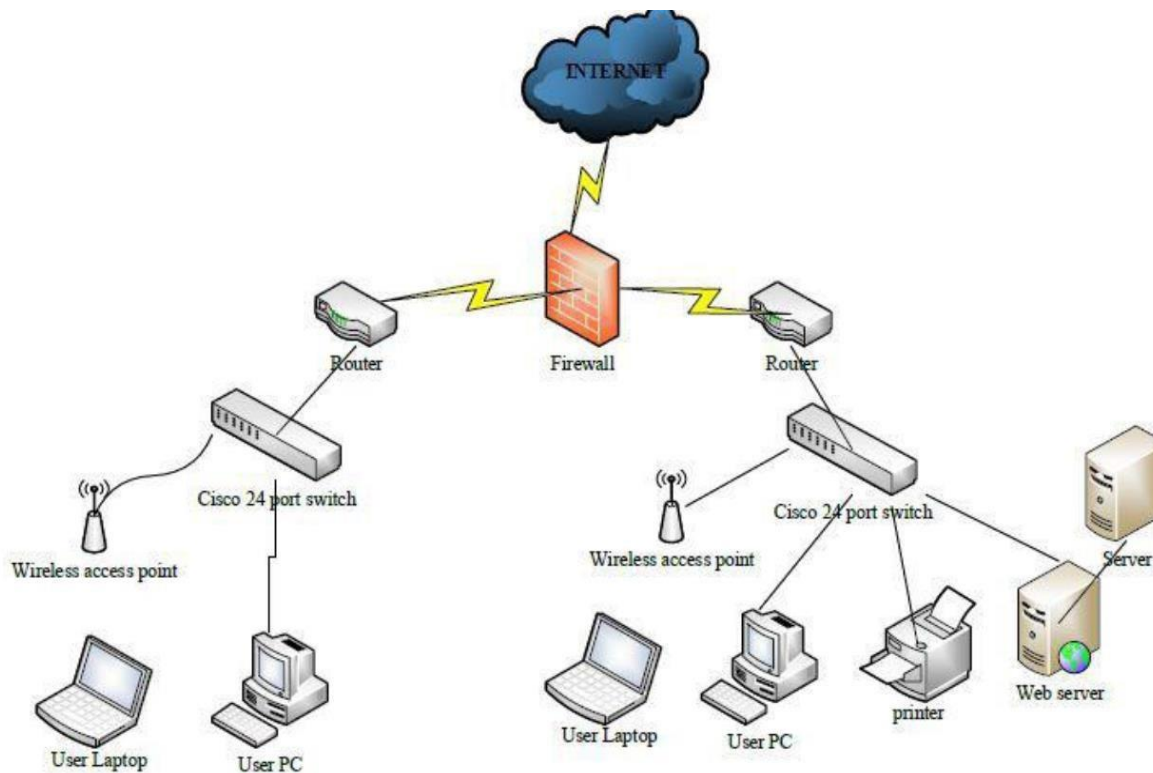
Fig 4.3 Physical Design

4.5 Database Design

Muller (2011) defined a database as an organized data collection in digital form. It therefore enable data storage as well as retrieval of data by the system users. For the design of the database, the ANSI/SPARC architecture shall be used which consists of three schemas that is the internal level, conceptual as well as the external level. The architecture facilitates data independence. This means that the changes in one schema will not affect other schemas.

The three database design levels are as follows:

- The External level

This level is responsible for access restriction. At this level, data may be presented differently to each user. This means that information significant to each user is granted.

- The Conceptual level

This is referred to as the community view of the database. It highlight the various entities as well as their attributes and relationship, information or data integrity as well as data constraints.

- The Internal level

This refers to the physical database representation and therefore determines how the data is stores in the system database.
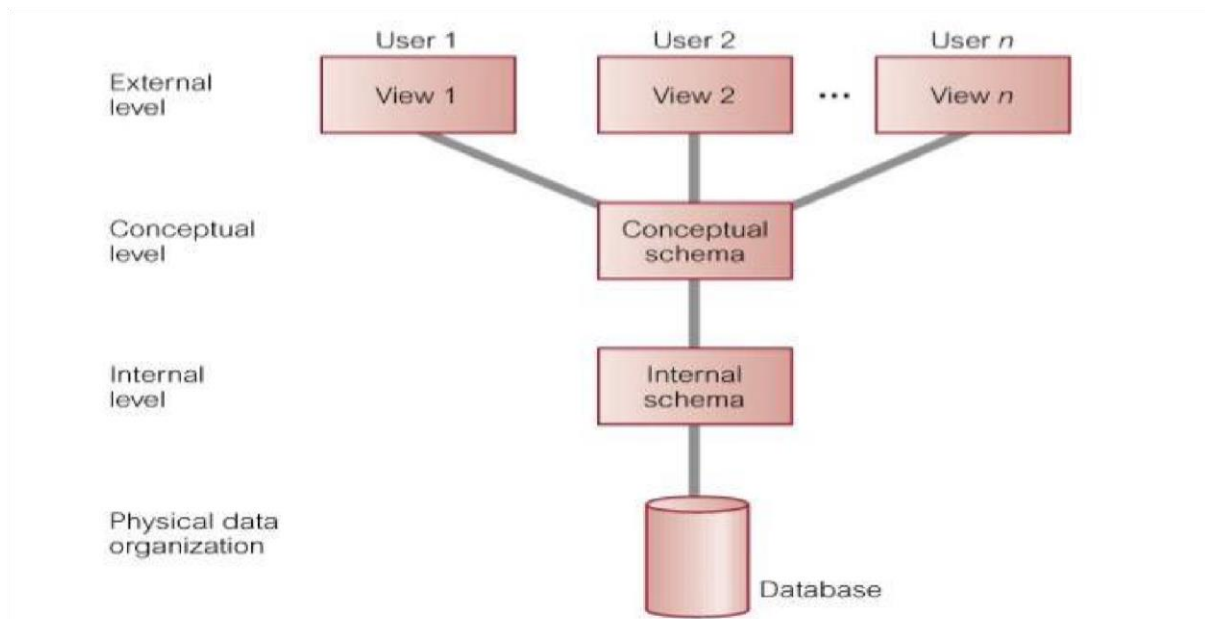
Fig 4.4 Three level architectural diagram

4.5.1 Database Tables

According to Gillenson (2011), all the data that is required in the system is stored in the database in rows and columns which are known as database tables. The proposed system's database tables are shown below:

Table 4.1: Database Design for Users

Field	Data type	Description
Username	Varchar (50) [PK]	The user's EC Number
Full_Name	Varchar (100)	Full Name of the user
Email	Varchar (50)	User Email address
Level	Varchar (50)	The access level of the user
Mobile	Varchar (20)	User phone number
Photo	Image	Username of the user
Password	Varchar (30)	The user's password
Department	Varchar (20)	Department of User
Creation_date	Date	Date user was created

Table 4.2: Database Design for Tickets

Field	Data type	Description
Tracking_Number	Varchar (20) [PK]	Ticket Unique Identifier
Date_Raised	DateTime	The date ticket was raised
Title	Varchar (20)	The title of the ticket
Category	Varchar (20)	Category in which ticket fall
Description	Varchar (500)	Brief description of Issue
Raised_By	Varchar (50)	Details of the user
Attended_By	Varchar (50)	Details of the ICT Personnel
Time_Attended	DateTime	Time Issue was attended

Duration	Varchar (50)	The period taken to resolve issue
Resolution	Varchar (500)	Solution to the problem
Status	Varchar (50)	Status of issue or ticket
Type	Varchar (50)	Scope in which ticket was raised
Priority	Integer	The priority of the request
Completion	Integer	Progress made to issue

Table 4.3 Database Design for Servers

Field	Data type	Description
Server_ID	Integer [PK]	Unique identifier of server
Serever_Name	Varchar	The name of the server
Server_Address	Varchar	The IP Address of the server
Location	Varchar	Where server is located
Description	Varchar	Brief description of server
Recorded_By	Varchar	One who recorded the server
Date_Recorded	Varchar	The date server was added

Table 4.4: Database design for server logs

Field	Data Type	Description
Record_ID	Integer [PK]	The record unique identifier
Server_Name	Varchar (50)	Name of server
Server_Address	Varchar (50)	Server IP Address

Description	Varchar (100)	Server description
Time_Span	Varchar (20)	The ping time interval
Status	Varchar (20)	The server status
Month	Varchar (20)	Month the record was made
Date_Recorded	DateTime	Date the record was made

Table 4.3 Database Design for Knowledge Base

Field	Data type	Description
ID	Integer [PK]	Unique identifier of solution
Title	Varchar (20)	The solution title
Description	Varchar (500)	The problem description
Category	Varchar (50)	The problem category
Resolution	Varchar (500)	Solution to the problem
Tag	Varchar (20)	Search tag that will be used

4.5.2 Logical Database Design

According to Gillenson (2011), the logical database design is done to determine how the attributes of the various system entities can be arranged into database structures. The major role of database tables facilitate storage of data and to manage the relationship between the data within various database tables through the use of foreign keys.

Table 4.5: Entity and Attributes

Entity	Attributes
ZPC General Users	Full Name, EC Number, Phone number, Email Address, Department, Password

ICT Personnel	Full Name, EC Number, Phone number, Email Address, Department, Photo, Password, User Level
ICT Administrator	Full Name, EC Number, Phone number, Email Address, Department, Photo, Password , User Level

4.5.3 Enhanced Entity Relationship Diagram

According to Tupper (2011), an entity relationship diagram is a pictorial view which illustrates the relationship between the various system entities. It also have other concepts such as sub classes as

well as super classes which also aid in showing the relationship between the entities of the system.
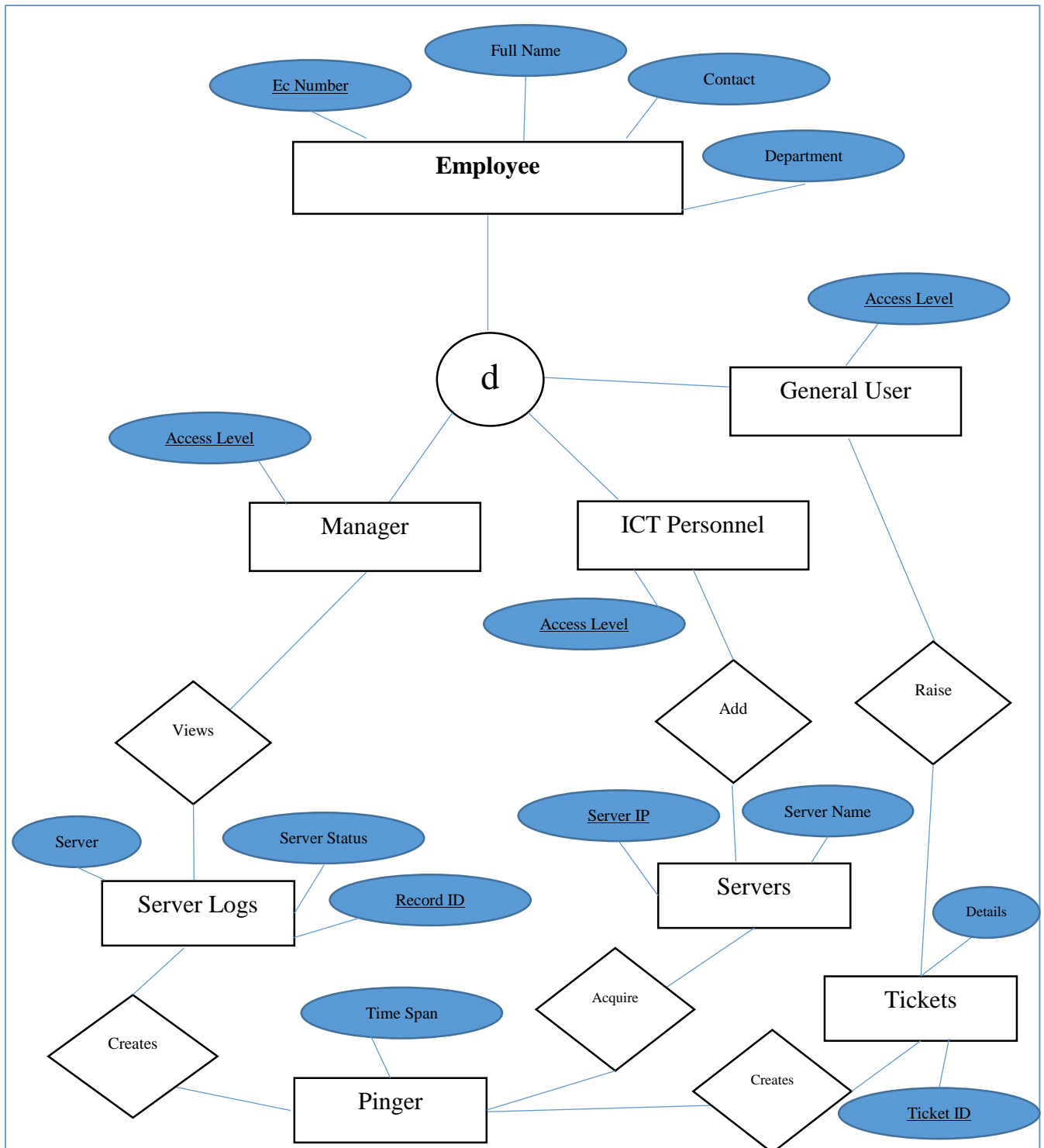
Fig 4.5: Enhanced Entity Relationship Diagram for the proposed system

4.6 Program Design

The program design illustrates the various modules of the program that is how the various modules are going to be coded and how the modules will communicate with each other to form a single program. It includes the class diagram, package and sequence diagrams which therefore clearly specifies how the system will work.

4.6.1 Class Diagrams

Satzinger, Jackson and Burd (2016) propounded that a class diagram is a graphical presentation of objects sets and the associations between them. As it captures the view of the system, it is therefore essential in Unified Modeling Language.
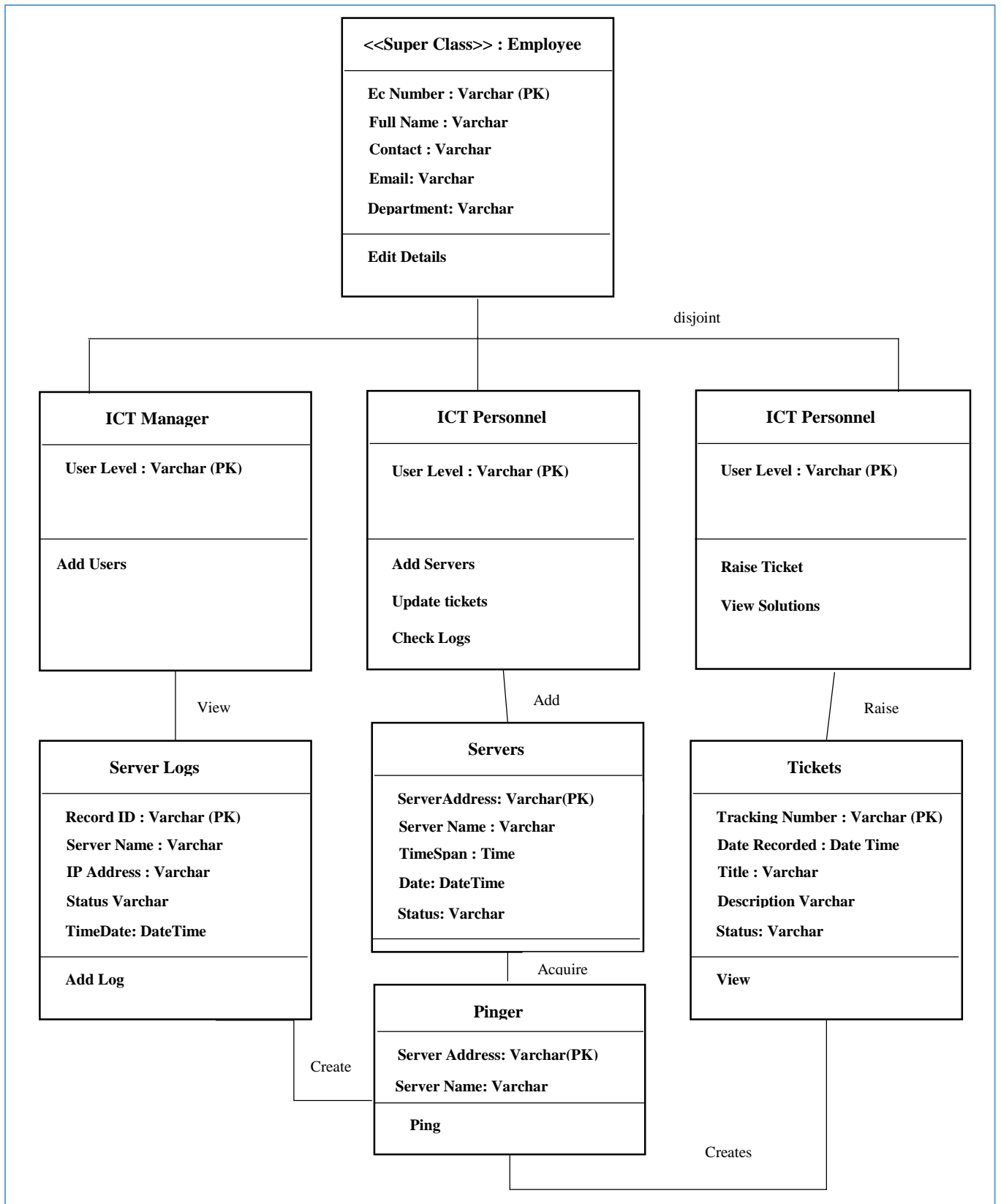
Fig 4.6: Class Diagram for the proposed system

