

MIDLANDS STATE UNIVERSITY



FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING

**TOPIC: AN INVESTIGATION OF THE EFFECTIVENESS OF COST CUTTING
MEASURES IN THE TOURISM AND HOSPITALITY BUSINESS. CASE OF THE
VICTORIA FALLS HOTEL**

BY

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS OF BACHELOR OF COMMERCE ACCOUNTING HONOURS
DEGREE**

ABSTRACT

The purpose of this research was to come up with a solution to problems that were being faced at the ZESA I.T department with regards to the way users report issues to the helpdesk and how support officers respond to these issues. ZESA I.T Support Ticket Management System is a web-based automated computer system that sets smart rules to prioritize and automatically assign support tickets to support officers and administrators. The end users or customers submit tickets regarding their issues to the intended helpdesk department which is automatically assigned to a helpdesk agent who then works on the issue until it is resolved and replies the resolved issue to the end user. Its major thrust is to provide a simple and easy platform to serve end users faster with help desk automation that automates repetitive tasks using smart help desk workflows. The system will eliminate the current problems that are being faced by the current system where users get responses from the I.T department late regarding their issues. ZESA uses quite a number of applications that need to be supported when users face difficulties and they are different support officers who specialize in those applications. The system was developed to address the weaknesses of the old system. MYSQL, MAMP, Sublime Text Editor php, css, java scripts and Microsoft word 2011 are the instruments that were used in the development of the new system.

DECLARATION

I Keith Zongoro hereby declare that I am the owner and author of this dissertation. I give permission to the Midlands State University to grant this dissertation to individuals or other institutions for the purpose of academic research.

Signature

_____ Date _____

APPROVAL

This thesis entitled “**ZESA I.T Support Ticket Management System**” by Keith Zongoro conforms to the regulations governing the award of the **BSc Information Systems Honours Degree** of Midlands State University, and is approved for its contribution to the knowledge and literal presentation.

Supervisor

Date

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The path towards this project has been circuitous. Its completion would not be possible without the large part of the special people who challenged, supported and stuck with me along the way.

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully. I can testify that this bible verse guided me throughout this project “Trust in the LORD with all your heart And do not lean on your own understanding. In all your ways acknowledge Him, and He will make your paths straight” (Proverbs 3:5-6).

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DEDICATION

I dedicate this project to my immediate family for their unwavering support, love and guidance in my life. Lastly I would like to dedicate this project to the Zimbabwe Electricity Supply Authority for giving me the opportunity to partake in it.

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LIST OF ACRONYMS

3E	:	Eclipse Enterprise Edition
CSS	:	Cascading Style Sheets
DCS	:	Design and Construction System
HTTP	:	Hyper Text Transfer Protocol
ID	:	Identity number
I.T	:	Information Technology
ICS	:	Integrated Customer Service
PHP	:	Hypertext Preprocessor
R.O.I	:	Return on Investment
RAM	:	Random Access Memory
SAP	:	Systems Applications and data Processing
SQL	:	Structured Query Language
UPS	:	Uninterrupted Power Supply
ZENT	:	ZESA Enterprises
ZESA	:	Zimbabwe Electricity Supply Authority
ZPC	:	Zimbabwe Power Company

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

ZESA I.T Support Ticket Management System is a web based collaborative suite of IT Support, Integrated Customer Service (ICS), Eclipse Enterprise Edition(3E), System Application Program (SAP) and Design and Construction System (DCS) and CITRIX. CITRIX is a