4.6.2 Package Diagram

The diagram shows packages and their relationship in the system. Packages are essential in modelling elements for example cases and classes into sets. The relationship is illustrated in the diagram.
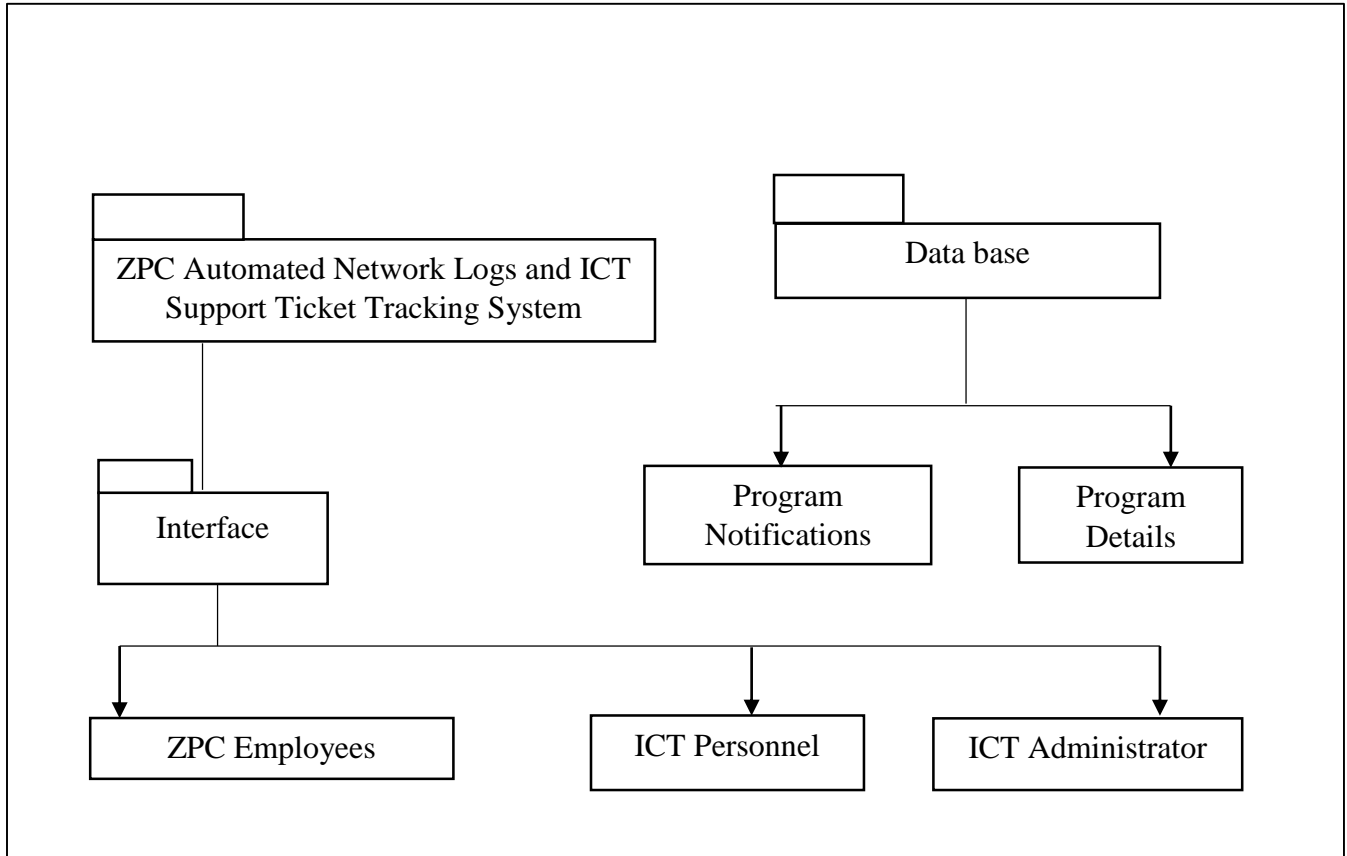
Fig 4.7: Package Diagram for the new system.

4.7 Interface Design

According to Rosenblatt and Tilley (2016), the interface design refers the design of hardware and software applications with the main thrust on the user interaction and experience. User Interfaces are done in order to simplify the operations of a certain application. It is therefore often called user-centered design as its main focus is on user interaction. The system shall be designed so that it is beautiful and interactive that is providing feedback if necessary so that it is easy to use. Textboxes shall be used for data input, message boxes for feedback as well as hyperlinks for redirecting users to various system pages.

4.7.1 Menu Design

The main menu is an interface that shows all the available navigation options for a given user. This means that different users will see a different menu depending on the access level of that particular user.

Main Menu
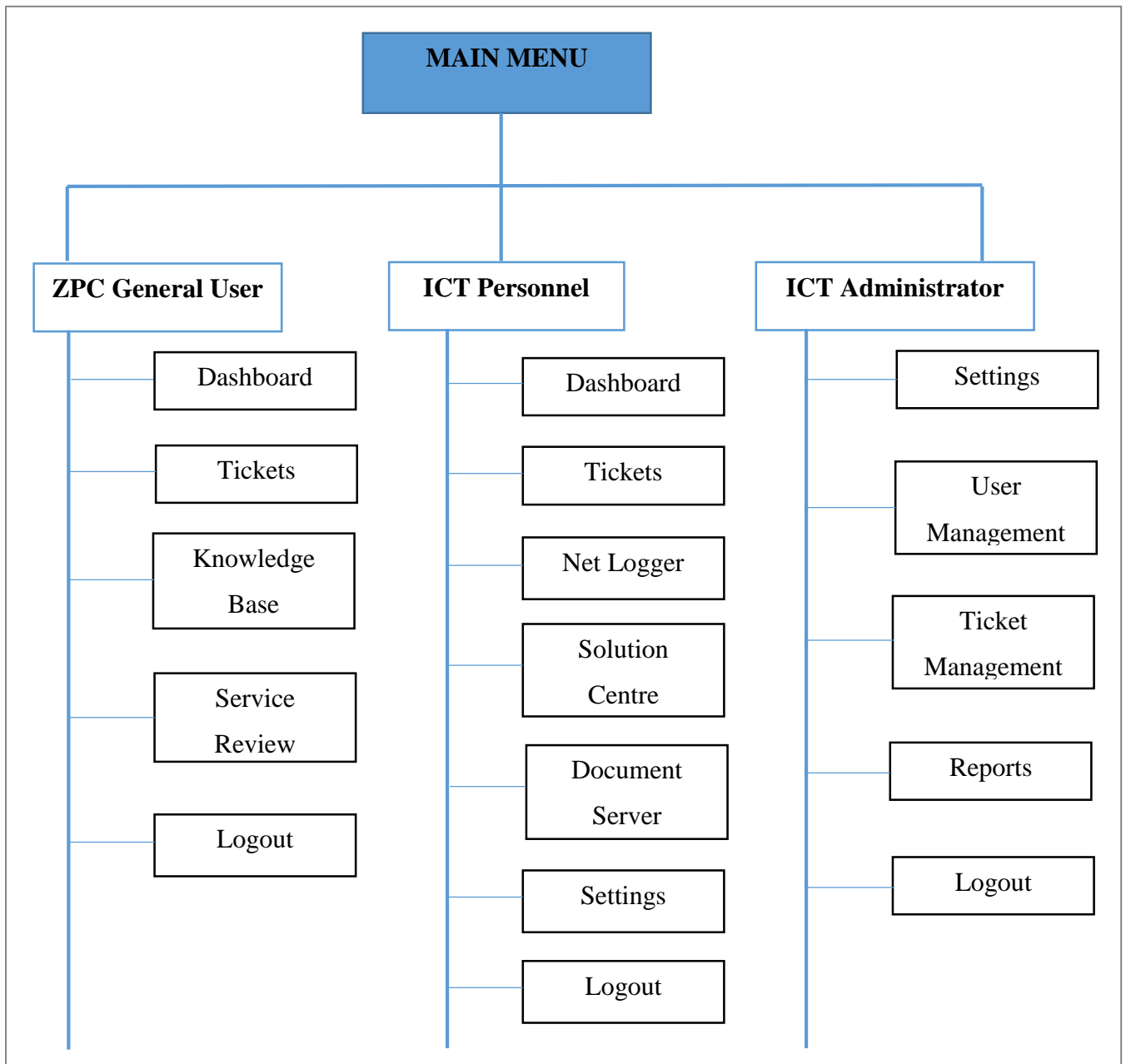
Fig 4.8 Main Menu Design

The homepage is the main system page which is firstly loaded upon system launch. It will therefore comprises of a brief description of the system, highlighting the system main functions, registration page as well as a login section where users can login to access various system options.

Home	Contacts	Register	ICT Updates	Login

ZPC Photos

ZPC Automated Network Logs and ICT Ticket Tracking System

Contacts
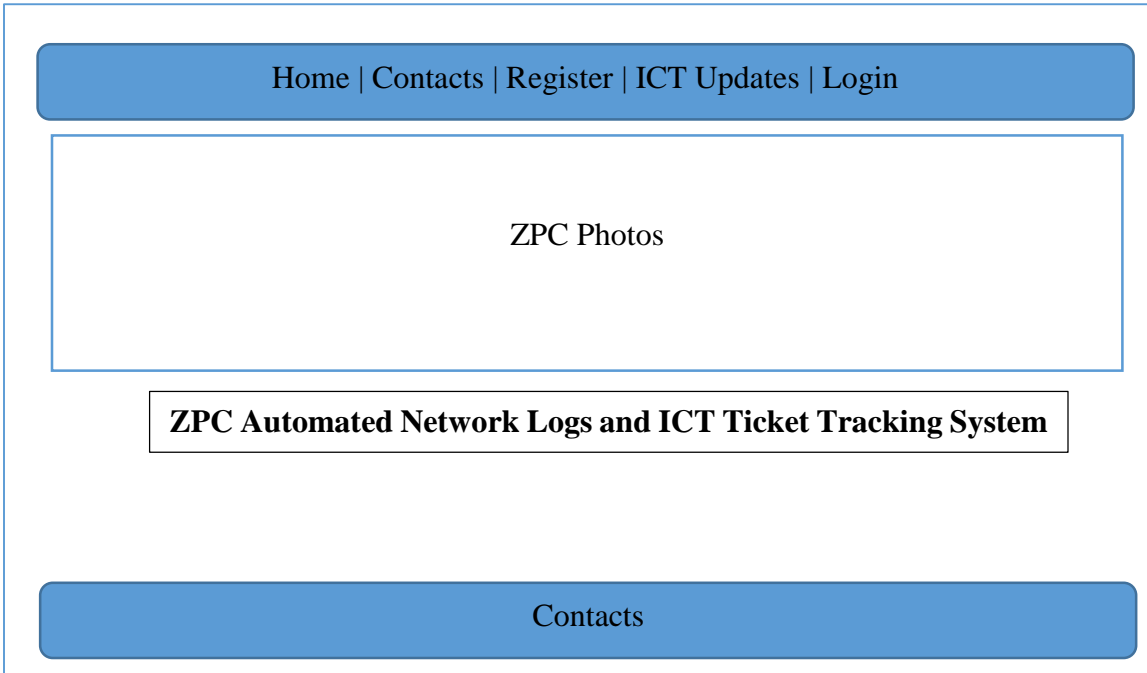
Fig 4.9 System Homepage

Sub menus

Sub menus will be used to navigate to various pages. The sub menus will be displayed depending on the level of users that is general users will not be able to see other menu items.

 Admin Page

This page is for the ICT Administrator or Manager. The page shall be used to control the entire system and shall be accessed by the user with an administrator password. The administrator will therefore access various system options such as network logs view as well as report generation.
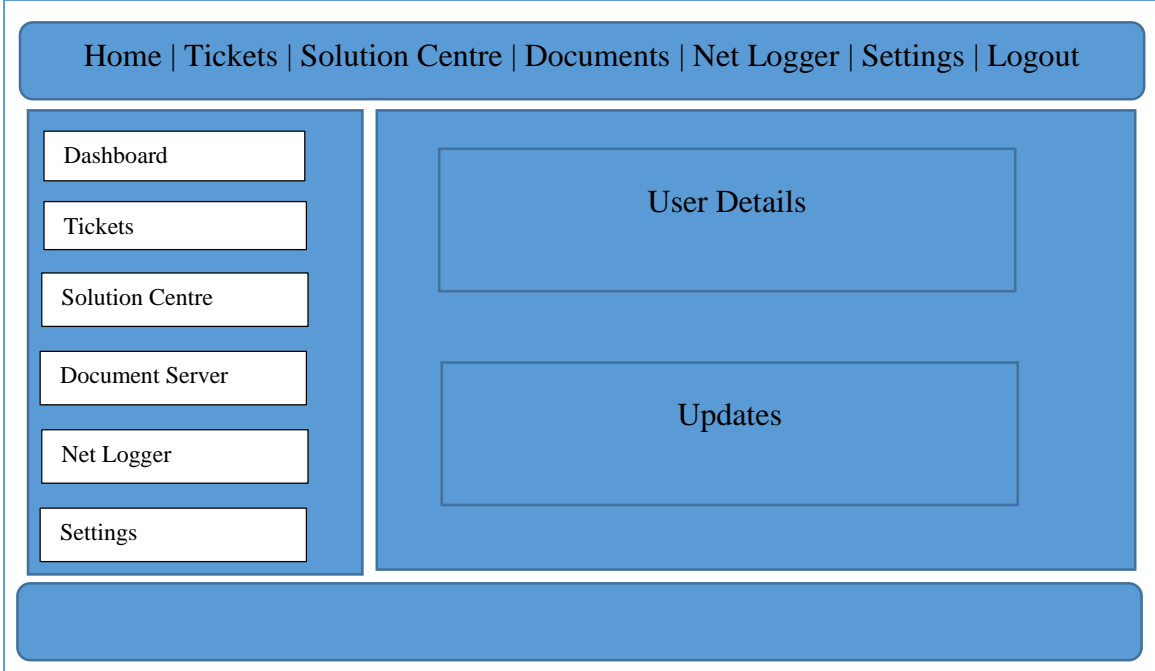
Fig 4.10 Admin Homepage

Other system users will have limited system functions therefore have their own homepage that will be different from the administrator's homepage.
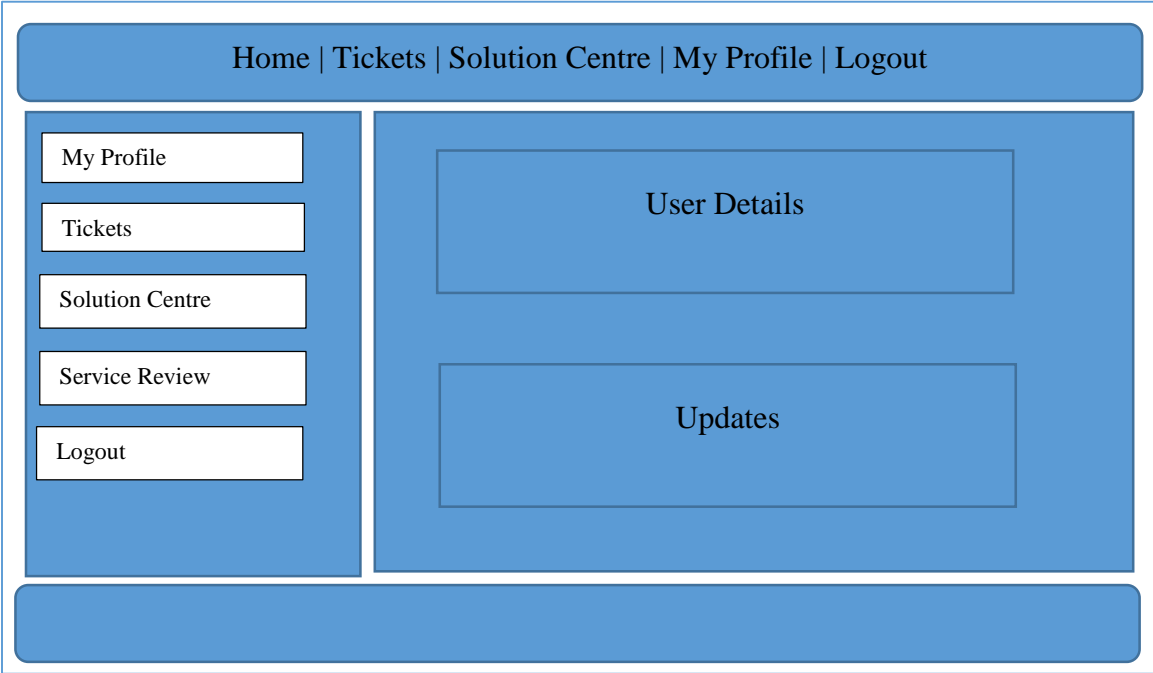
Fig 4.11 General User Homepage

4.7.2 Input design

Input is raw data that is then converted into output. The quality of a system's inputs will therefore contribute to the overall quality of a system's outputs. To enforce quality input standards, the system shall have strongly validated fields that should not allow incorrect information to be loaded in the database. This is in accordance to Dennis, Wixom and Roth (2015).

Raising Ticket in System

Users can raise tickets in the system.

Fig 4.11 Raising a new ticket

Fig 4.12 Closing a ticket

The ICT Personnel will close a ticket if the issue has been completed.

Fig 4.13 Add User Form

Users will be added by the Administrator in the system or the ICT Personnel.

<table>
<tr><td colspan="2" align="center">**Add Servers**</td></tr>
<tr><td colspan="2">**Add Servers**</td></tr>
<tr><td>Server Name</td><td></td></tr>
<tr><td>Server IP Address</td><td></td></tr>
<tr><td>Server Description</td><td></td></tr>
<tr><td>Server Location</td><td></td></tr>
<tr><td>Date Added</td><td></td></tr>
<tr><td colspan="2" align="center">Add Server</td></tr>
</table>

Fig 4.14 Adding a new server

New servers can be added in the system by the ICT Personnel or Administrator for monitoring

<table>
<tr><td colspan="2" align="center">**Server Availability Calculator**</td></tr>
<tr><td colspan="2" align="center">**Retrieve Server Name**</td></tr>
<tr><td>Server Name</td><td>Retrieve Server from list</td></tr>
<tr><td>Server IP Details</td><td></td></tr>
<tr><td>Daily Availability</td><td></td></tr>
<tr><td>Weekly Availability</td><td></td></tr>
<tr><td>Monthly Availability</td><td></td></tr>
<tr><td>Save Report</td><td>View Saved Report</td></tr>
</table>

Fig 4.15 Server Availability form

4.7.3 Output Design

Output refers to the final information that is produced by the system. It therefore involves reports as well as other output information produced by the system.

 Server Logs

The system automatically generate server logs which will be recorded after every minute.

RECORD ID	SERVER ADDRESS	SERVER NAME	STATUS	TIME SPAN	DATE
PI1416NG	172.16.15.1	Mail Server	Up	8:00:00	01/04/2018
PI7745NG	192.168.0.1	SAP Server	Down	8:00:00	01/04/2018

Fig 4.13 Server logs

 Tickets timeline

All the tickets raised by the system and those raised by users will be displayed on the tickets section in the system.

Tracking Number	Date Raised	Raised By	Title	Description	Category	Priority	Status	Resolution	Completion
ZPC77TKT	01/02/2018	System	Net Logger	SAP Server is down	Networks	5	Pending		0%
ZPC54TKT	01/02/2018	Tinashe Mahla	Mail	Not Updating Mails	Mail	4	Resolved	Restarted Outlook	100%

Fig 4.14 Tickets Timeline

 Administrator Dashboard

This will display the overall system data extracted from the database. Pie charts and bar graphs shall be used to effectively display the data.

Administrator Dashboard			
Tickets	**Servers**	**Net Logs**	**Tickets Data**
700	5	555	Detailed Data

Fig 4.15 Administrator dashboard report

Reports will be generated by the system that is tickets reports, user reports, network log reports as well as server list reports.

☐ Network Log Reports

Date	report id	Server	IP Address	Status	Time
28/10/17	ZPC67RPT	SAP Server	192.168.0.1	Down	8.00 am

Fig 4.16 Network Log Reports

4.8 Pseudo Code

4.8.1 Log in code

Enter Ec -Number and password

Complete CAPTCHA authentication

Press Enter or login button

Application connect to SQL Server database

If credentials are correct then select access level

Case "Administrator": {

Direct to Administrator homepage

}

Case "ICT Personnel": {

  Direct to ICT Personnel homepage

}

Case "General User": {

   Direct to User Homepage with less options

}

Else if the fields for username and password are empty

Print "ENTER CREDENTIALS TO ACCESS SYSTEM"

Clear textbox fields and remain on the login page

Else if password or username is incorrect

Print "INCORRECT CREDENTIALS"

Else if CAPTCHA is valid equals False

Print "Incorrect CAPTCHA value"

4.8.2 Raising a new ticket

Enter the ticket details in the fields required

Click raise new ticket

Post ticket details to SQL Database and update status as "Pending"

Retrieve ICT Personnel contact from database

Send message using SMS API notifying the personnel on the new ticket raised

Print "TICKET CREATED SUCCESFULLY AND MESSAGE SEND TO ICT"

4.8.3 Updating a ticket status

Retrieve ticket details from tickets where the status is "Pending"

Update the ticket status with parameter specified

Notify the ticket owner if the issue has been completed

Print "TICKET UPDATED AND MESSAGE SENT"

4.8.4 Logging server status

Print "NET LOGGER HAS BEEN STARTED"

Check Day

If it is "Weekend" Then

Don't ping

Else

Retrieve IP Address for each server in the database

Foreach IP Address Then perform ping request

If the server status is "Up" Then log the results in server logs

Else if the server is "Down" Then log the results in server logs

Send MESSAGE notifying the ICT Personnel notifying that the server is down

Raise a ticket if server is down which will be shown in tickets timeline

4.8.2 Calculation of server availability

Retrieve server details from database

Count server logs "Up"

Count server logs "Down"

Count ALL server logs

Calculate availability as percentage using the server logs

Show calculated server availability

4.9 Security Design

Lopez, Huang and Sandhu (2013) states that the security design of a system is crucial in ensuring system protection from all possible aspects of intrusion and damage. The security design therefore

has three aspects which include physical security, network security as well as operational security. These ensure full system protection against intruders.

4.9.1 Physical Security

According to Harris (2013), physical security is whereby all IT hardware equipment, software as well as network devices are safeguarded from physical events that could cause harm to the equipment resulting in a loss. It therefore involves protecting equipment from things such as floods, theft, vandalism as well as other physical dangers. Measures have been put in place to safeguard the equipment from such dangers. These include biometric security with CCTV technology, alarms for fire detection as well as an uninterrupted supply of electricity. Alarms and security cameras have been put in place to detect unauthorized entry so as to reduce theft cases. Fire detection systems will serve as a fire guard to safeguard network and other hardware devices.

4.9.2 Network Security

According to Kizza (2015), network security is meant to ensure protection of the network and data flowing in a network. It therefore includes hardware as well as software technologies. It is therefore meant to protect physical network infrastructure against unauthorized access, misuse, modification as well as destruction to ensure that users perform their daily activities in a secure environment. An updated antivirus software will be used to scan potential harmful programs so that the network infrastructure will continue to function in a more efficient manner. Also a firewall will act as a defense mechanism to filter requests so that hackers will not attack the network. Traffic will be blocked through various policies which will be set by the network administrator. This will therefore ensure a secure environment.

4.9.3 Operational Security

According to Voelz, Moran and Philpott (2011), this involves operational security procedures, administrative security which involves policies, procedures through policy and guideline documents. It involves an outline of the procedures that are allowed and those prohibited at by the organization. Business processes are outlined in the procedural document. Policies outline all the activities allowed and those not allowed by the organization. This is meant to protect the overall business security so that all activities are carried out in an efficient and effective manner. Also policy standards shall be used so that all the system input is secure. This will be done through use of CAPTCHAs and password complexity which shall also be used for authentication so as to

reduce chances of a security breach. Guidelines will be used to outline how the various ICT procedures as well as other business procedures will be carried out to achieve desired goals.

4.10 Conclusion

The overall system functionality was explained. The flow of data was also illustrated as well as the hardware and software needed were outlined in the system architectural design. The physical design has clearly reflected the communication between hardware and software. Also the database design have been fully explained through the ANSI SPARC Model and also the system tables have been designed. The relationship between various entities and the processes have been shown using the enhanced entity relationship diagrams. The program design have also been drawn which include the package and class diagram. The proposed system's interfaces where designed to reflect how the users will interact with the system. Also the security design was explained which included the operational security, physical as well network security. The last chapter is the implementation phase in which the final system phase which is the implementation phase will be explained. The system will be tested and errors will be detected and corrected during this phase. It is also in this phase where the maintenance of the system shall be discussed and further system recommendations.

CHAPTER 5: IMPLEMENTATION PHASE

5.1 Introduction

The implementation phase refers to the execution of plan or a design as well as its practice. It therefore means that the blueprint will now be put into action. This is in accordance to Sommerville, (2015). The chapter will highlight the various coding as well as testing techniques, and installation alternatives highlighting their merits and demerits. The maintenance methods will be explained and the system will be evaluated to see if it meets the stated objectives. Further recommendations will be done to highlight various areas which should be modified in the future.

5.2 Coding

According to Dickins, Stowell and Melmoth (2015), coding is whereby the system developer writes code, debug and maintain the system. This is also known as computer programming. The programmer will develop the system to suit with the specified objectives. In this case, Visual C# and ASP.net was used to develop the system. Not only was the programmer involved in the coding exercise but also the system analysts, users as well as researchers.

5.3 Testing

This is a procedure which is done in order to detect errors, functionality as well correcting errors so that the developed system is of high quality and according to the specifications. When testing a software, all faults that might affect the system performance or security identified and corrected. According to Mahapata (2016), the goal of software testing is to find out if the software meets functional and non-functional user requirements. Validation and verification are also part of software testing since these also increase the quality of the software. Validation ensures that the system fulfil user requirements at the completion of the system and also verification on the other hand, verification ensures that the system meets the expected objectives at the beginning of the development exercise. The testing procedure is further split into two types which are black-box testing as well as white-box testing.

Black box testing does not concentrates on the system's internal mechanism but rather checks the input against the system's output. This is in accordance to Suryn, (2014). The technique is therefore mainly used for validation. On the other hand, white box testing considers the system's internal mechanism and require experience in order to perform this exercise since it is mainly for verification.

5.3.1 Unit Testing

This is also called program testing and in this case, system modules are tested independently. The aim is to check if the various modules are performing as per user requirements on specific blocks of code and if there are any errors on the modules, they are then corrected. White box testing technique was used for testing blocks of code in the various modules. The modules were tested and the following screenshots highlight the testing procedure. Black box testing was used to check if the users were satisfied with the functionality of the system.

Figure 5.1 Account Request Form

The module was tested if it was submitting the user details to the company database as expected. The module performed well since it was able to submit user details together with an image for the user to the database for system access.

5.3.2 Sub system testing

The various disintegrated modules are combined to form larger sub systems which are then tested to detect errors. It is carried out after completing the unit tests. The tests are run until all the sub systems errors are corrected. The tests were run on the various system sections. The following

shows the login page in which is used for authentication purposes. All the users login and are hen redirected to their respective homepages.
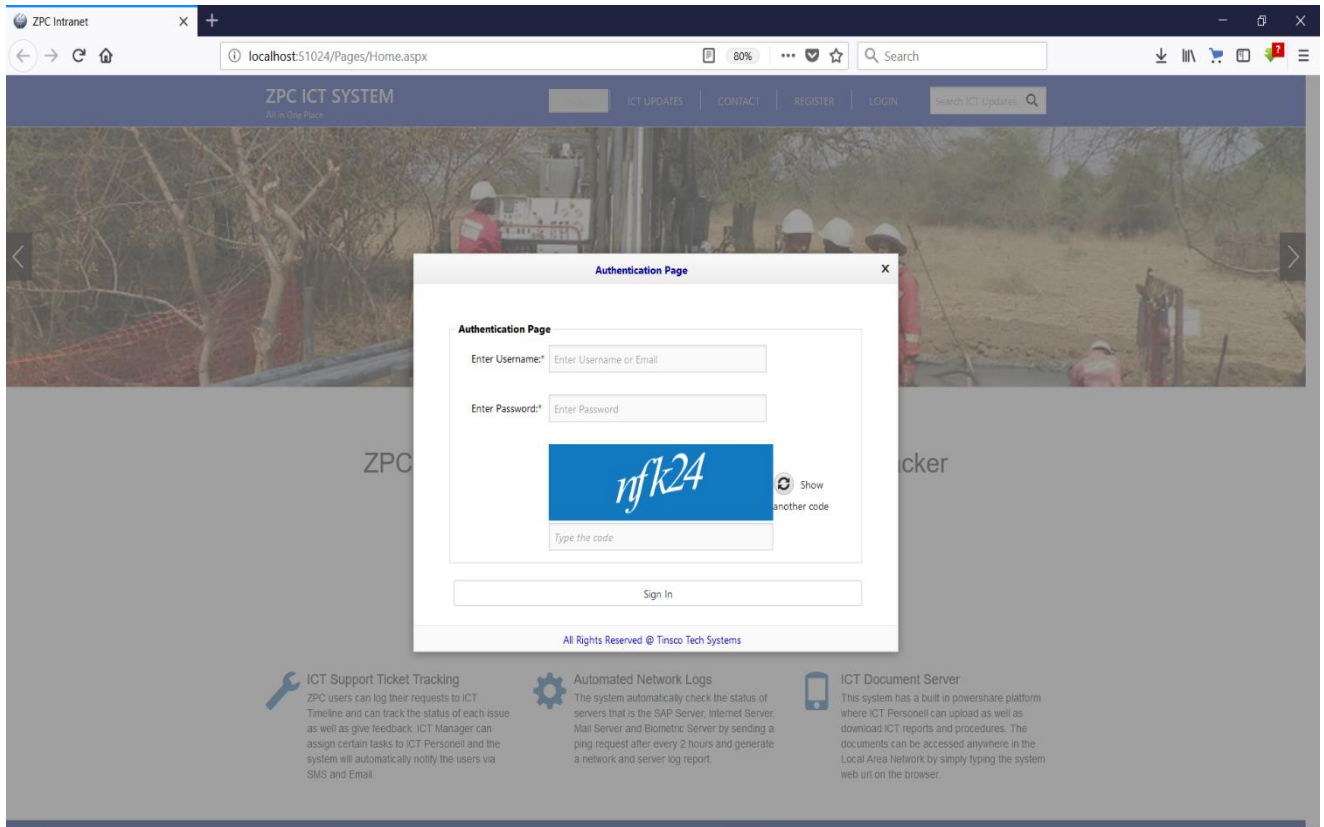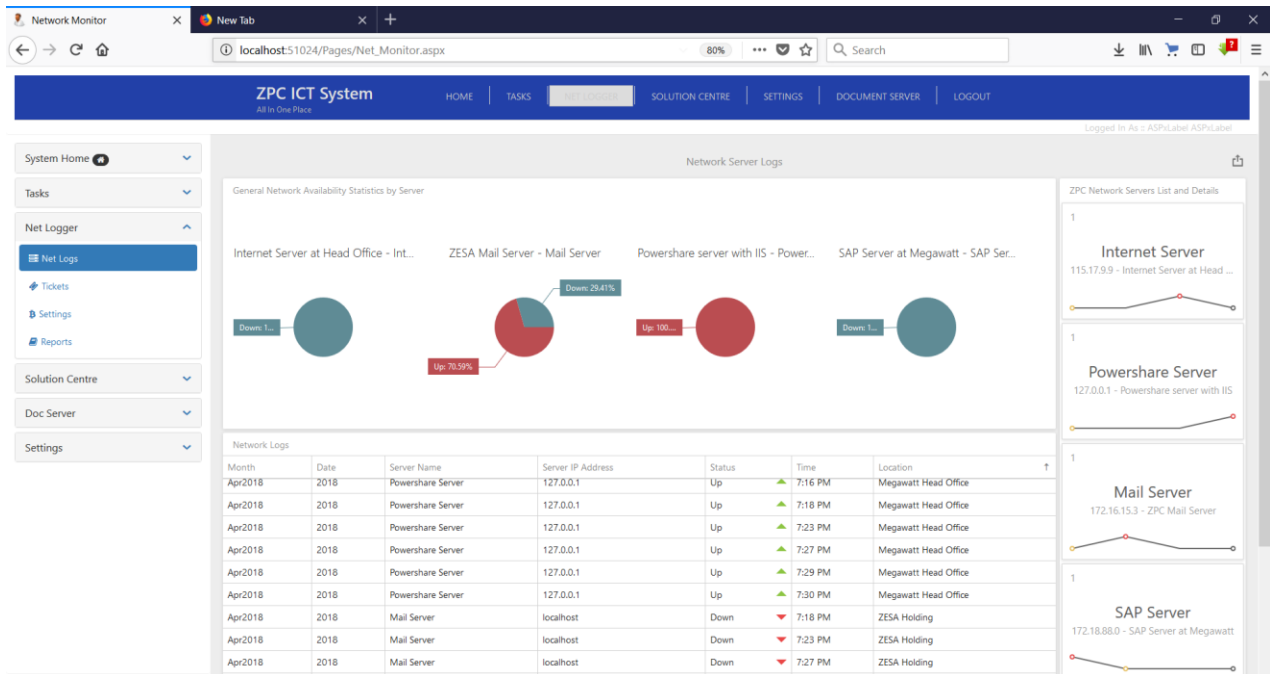

Fig 5.2: User Login Page

Fig 5.3: Admin Homepage

The system was tested if it is performing as required. The system successfully redirected the administrator to the admin homepage. The admin dashboard was also tested if the correct results were displayed.
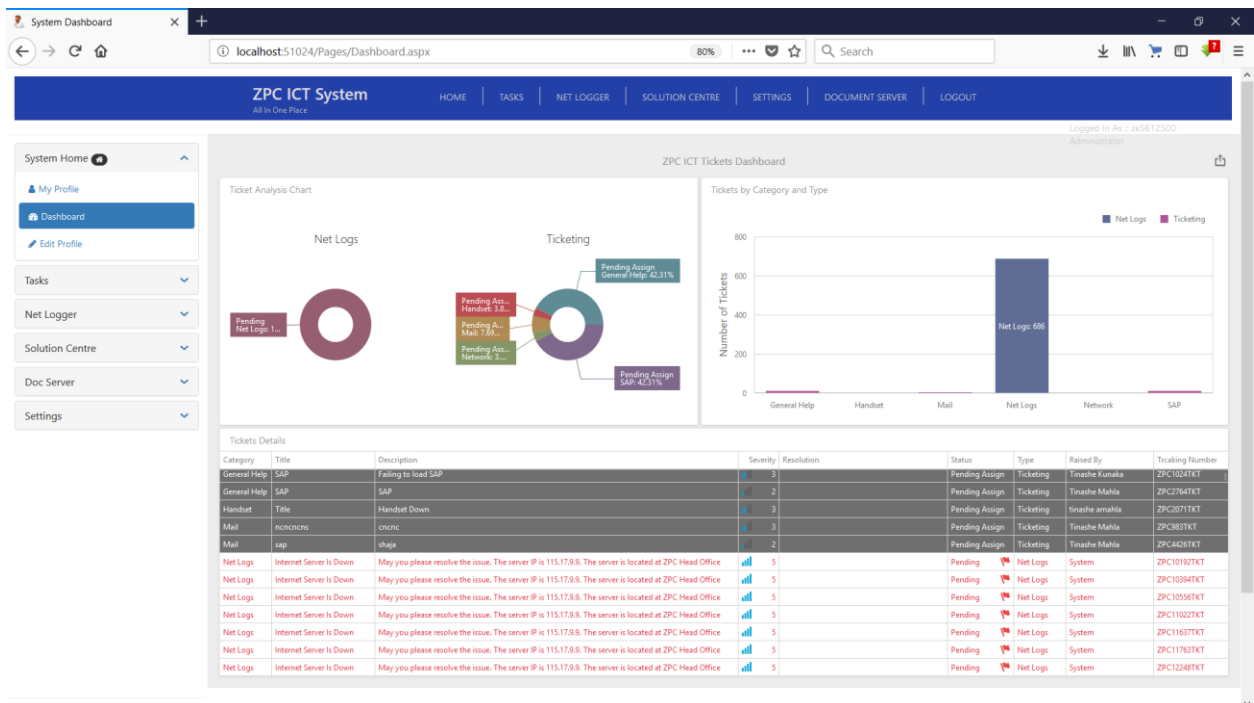
Fig 5.4: User Dashboard

5.3.3 Acceptance Testing

This is a test done to find out whether the system is accepted for delivery and if it is complying with the requirements of the company. This stage is vital as it calls for user involvement. This is in accordance to Roger (2013). It is when the user requirements are matched against the system's functionality to check if the system is processing as per user requirements. This stage is therefore crucial since the involvement of final users of the system is key to a good acceptable software. The acceptance testing is therefore done in two phases which are alpha and beta testing. The system is ready for implementation when the acceptance testing is completed.
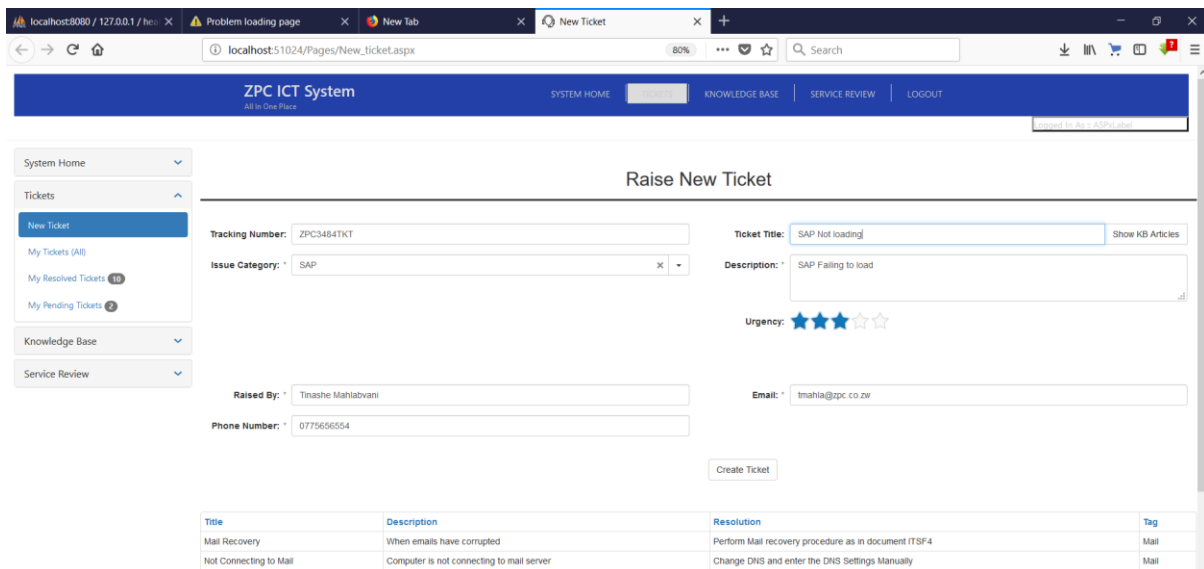

Fig 5.4 Raising a new ticket

The validation of the system is checked in Beta testing. The user in this test tried to create a ticket without sufficient information and the system highlighted all the fields which required input from the user. The system is therefore validated in such a way that a user will not be able to raise the ticket without sufficient data. In Alpha testing, the system was tested if it was functioning as anticipated. Since the system was to notify users by sending messages, the system successfully notified the user if the server is down. This is as shown below.
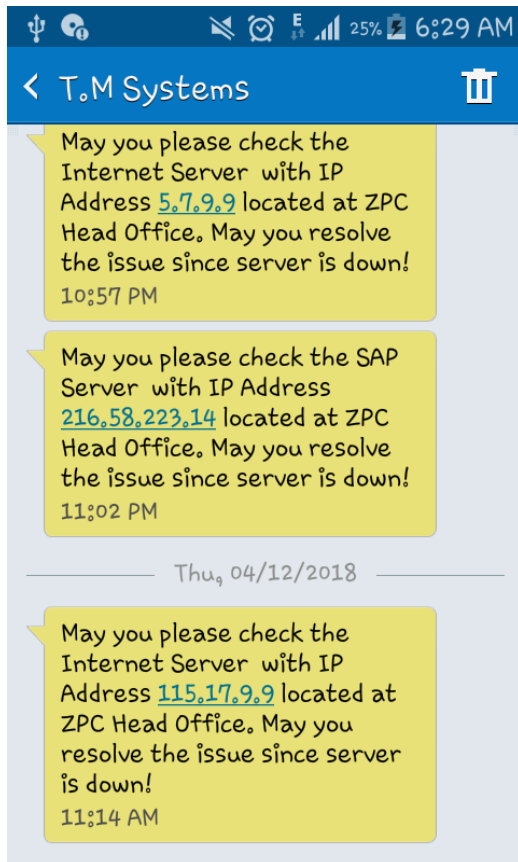
Fig 5.5 Successful sending of a message

5.3.4 Validation

According to Dennis et al (2014), defines validation as a process getting the right system. This means that the system developed should be the one that users are expecting. In this case there is need to involve the final users of the system throughout the design of the system. The system should therefore efficient for its purpose through accepting the right data in the system. For the system to produce the required output, the right data should be captured. This has been achieved through validation of the system. The system must therefore reject input of alphanumeric content in fields were numeric content is required. This is demonstrated on the test below.
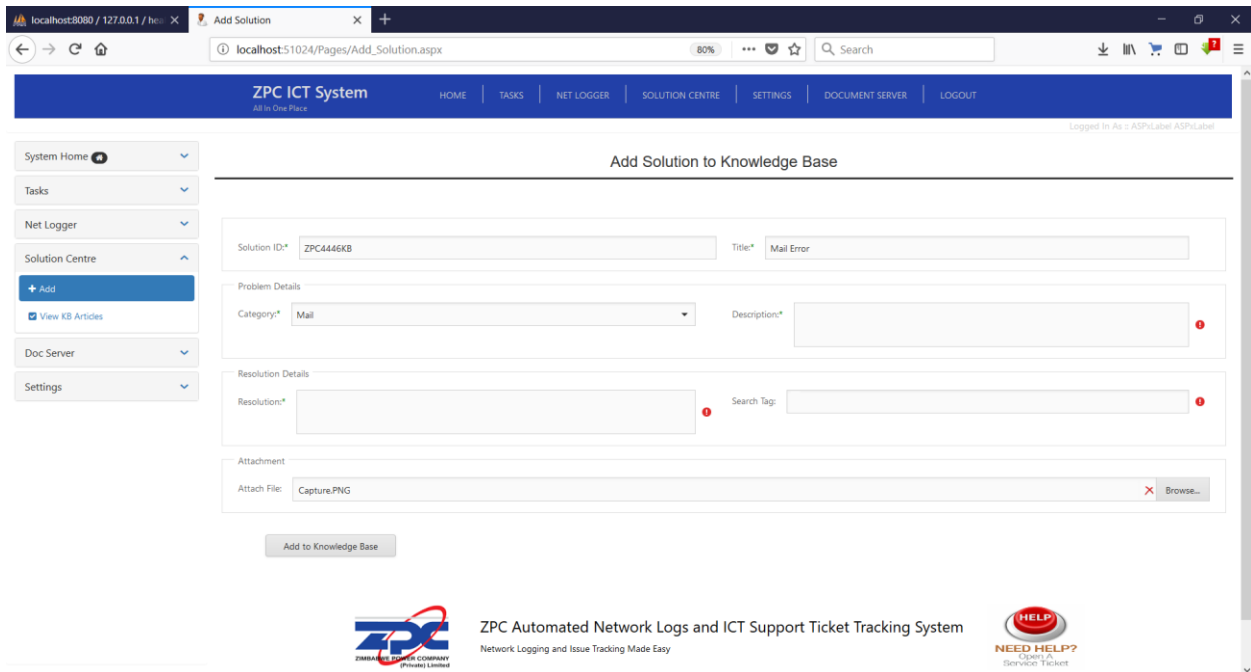
Fig 5.6 Validation of input fields

As illustrated, a user cannot add information to knowledge base if some of the required input fields are empty. The system will show an error icon besides all required fields and the error message will be shown upon mouse hover.
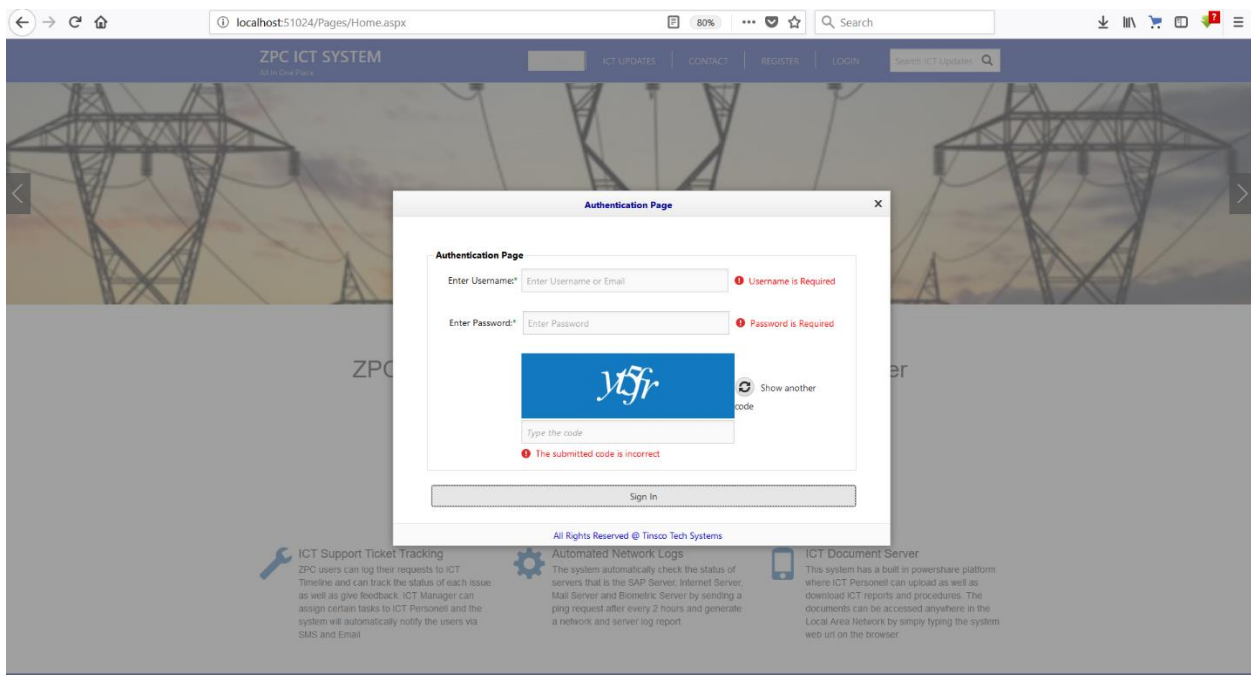
Fig 5.7 Blank Submission validation

The system will therefore show an error if the user attempts to login without entering his enter his or her credentials. An error icon together with the error message will be displayed if there are fields required.
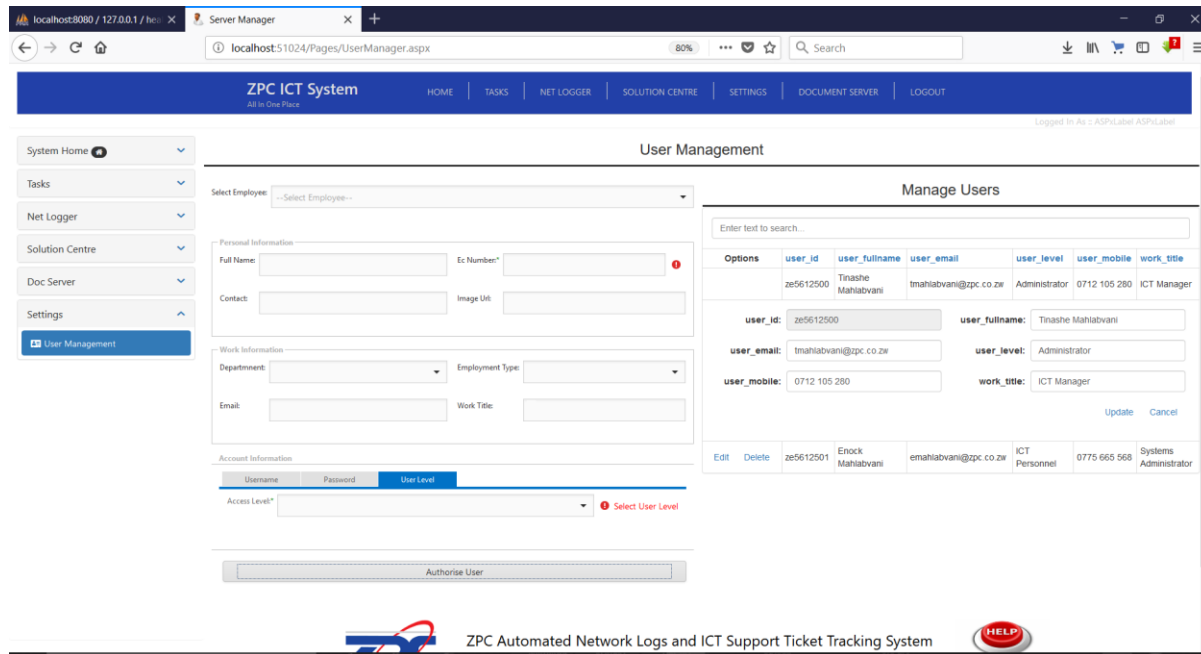

Fig 5.8 Employee Unique Number Validation

The employee unique number cannot be altered by the ICT Personnel since it is the right of the administrator to change the EC Number. In this case, the EC Number field is greyed out since it cannot be changed by the personnel.

5.3.5 Verification

According to Dennis et al (2015), verification is the process of getting the system right. This means testing the system to see if the system is being designed as required by the final system users. It checks or evaluates the work in progress of the system if the system phases are functioning as expected. The verification process therefore answers the question "Are we developing the system right?". The following reflects a successful login by a user.
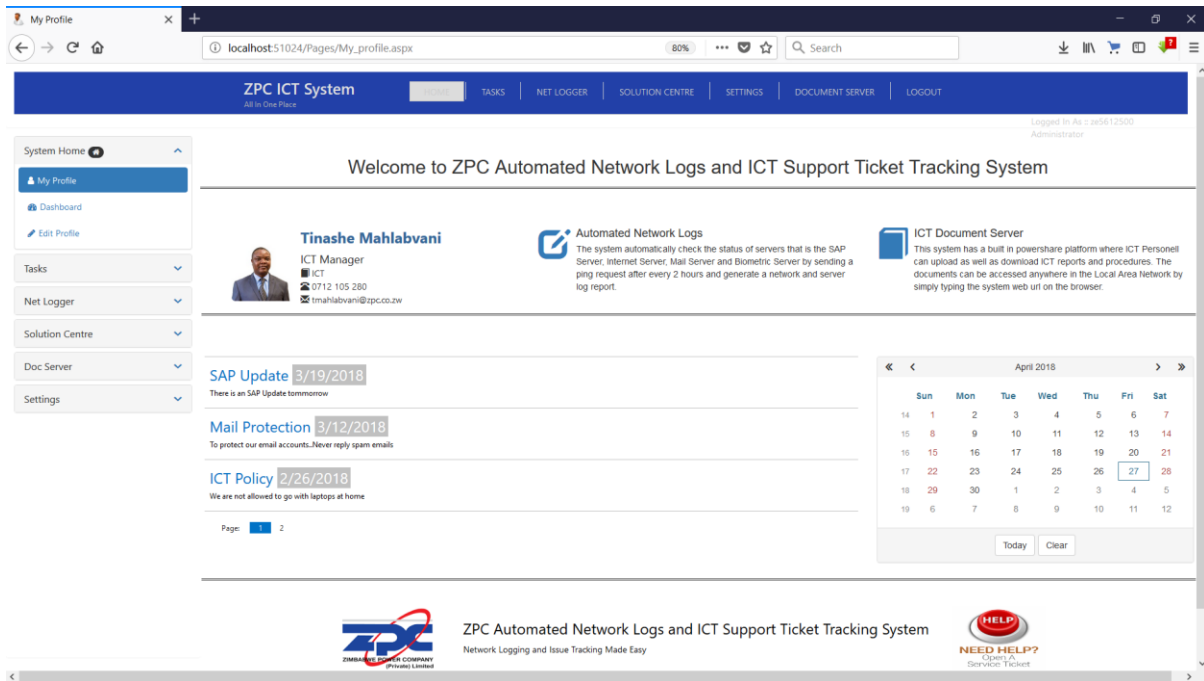
Fig 5.9: Successful login

When a user successfully login to the system, the user will be directed to his or her homepage and the user details are reflected together with system notifications.
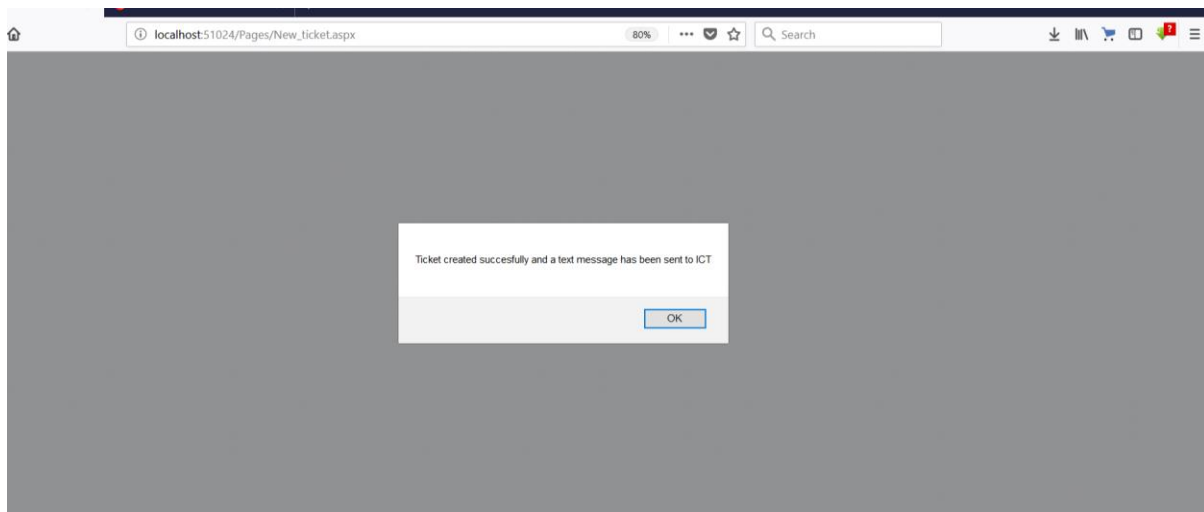

Fig 5.10: Successful creation of a ticket

This form shows that the user successfully created a ticket and a text message have been sent. This since this was one of the core objectives of the system.
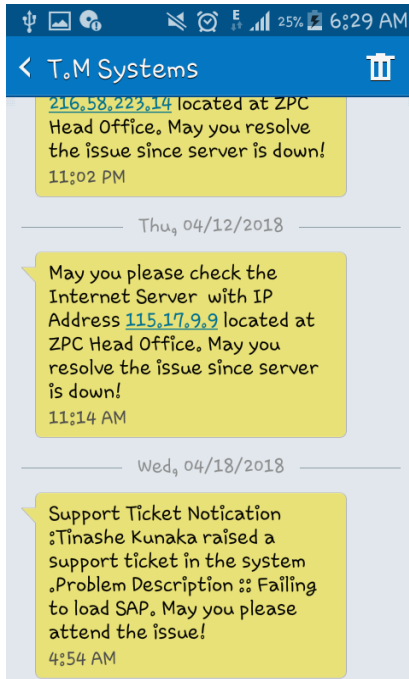
Fig 5.11 Successful sending of text message to ICT

This shows that the system successfully sent a message to the ICT Personnel notifying the personnel about the ticket which had been created.

Fig 5.12: Real Time server logging

This shows the system logging the server downtime and uptime as a background task and successfully sending messages notifying the ICT if a server is down.
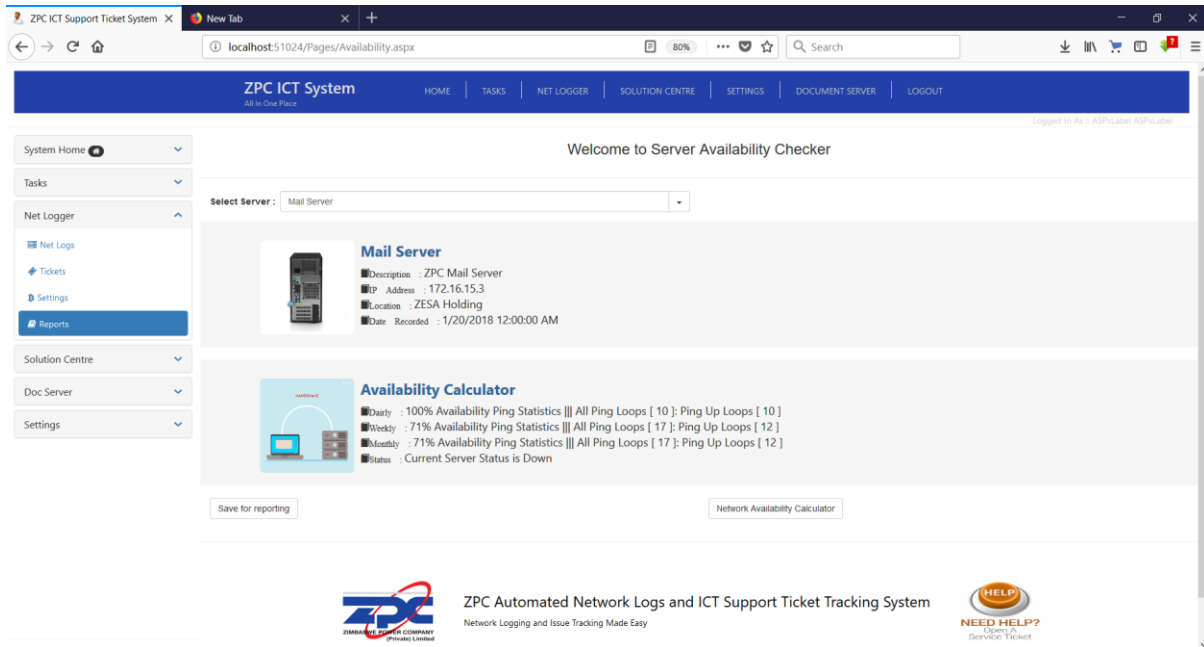
Fig 5.13 Successful calculation of server availability

The system successfully calculated the servers' availability automatically using logged data. This means that the calculation process has been automated.

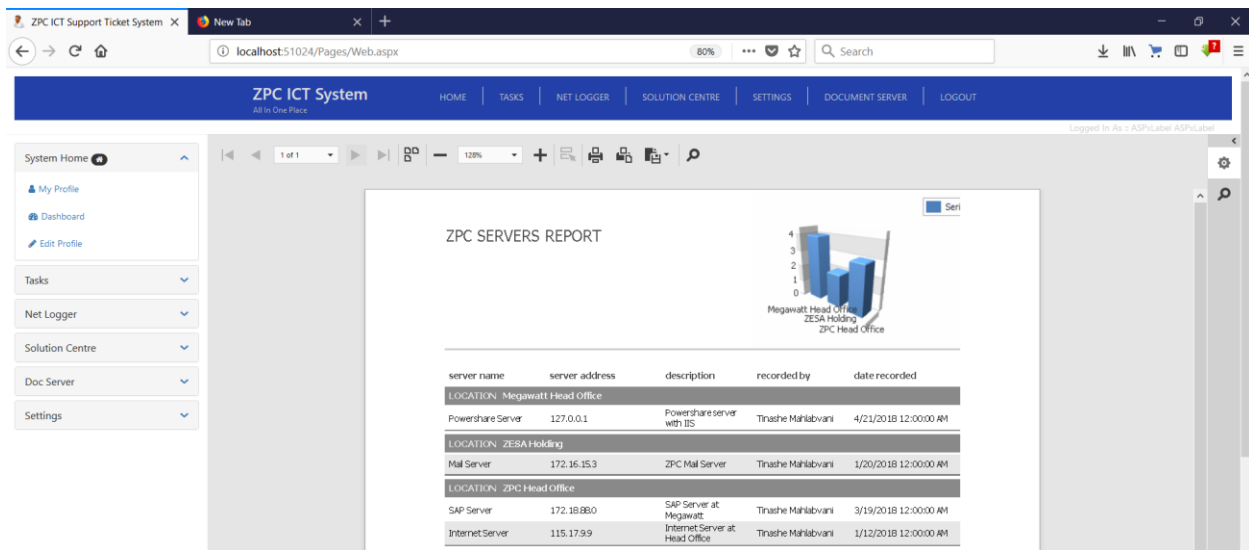*Fig 5.14 Successful report creation*

5.4 Installation

This is the stage whereby the system is set for use by the final system users. It therefore involves implementing the new system for use by final system users. This is in accordance to Nagpal

(2011).The system is going to be installed through the direct cutover conversion technique. This means that the old system will be switched off while the users start to use the new computerized system. The new system is going to be installed on the company's IIS (Internet Information Services) Server so that anyone can easily access the system using a specified URL.

System Installation procedures

Open IIS

Create Virtual directory and copy all the files of the published application to the directory folder.

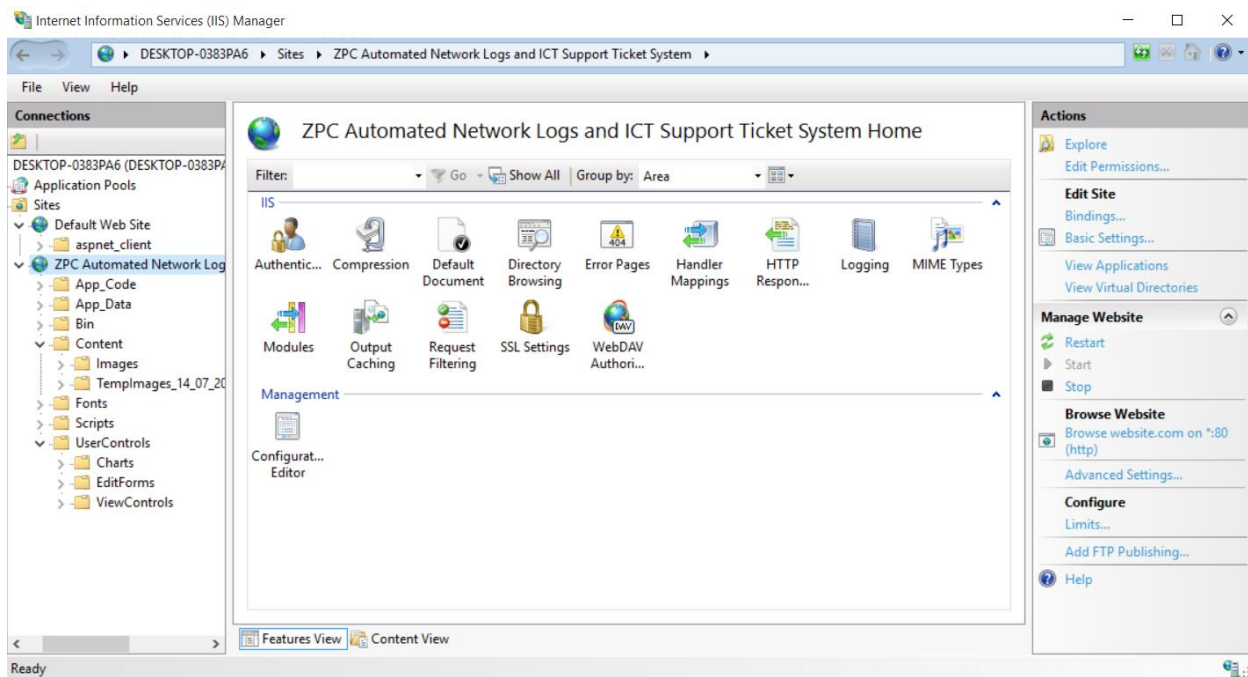Start the system in IIS.

Fig 5.15 Installing System in IIS

General User installation procedures

Install a web browser (Chrome (recommended), Firefox, Opera etc).

Write http://172.16.12.1/supportdesk/net on URL.

Bookmark the URL for easy access

5.4.1 User Training

The new system is an advancement in technology which require a technical knowhow so that the final users are able to operate the system. This means that workers should be trained in order to effectively use the system. The user must be able to record, view, edit as well as extract reports in the system. A workshop will be help for the general system users, the ICT Personnel as well as the administrators to demonstrate how the system is working. According to Ashish (2012), the goal of user training is to equip users with technical knowhow about the system, what it does and how it operates. The user manual or user guide will further assist users on how to operate the system. Questionnaires will be distributed to all the users which will help to measure the acceptance of the new system. After the training, an exercise will then be done to check if the users grasped the system.

5.4.2 Data Migration

According to Mahapatra (2016), data migration refers to the transmission of data between data stores or computer systems. It is done for various reasons which are to replace a server or upgrading it, to move data to third party cloud service providers, maintaining infrastructure and also for software upgrades as well as software implementation. There are also a number of factors that should be considered when carrying out this exercise. These include the duration, the risk as well as other technical issues. The research which has been done shows that the old system was using hard copy files so there is need to capture the data in the files to transfer the data to the new system. It was however concluded that the system will only work with data inputs from the day of installation.

5.4.3 System Conversion

After the system has been accepted by users, there is therefore need to change from the old system to the new system. There are a number of techniques which can be used to move or carry out the changeover exercise. These include pilot changeover, direct changeover, phased changeover as well as parallel changeover.

5.4.3.1 Parallel Changeover

According to Cannon (2011), parallel changeover is the implementation of the new system while the old system is still in use. This means running all the system concurrently. In this case, the system will be fully implemented in the long run while the old system is abandoned. This is done

for projects which have a high probability of failure. This means that if the new system fails, the users will simply revert to the old system since the two systems will be running concurrently.

Advantages

- The two systems can be easily compared to determine the best.

- If the new system fails, the organization will simply revert back to the old system.

Disadvantages

- It is expensive to run all the two systems concurrently since a lot of resources are required.

- There is data duplication since data is entered twice.

5.4.3.2 Phased Changeover

In this case, the system is delivered in a series of versions or modules. The first module is implemented and if it is accepted, the second is then implemented until all system modules are implemented. It is therefore an incremental type of implementation. In the long run, the entire system will then replaces the old system. This is in accordance to Sommerville (2015).

Advantages

- There is limited loss of data when using this approach since the system is installed in phases.

- Users gradually familiarize with the system.

- Since user training is done in phases, users are likely to grasp the functionality of the system.

Disadvantages

- The implementation phase is time consuming.

- The procedure is costly since each phase will have its own costs.

5.4.3.3 Pilot Changeover

Mahapatra (2016) defined this as a process whereby a new system is firstly implemented to a defined cluster of users so that they can test, evaluate and give feedback on how the system works. It is therefore tried at a pilot site before it is implemented companywide. This means that those users that would have carried out the pilot survey will therefore provide feedback on the quality as well as reliability and performance of the new system. The feedback will be checked to see if it is satisfactory so that the system can be fully implemented.

Advantages

- The new system can be easily evaluated since both systems will be running.

- The risk of losing data is minimized through the pilot strategy.

- It is also easy to evaluate results.

- The pilot branch may assist other users in training since they would have familiarized with the system.

Disadvantages

- The strategy requires a lot of time.

- Huge costs are involved.

5.4.3.4 Direct Changeover

According to Rosenblatt (2014), direct changeover is whereby the new system totally replaces the old system. In this case, the old system is substituted by the new system in one operation. This strategy is usually done when users will not have too much workload so that there is no interruption to the ongoing processes at the company.

Advantages

- The system is delivered quickly.

- The new system will run independently after installation therefore there is no duplication of data.

- It is the cheapest changeover technique.

Disadvantages

- If the system fails, the users will not be able to revert to the old system.

- It is not easy to learn the functionality of the system in a short period of time.

- Data from the old system should be compatible with new system data which is stressful to the developers.

5.4.3.5 Recommendations

The parallel changeover strategy was considered the best strategy since it has more merits than demerits. It gives users time to grasp the functionality of the new system and also if the new system fails, users can therefore revert back to the old system. This means that the users will have time to access the system and once they gain confidence, the old system will therefore be abandoned.

5.5 Maintenance

According to Beichelt and Tittmann (2012), maintenance refers to the amendments that are done on the final system after its implementation with the goal of improving its performance, adding new features and other factors that might call for changes in the system. Since technology is evolving at a faster rate, there is need to remain on the technological bar by adding new features to the system as well as accommodating for various changes. There are various types of maintenance which are perfective maintenance, adaptive maintenance, corrective as well as preventive maintenance.

5.5.1 Perfective Maintenance

There is need to continuously add features to the system in order to improve the system functionality. According to Beichelt and Tittmann (2012), perfective maintenance is whereby the software is updated or modified with the aim of improving its lifespan. It therefore considers the requirement of the users, new technological changes as well as performance and reliability issues.

Perfective Maintenance plan

It was agreed to carry out this exercise on a monthly basis so that new features are added as required by the final system users.

Corrective Maintenance

This refers to the day to day repairing of errors or bugs in the system so that its quality is improved. This is in accordance to Sommerville (2015). The errors or bugs are either identified by users or the development team. Error reports are collected daily, weekly or monthly so that the errors can be analyzed and resolved.

Corrective Maintenance plan

It was agreed that the corrective maintenance exercise should be done every day for the first 3 months and then the team will review report errors after three months so that they can revise the time schedule if error levels reduces.

Preventive Maintenance

According to Sommerville (2015), preventive maintenance focus on updating or modifying the system so as to avoid or prevent future glitches. It therefore includes documentation update, optimization of code as well as restructuring of code. Documentation update involves updating the system documentation so that all system changes are reflected in the documentation for future reference. On code restructuring and optimization, certain blocks of code are modified so that the system caters for future developments or to prevent glitches. For a system to process faster, utilize less disk space and to produce quality results, code optimization is of prime importance therefore this will be carried out to prevent problems.

Preventive Maintenance plan

The exercise was concluded to be performed on a yearly basis.

The project team therefore came up with a plan for each maintenance strategy since all the strategies are going to be used.

5.6 Recommendations for future or further developments

The recommendations are further developments that should be made so that the system's functionality is improved. The future expectations are as follows:

A chat facility should be added so that users can chat in an intranet based platform.

A service review module is to be added so that users can analyses the support services provided by the ICT Department.

The server monitoring section should be improved so that the system checks all the various processes running on a server as well as file modification operations on the server.

More recommendations except the ones listed are welcome so that the system is of high quality and effective in making ZPC a conducive working environment.

5.7 Conclusion

The coding was clearly explained and the system was tested to ensure that it is error free and to ensure that it was in line with the user expectations. The system installation was explained which highlighted how the system was to be implemented. Data migration techniques and system changeover strategies have been explained highlighting the merits and demerits of each as well as the recommended strategy. Also the maintenance strategies have been clearly outlined as well as the recommended strategy was highlighted. Recommendations were made which reflected future system expectations. This therefore highlighted that the implementation phase was a success however new improvements and additional functionality will be welcome so that the system makes ZPC a conducive working environment.

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APPENDIX A: User Manual

The user manual is created in provision for the system users to be able to gain to have a clear knowledge about the system and how it operates. The user manual explains how the ZPC Automated Network Logs and ICT Support Ticket Tracking System will work.

Home Page

The homepage is the main menu or the start-up page of the system accessed through www.zpc.co.zw/ictsupportdesk on the web browser.

The main homepage of the system will be displayed. There are a number of options which will be available for all the users before they login to the system. The users can navigate various options such as Contacts, Register, ICT Updates as well as an option to Login to the system.

The homepage will also show a description of how the system works so that users can quickly get familiar with the system.

Contacts

The contacts section shows the ICT contact list. All the ZPC ICT Top management will be shown with their contacts.

The ICT management will be shown with their contacts and photos

The System also have a section for ICT Updates. These can be shown in the system when a user click on the ICT Updates section on the homepage. Various ICT Updates posted by the Administrator will therefore be shown on this page. This page can be accessed by anyone before logging in to the system.

User can click the update link to view a detailed description of the particular update

Requesting User Account

When one wants to create an account, the register option will direct the user to a registration page where the user can therefore request for a user account to the ICT Department. The user has to enter his or her details which will be send to the ICT Department for account verification and configuration.

Registration page

System Login

When logging in to the system, the user has to have an account which will have been configured by the ICT Department. The Login Option will direct a user to a pop-up form which will be shown for a user to login.

User has to enter username and password and complete the CAPTCHA correctly to login

User can click sign in button or press Enter to login
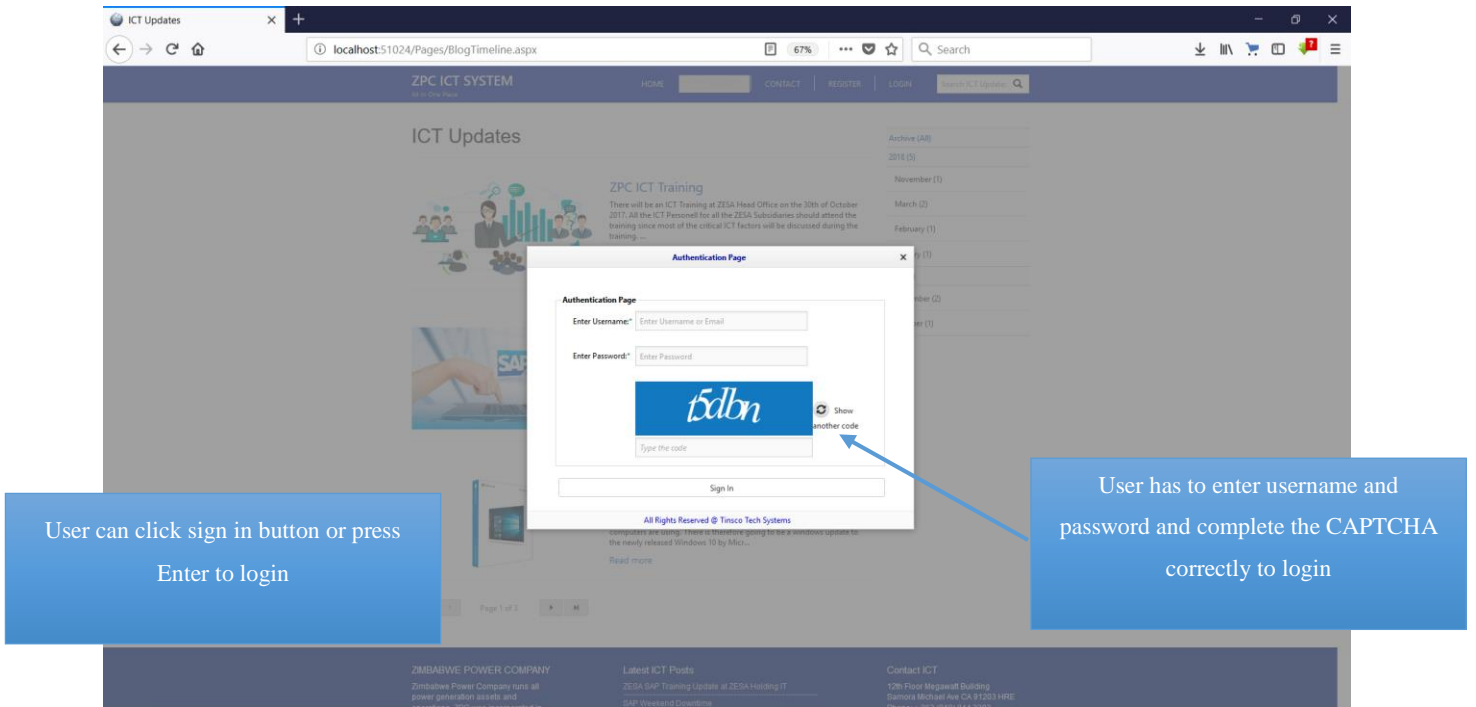
Login Page

The user has to enter the username and password in order to login. The user has to complete the CAPTCHA that will be shown which distinguish computers and humans apart.

Invalid Login Error

When a user's account is locked, the message box will be displayed showing that the account of the user have been temporarily locked. This will mean that the user will have to contact the ICT Personnel. When a user account is not in the company database, an error message will be displayed showing that credentials are invalid.

Successful system login

When a user has sufficient rights, the user will be directed to the system homepage. This depends on the level of the user. A general user homepage will not have many options as an administrator homepage. The following form shows a user homepage.

User Homepage

Raising a new ticket

The user can raise a new ticket in the system. The user has to enter the ticket description as well as its category. Once the user fill in all the fields, the user can then raise the ticket. The ICT Personnel will be notified in real time via SMS once the user raise a ticket.

Raising a new ticket

The user will enter the ticket details the click on create ticket button.

Navigating Knowledge Base

Users can acquire technical knowledge on the various challenges they face which are ICT related. This is a centralized repository of all the technical problems that users usually face. The user can therefore search in the knowledge base before raising a new ticket. If the ticket has been added to knowledge base, the results will be shown in the knowledge base section.

Knowledge base showing problems and solutions

User Knowledge Base

The following shows a message which has been received notifying the ICT Personnel on the new ticket created.

SMS Notification for ticket creation

The ICT can also login to the system to check the tickets timeline which will be shown after navigating on the "All Tickets" Section.

Tickets timeline showing ticket details and various options to manage tickets
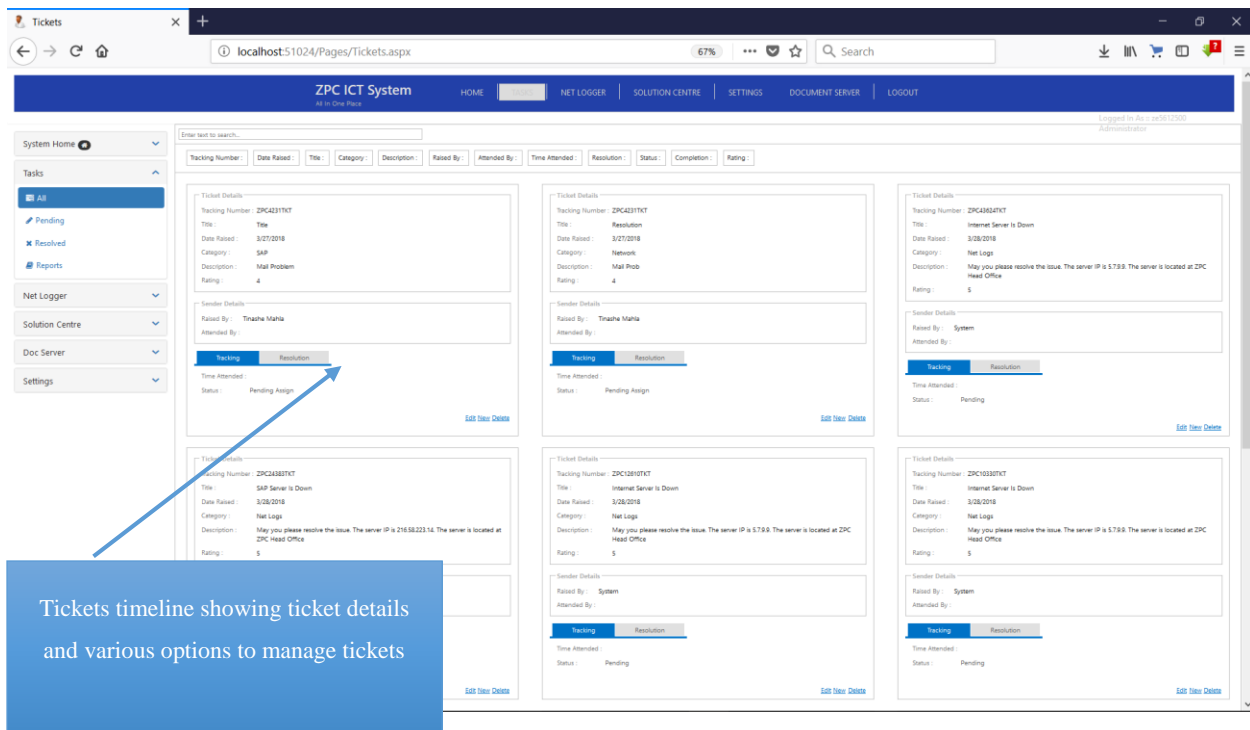
Tickets Timeline

On the tickets timeline, the administrator can view all the tickets, edit as well as delete tickets. The administrator or ICT Personnel can also sort the tickets using either its status, Date raised, Category, Rating as well as the Duration.

Administrator Dashboard

The Ticketing Dashboard for the Administrator or ICT Personnel will be accessed through clicking on the "Dashboard" link.

Dashboard showing the number of tickets based on the category
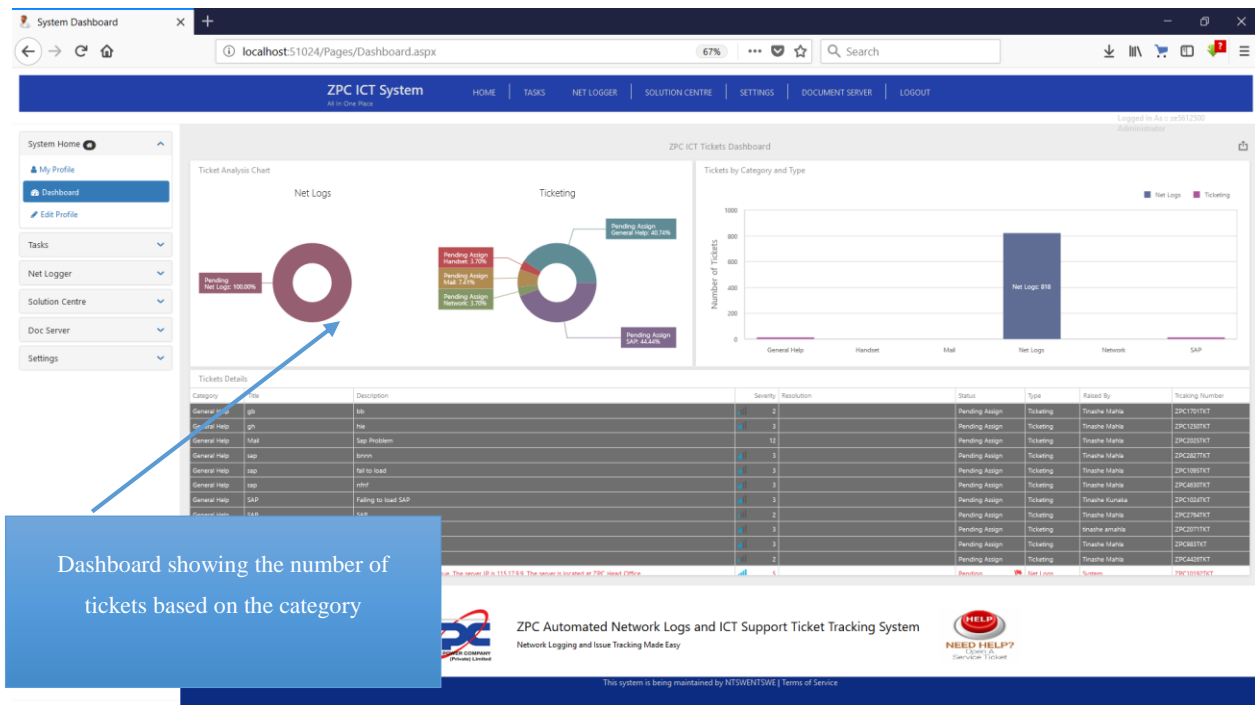
Administrator Dashboard

The dashboard will show all the tickets that are in the database. The tickets will be categorized into two that is the Net Logs and the Ticketing section. The net logs section will show the number of tickets that have been raised by the automated server logger system section. The ticketing section will show all the tickets that will have been raised by users in the system.

Updating ticket status

The administrator or ICT Personnel can also update the status of a ticket when he or she clicks on the edit section.

Updating ticket status

Adding Solution to Knowledge base

The administrator or the ICT Personnel can also add a particular solution to a problem in the system. The "add to knowledge base" section allows the user to enter a problem and a solution which will be directly added to the knowledge base.

Adding Solution to knowledge base

The system allows adding of solutions to knowledge base. The solutions added can be viewed on the General Users side as well as all other users of the system.

Network Logs

The network server logger will run in the background. Servers will be monitored in real time and can be added by the administrator.

Adding servers for monitoring

The administrator can manage servers which are being monitored by the net logger module.

Server Logger

The module will send Ping requests to the server after 1 minute to check the status of the servers. If the server is down, the module will send a message to the ICT Personnel notifying the user on the issue. The message will be shown as follows.
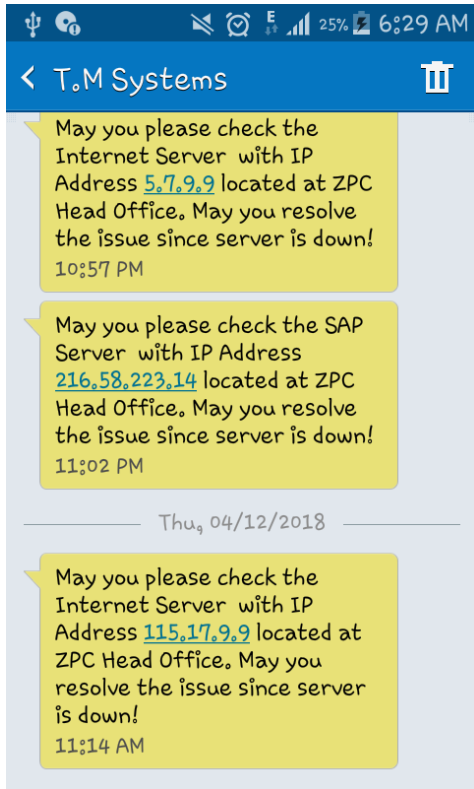
SMS Notification if server is down

If the server is up, the server log will be added in the database. The administrator will only have to view the server logs since this is automated.
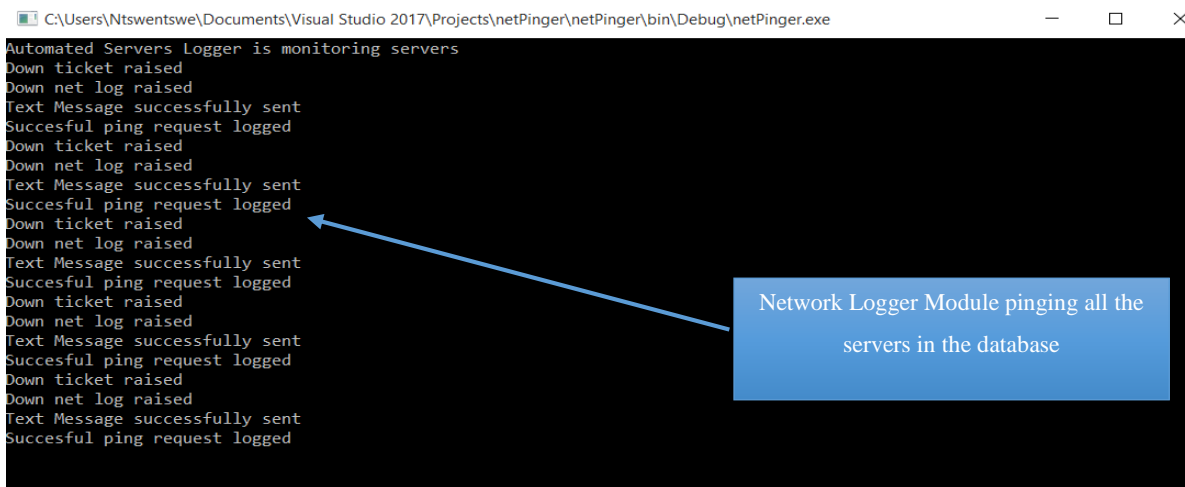
Automated Server Logger module

The results can be viewed on the browser by the administrator or the ICT Personnel.

Network server logs dashboard

A green arrow will reflect that the server was up on the time shown and a red arrow shows that the server was down

All the servers being monitored will be shown here

Network Logs Dashboard

This dashboard will be visible to the administrator which will show the logs that have been added in the database by the automated logger module.

Network Availability Calculation

The system will automatically calculate the server availability based on the recorded server logs. The administrator can therefore access this section by clicking on the availability option.

Server Availability Calculation

The reports generated can be printed.

Administrator Settings

The administrator has also privileges to configure user accounts in the system. A user cannot be able to login if the account is not approved and configured by the administrator. The admin will set user rights in the system.

Configuring user account

User Management Section

User Management

The admin can therefore delete, edit as well as configure user accounts in the user management section.

ICT Document Management

The system also have a document repository center where ICT users can manage documents. They can therefore upload and download documents.
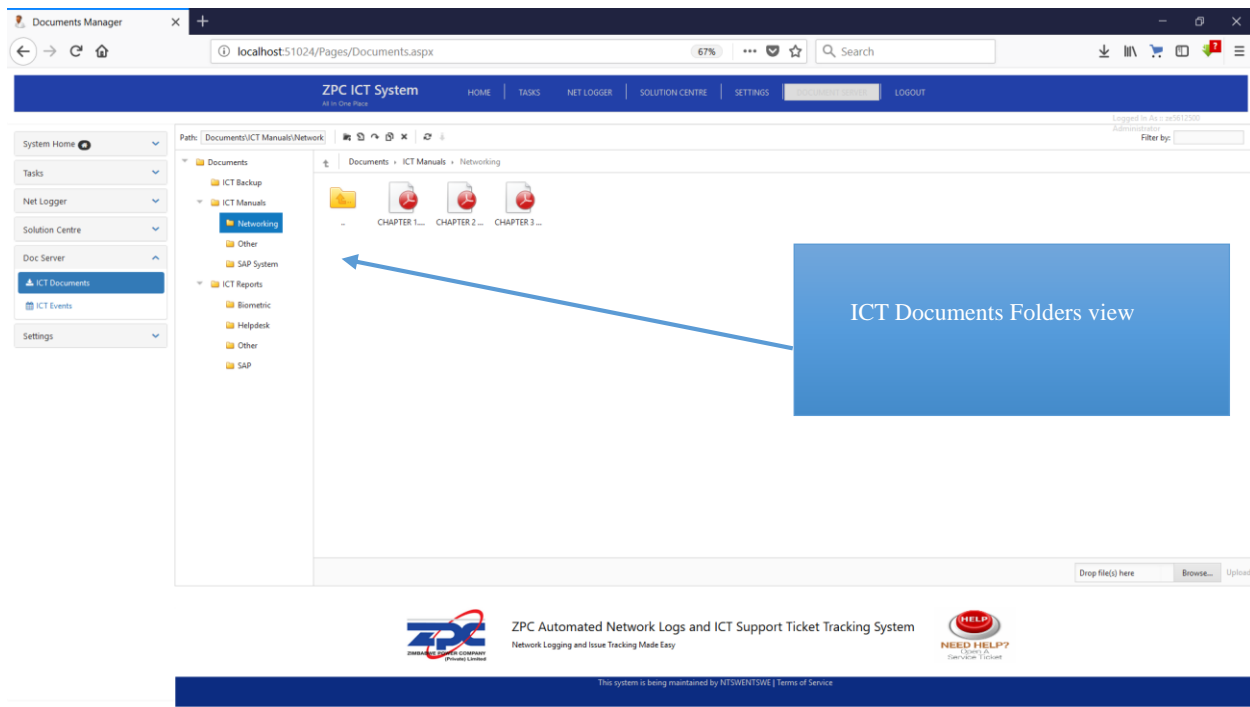
Document Management

Report Section

The administrator can view various types of reports in the system which include user reports, server reports, tickets reports as well as net log reports. The reports can be printed or exported in various formats which include pdf, pictures as well as excel and word documents. A sample report is shown below.

Server Report

APPENDIX B: Interview Checklist

ZPC Employees

The sample questions that were asked and answered during the interview sessions.

Interviewer name…………………………………………………………

Interviewee position…………………………………………………………

Interviewee department…..………………………………………………….

Questions

Q1. We understand a need for a system to be developed has risen, what are the contributing factors?

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

Q2. How does the current system work?

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

Q3. What are the main challenges associated with the current system?

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

Q4. What do you think can be done to curb all these challenges?

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

Q5. Do you think the new issue tracking system will be of benefit to your department and organization as a whole and what are your reasons?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

DATE……………………………………………………………

THANK YOU FOR YOUR COOPERATION

APPENDIX C. Questionnaires

The researcher is a student at Midlands State University Faculty of Science and Technology specializing in Information Systems. As part of the course a student is required to carry out a research study. This questionnaire aims to collect information on the current system at Zimbabwe Power Company. Your co-operation will be greatly appreciated in answering the questions below. Personally, l promise that the information that you are going to supply will be treated with respect and confidentiality. The information you will give will be used only for the purpose of this research and not anything else. Thank you for taking your time completing the questionnaire

N.B TICK IN THE BOXES WHEN NEEDED AND FILL IN THE SPACES PROVIDED.

Please answer all questions

1. Are you satisfied with the current system for ticket or issue management?

    Yes ☐   No ☐

If not, what are your concerns and what do you think should be done?
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

2. Does the existing system store data efficiently and are the records easy to manipulate?
…..
....

3. How do you rate your current network logs management system?

Excellent ☐   Average ☐   Bad ☐

If not excellent, what are the difficulties you encounter in network logs management?

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

4. Do you think the new system will be of benefit to your department and organization as a whole and what's your reasons?

………

……

DATE………………………………………….

<div align="center">THANK YOU FOR YOUR COOPERATION</div>

APPENDIX D: Observation score sheet

Date ....

Time ....

Department under observation ....

....

....

....

....

....

....

Conclusion ....

....

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....

....

....

APPENDIX E: Code Snippets

Login Code

```
public partial class Layout : System.Web.UI.MasterPage
    {
        bool showSearch = true;
        public bool ShowSearch { get { return showSearch; } set { showSearch = value; } }

        SqlConnection con = new
SqlConnection(ConfigurationManager.ConnectionStrings["ticketingConnectionString"].Connect
ionString);
        SqlDataReader dr;

        public void MsgBox(String ex, Page pg, Object obj)
        {
            string s = "<SCRIPT language='javascript'>alert('" + ex.Replace("\r\n",
"\\n").Replace("'", "") + "'); </SCRIPT>";
            Type cstype = obj.GetType();
            ClientScriptManager cs = pg.ClientScript;
            cs.RegisterClientScriptBlock(cstype, s, s.ToString());
        }
        protected void Page_Load(object sender, EventArgs e)
        {
            Page.Header.DataBind();
            SearchBlock.Visible = ShowSearch;
            if (IsPostBack && hfAction.Contains("search"))
            {
                Session["query"] = Search.Text;
                Response.Redirect("~/Pages/Search.aspx");
            }


        }

        protected void BootstrapButton1_Click(object sender, EventArgs e)
        {
            String newpass = Cryptography.Encrypt(txtpassword.Text);

            if (!Captcha.IsValid)
            {
                return;
            }
            else
            {
                con.Close();
                 con.Open();

                    SqlCommand cmd = new SqlCommand("SELECT user_level FROM
[ticketing].[dbo].[users] where user_id='" + txtusername.Text + "' and user_password='" +
newpass + "'", con);
                    SqlDataReader dr = cmd.ExecuteReader();
                    if (dr.Read() == true)

                    {
```

```
                        dr.Close();
                        con.Close();
                        con.Open();
                        SqlCommand cmd1 = new SqlCommand("SELECT user_level FROM
[ticketing].[dbo].[users] where user_id='" + txtusername.Text + "' and user_password='" +
newpass + "'", con);
                        string content = cmd1.ExecuteScalar().ToString();

                        if (content == "Administrator")

                        {
                            cmd.Dispose();
                            cmd1.Dispose();
                            Session["UserLevel"] = "Administrator";
                            Session["Username"] = txtusername.Text;


                            dr.Close();

                            con.Close();

                            Response.Redirect("My_profile.aspx");

                            txtusername.Text = "";
                            txtpassword.Text = "";
                        }

                        else if (content == "General User")
                        {
                            Session["username"] = txtusername.Text;
                            Response.Redirect("AddUser.aspx");
                            con.Close();
                            MsgBox("Welcome " + txtusername.Text, this.Page, this);
                            txtusername.Text = "";
                            txtpassword.Text = "";
                        }
                        else if (content == "ICT Personnel")
                        {
                            Response.Redirect("Input.aspx");
                            con.Close();
                            MsgBox("Welcome " + txtusername.Text, this.Page, this);
                            txtusername.Text = "";
                            txtpassword.Text = "";
                        }
                        else

                        {
                            cmd.Dispose();
                            cmd1.Dispose();
                            con.Close();
                            dr.Close();
                            MsgBox("Invalid Login", this.Page, this);
                        }
                    }

                    else if (dr.Read() == false)

                    {
```

```
                    cmd.Dispose();
                    con.Close();
                    dr.Close();
                    MsgBox("Insufficient rights to login. ", this.Page, this);
                }
                dr.Close();
                cmd.Dispose();
                con.Close();

            }

            con.Close();
        }




        private void Clear()
        {
            txtpassword.Text = "";
            txtusername.Text = "";
        }
    }
}
```

Raising a new ticket

```
public partial class New_ticket : System.Web.UI.Page
    {
        SqlConnection con = new
SqlConnection(ConfigurationManager.ConnectionStrings["ticketingConnectionString"].Connect
ionString);
        static String destinations;
        static String messagetosend;
        public void MsgBox(String ex, Page pg, Object obj)
        {
            string s = "<SCRIPT language='javascript'>alert('" + ex.Replace("\r\n",
"\\n").Replace("'", "") + "'); </SCRIPT>";
            Type cstype = obj.GetType();
            ClientScriptManager cs = pg.ClientScript;
            cs.RegisterClientScriptBlock(cstype, s, s.ToString());
        }
        protected void Page_Load(object sender, EventArgs e)
        {
          if (!IsPostBack)
                {
                GetListData("SELECT [Title],[Description],[Resolution],[Tag] FROM
[ticketing].[dbo].[knowledge_base] ", BootstrapGridView1);
                fillpass();
            }


        }
        private void GetKB(String Query, BootstrapComboBox grd)
        {
            con.Close();
            try
            {
```

```
                con.Open();
                SqlCommand cmd = new SqlCommand(Query, con);
                SqlDataAdapter da = new SqlDataAdapter(cmd);
                DataSet ds = new DataSet("ds");
                da.Fill(ds);

                DataTable dt = ds.Tables[0];
                foreach (DataRow dr in dt.Rows)
                {
                    grd.DataSource = ds;
                    grd.DataBind();
                }
            }
            catch (Exception ex)
            {
                con.Close();
                MsgBox(ex.Message, this.Page, this);
                //throw;
            }
        }
        private void GetListData(String Query, BootstrapGridView grd)
        {
            con.Close();
            try
            {
                con.Open();
                SqlCommand cmd = new SqlCommand(Query, con);
                SqlDataAdapter da = new SqlDataAdapter(cmd);
                DataSet ds = new DataSet("ds");
                da.Fill(ds);

                DataTable dt = ds.Tables[0];
                foreach (DataRow dr in dt.Rows)
                {
                    grd.DataSource = ds;
                    grd.DataBind();
                }
            }
            catch (Exception ex)
            {
                con.Close();
                MsgBox(ex.Message, this.Page, this);
                //throw;
            }
        }
        private void fillpass()
        {
            if (tracking_num.Text=="")
            {
                Random r = new Random();
                string password = "ZPC" + r.Next(1, 5000).ToString() + "TKT";
                tracking_num.Text = password;
            }

        }
        protected void BootstrapFormLayout1_E11_Click(object sender, EventArgs e)
        {
            try
```

```csharp
        {
            con.Open();
            DateTime dt = DateTime.Now;
            SqlCommand cmd = new SqlCommand("insert into [ticketing].[dbo].[tickets]
([tracking_num],[date_raised],[title],[category],[description],[rating],[raised_by],[phon
e_raiser],[mail_raiser],[status],[type]) values('"  + tracking_num.Text  + "' ,'" +
dt.ToShortDateString() + "','" + title.Text.Replace("'","''") + "','" +
category.Text.Replace("'", "''") + "','" + description.Text.Replace("'", "''") + "','" +
ASPxRatingControl1.Value  + "','" + raised_by.Text.Replace("'", "''") + "','" +
phone_number.Text.Replace("'", "''") + "','" + sender_email.Text.Replace("'", "''") +
"','" + "Pending Assign" + "','" + "Ticketing" + "')", con);
            cmd.ExecuteReader(CommandBehavior.CloseConnection);
            //cmd.Dispose();

            con.Close();

            usersms();
            con.Close();
            title.Text = "";
            category.Text = "";
            description.Text = "";
            ASPxRatingControl1.Value=0;
            raised_by.Text = "";
            phone_number.Text = "";
            sender_email.Text = "";


            //  emailsend();

        }
        catch (Exception ex)
        {
            con.Close();
            MsgBox(ex.Message, this.Page, this);
            // throw;
        }
    }
    private void usersms()
    {

        con.Open();
        SqlCommand mycmd = new SqlCommand("SELECT Distinct [user_mobile] from
[ticketing].[dbo].[users] Where [user_level]='ICT Personnel'", con);
        SqlDataAdapter ad = new SqlDataAdapter(mycmd);
        DataTable dtt = new DataTable();
        ad.Fill(dtt);
        foreach (DataRow drr in dtt.Rows)
        {

            String dmydes = drr["user_mobile"].ToString();
            destinations = dmydes;
            messagetosend = "SUPPORT TICKET NOTIFICATION: " + raised_by.Text + " " +
"raised a support ticket in the system." + " Problem Description ::> " + description.Text
+ ". Please resolve attend the issue!";
            // MsgBox(messagetosend , this.Page, this);
            sendSMS();
```

```csharp
                MsgBox("Ticket created succesfully and a text message has been sent to
ICT", this.Page, this);
        }
    }


    private void sendSMS()
    {
        Task T = new Task(ApiCall);
        T.Start();
    }
    static async void ApiCall()
    {

        using (var client = new HttpClient())
        {
            string username = "tins";

            // Webservices token for above Webservice username
            string token = "8ead2ff1a50d3a9a1eb1522bbdc96c0e";

            // BulkSMS Webservices URL
            string bulksms_ws = "http://portal.bulksmsweb.com/index.php?app=ws";


            string ws_str = bulksms_ws + "&u=" + username + "&h=" + token + "&op=pv";
            ws_str += "&to=" + Uri.EscapeDataString(destinations) + "&msg=" +
Uri.EscapeDataString(messagetosend);
            try
            {
                HttpResponseMessage response = await client.GetAsync(ws_str);

                response.EnsureSuccessStatusCode();


                using (HttpContent content = response.Content)
                {
                    string responseBody = await response.Content.ReadAsStringAsync();
                }

            }
            catch (Exception )
            {

            }

        }
    }

    private void getData()
    {
        con.Close();
        try
        {
            con.Open();
            SqlCommand sqlCmd = new SqlCommand("SELECT * from
[ticketing].[dbo].[knowledge_base] where Title ='" + title.Text + "'", con);
            SqlDataAdapter adapter = new SqlDataAdapter();
```

```
            adapter.SelectCommand = sqlCmd;
            DataTable table = new DataTable();
            adapter.Fill(table);
            BootstrapGridView1.DataSource = table;
            BootstrapGridView1.DataBind();
            con.Close();
        }
        catch (Exception)
        {
            con.Close();
            throw;
        }

    }
```

Network Logger Code

```
 class Program

{

    public    static   SqlConnection   con   =   new   SqlConnection("Server=DESKTOP-
0383PA6\\TMSQL16; Integrated Security = True");

    static bool pinging = false;

    static Ping isping = new Ping();

    static string serverid;

    static string ticketID;

    private static int _countDown = 30; // Seconds

    private static bool waySelected = false;


    static String monthnowg = DateTime.Now.ToString("MMM");

    static String dtnw = DateTime.Now.ToString("yyyy");

    static String todayy = DateTime.Now.ToString("dd/MM/yy");


    //sms

    static String destinations;
```

```
static String messagetosend;


static void Main(string[] args)

{

    Console.WriteLine("Automated Servers Logger is monitoring servers");

    SpeechSynthesizer synth = new SpeechSynthesizer();

    synth.Speak("Automated Servers Logger is monitoring servers");

    Getdata();

    Environment.Exit(0);


}

static async void ApiCall()

{


    using (var client = new HttpClient())

    {

        string username = "tinsco";


        // Webservices token for above Webservice username

        string token = "7ead2ff1a50d3a9a1eb1522bbdc96c0e";


        // BulkSMS Webservices URL

        string bulksms_ws = "http://portal.bulksmsweb.com/index.php?app=ws";

        string ws_str = bulksms_ws + "&u=" + username + "&h=" + token +
"&op=pv";
```

```csharp
            ws_str += "&to=" + Uri.EscapeDataString(destinations) + "&msg=" +
Uri.EscapeDataString(messagetosend);

            try

            {

                HttpResponseMessage response = await client.GetAsync(ws_str);

                 response.EnsureSuccessStatusCode();

                using (HttpContent content = response.Content)

                {

                    string            responseBody          =           await
response.Content.ReadAsStringAsync();

            Console.WriteLine("Message Sent to " + destinations);

                }


            }

            catch (Exception ee)

            {

                //MessageBox.Show("There is no network to send message");

        }

    }

    private static void sendsms()

    {

        Task T = new Task(ApiCall);

        T.Start();

    }


    private static void fillid()

    {
```

```csharp
        Random r = new Random();

        string serv = "PI" + r.Next(1, 50000).ToString() + "NG";

        serverid = serv;

    }

    private static void filltickid()

    {

        Random r = new Random();

        string serv = "ZPC" + r.Next(1, 50000).ToString() + "TKT";

        ticketID = serv;

    }

    private static void Getdata()

    {

        //weekend watcher

        //MessageBox.Show(DateTime.Now.DayOfWeek.ToString() );

        if      (DateTime.Now.DayOfWeek.ToString()      ==      "Saturday"      ||
DateTime.Now.DayOfWeek.ToString() == "Friday")

        {

            Console.Write("Its weekend");

        }

        else

        {

            while (true)

            {

                con.Close();
```

```csharp
                      try

                      {

                           con.Close();

                           con.Open();

                           SqlCommand    sqlCmd    =    new    SqlCommand("SELECT    *    from
[ticketing].[dbo].[servers]", con);

                           SqlDataAdapter adapter = new SqlDataAdapter(sqlCmd);

                           DataTable dt = new DataTable();

                           adapter.Fill(dt);


                           foreach (DataRow dr in dt.Rows)


                           {

                                PingReply                    reply                    =
isping.Send(dr["server_address"].ToString());



                                string sname = dr["server_name"].ToString();

                                string saddress = dr["server_address"].ToString();

                                string locatio = dr["location"].ToString();

                                string desc = dr["description"].ToString();

                                pinging = reply.Status == IPStatus.Success;


                                if (pinging == true)

                                {

                    if (con.State == ConnectionState.Closed)

                                     {
```

```csharp
                    con.Open();

                }

                fillid();

                SqlCommand  com  =  new  SqlCommand("INSERT  INTO
[ticketing].[dbo].[server_logs]
([record_id],[server_address],[status],[server_name],[location],[description],[time_span]
,[week_id],[month_yr],[date_rec]) Values ('" + serverid + "','" + saddress + "','" + "Up"
+ "','" + sname + "','" + locatio + "','" + desc + "','" + DateTime.Now.ToShortTimeString()
+  "','"  +  DateTime.Now.DayOfWeek  +  "','"  +  monthnowg  +  dtnw  +  "','"  +
DateTime.Now.ToString() + "') ", con);

                    com.ExecuteReader(CommandBehavior.CloseConnection);

                    Console.WriteLine("Server log up raised");

                    con.Close();

            }

            else

            {

                if (con.State == ConnectionState.Closed)

                {

                    con.Open();

                }


                fillid();

                filltickid();


                SqlCommand  mycmd  =  new  SqlCommand("SELECT  Distinct
[user_mobile] from [ticketing].[dbo].[users] Where [user_level]='Administrator'", con);

                    SqlDataAdapter ad = new SqlDataAdapter(mycmd);

                    DataTable dtt = new DataTable();

                    ad.Fill(dtt);
```

118

```csharp
                        foreach (DataRow drr in dtt.Rows)

                        {


                            String dmydes = drr["user_mobile"].ToString();

                            destinations = dmydes;

                            messagetosend = "May you please check the " + sname
+ " " + " with IP Address " + saddress + " located at " + locatio + ". May you resolve the
issue since server is down!";

                            Console.WriteLine("message send" + dmydes);

                            // sendsms();

                        }


                        if (con.State == ConnectionState.Closed)

                        {

                            con.Open();

                        }

                        SqlCommand   com   =   new   SqlCommand("INSERT   INTO
[ticketing].[dbo].[server_logs]
([record_id],[server_address],[status],[server_name],[location],[description],[time_span]
,[week_id],[month_yr],[date_rec]) Values ('" + serverid + "','" + saddress + "','" + "Down"
+ "','" + sname + "','" + locatio + "','" + desc + "','" + DateTime.Now.ToShortTimeString()
+   "','"   +   DateTime.Now.DayOfWeek   +   "','"   +   monthnowg   +   dtnw   +   "','"   +
DateTime.Now.ToShortDateString() + "') ", con);

                            com.ExecuteReader(CommandBehavior.CloseConnection);

                            con.Close();

                            Console.WriteLine("Down ticket raised");


                            //auto record ticket

                            if (con.State == ConnectionState.Closed)
```

```csharp
                    {

                        con.Open();

                    }

                    SqlCommand   co   =   new   SqlCommand("INSERT   INTO
[ticketing].[dbo].[tickets]
([tracking_num],[date_raised],[title],[category],[description],[support_group],[raised_by
],[status],[type],[rating],[completed])   Values   ('"   +   ticketID   +   "','"   +
DateTime.Now.ToShortDateString() + "','" + sname + " Is Down" + "','" + "Net Logs" + "','"
+ "May you please resolve the issue. The server IP is " + saddress + ". The server is
located at " + locatio + "','" + "Net Logs" + "','" + "System" + "','" + "Pending" + "','"
+ "Net Logs" + "','" + "5" + "','" + "0" + "') ", con);

                        co.ExecuteReader(CommandBehavior.CloseConnection);

                        Console.WriteLine("Down net log raised");

                        //Console.Read();




                    }
                }


                // con.Close();


            }

            catch (Exception ee)

            {

                //Console.WriteLine("There is No connection");

                //Console.Read();
```

120

```
                //Environment.Exit(0);

                // Console.Read();

            }

            finally

            {

                //Console.Read();

                // Environment.Exit(0);

                // con.Close();

            }

        }


    }

    con.Close();

    // Environment.Exit(0);


}

static void OnTimedEvent(object source, ElapsedEventArgs e)

{

    if (waySelected == false)

    {

        if (_countDown-- <= 0)

            Console.WriteLine("You got crushed!");

        else

        {

            Console.SetCursorPosition(0, 9);

            Console.WriteLine(_countDown + " seconds until you are crushed");
```

```
                }

            }

        }
```

Availability Calculation

```csharp
    private void dairlycounter()
    {

        try
        {
            dairlyavailability.Text = "Dairly Availability";
            con.Close();
            con.Open();

            SqlCommand cmd = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [status]='" + "Up" + "' AND [server_name]='" +
serverlist.Text + "' AND [date_rec] >= cast(dateadd(day, -1, GETDATE()) as date) AND
[date_rec] < cast(GETDATE() + 1 as date) ", con);
            int count = int.Parse(cmd.ExecuteScalar().ToString());

            SqlCommand cmd2 = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [server_name]='" + serverlist.Text + "' AND
[date_rec] >= cast(dateadd(day, -1, GETDATE()) as date) AND [date_rec] < cast(GETDATE() +
1 as date) ", con);
            int countall = int.Parse(cmd2.ExecuteScalar().ToString());

            double x = ((Convert.ToDouble(count)) / (Convert.ToDouble(countall))) *
100;

            dairlyavailability.Text = Math.Round(x) + "% Availability" + " Ping
Statistics ||| " + "All Ping Loops [ " + countall + " ]" + ": Ping Up Loops [ " + count +
" ]";
            con.Close();
            cmd.Dispose();
            cmd2.Dispose();
        }
        catch (Exception)
        {

        }
    }
    private void weeklycounter()
    {
        try
        {
            weeklyavailability.Text = "Weekly Availability";
            con.Close();
            con.Open();

            SqlCommand cmd = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [status]='" + "Up" + "' AND [server_name]='" +
serverlist.Text + "' AND [date_rec] >= cast(dateadd(day, -7, GETDATE()) as date) AND
[date_rec] < cast(GETDATE() + 1 as date) ", con);
            int count = int.Parse(cmd.ExecuteScalar().ToString());
```

```csharp
            SqlCommand cmd2 = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [server_name]='" + serverlist.Text + "' AND
[date_rec] >= cast(dateadd(day, -7, GETDATE()) as date) AND [date_rec] < cast(GETDATE() +
1 as date) ", con);
            int countall = int.Parse(cmd2.ExecuteScalar().ToString());

            double x = ((Convert.ToDouble(count)) / (Convert.ToDouble(countall))) *
100;
            weeklyavailability.Text = Math.Round(x) + "% Availability" + " Ping
Statistics ||| " + "All Ping Loops [ " + countall + " ]" + ": Ping Up Loops [ " + count +
" ]";
            con.Close();
            cmd.Dispose();
            cmd2.Dispose();
        }
        catch (Exception)
        {

        }
    }
    private void monthlycounter()
    {
        try
        {
          monthlyavailability.Text = "Monthly Availability";
          con.Close();
          con.Open();

            SqlCommand cmd = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [status]='" + "Up" + "' AND [server_name]='" +
serverlist.Text + "' AND [date_rec] >= cast(dateadd(day, -30, GETDATE()) as date) AND
[date_rec] < cast(GETDATE() + 1 as date) ", con);
            int count = int.Parse(cmd.ExecuteScalar().ToString());

            SqlCommand cmd2 = new SqlCommand("SELECT COUNT (*) FROM
[ticketing].[dbo].[server_logs] WHERE [server_name]='" + serverlist.Text + "' AND
[date_rec] >= cast(dateadd(day, -30, GETDATE()) as date) AND [date_rec] < cast(GETDATE()
+ 1 as date) ", con);
            int countall = int.Parse(cmd2.ExecuteScalar().ToString());

            double x = ((Convert.ToDouble(count)) /
(Convert.ToDouble(countall)))*100;
            monthlyavailability.Text = Math.Round(x) + "% Availability"+" Ping
Statistics ||| "+ "All Ping Loops [ "+ countall+" ]" +": Ping Up Loops [ "+ count +" ]" ;
            con.Close();
            cmd.Dispose();
            cmd2.Dispose();
        }
        catch (Exception)
        {

        }
    }
```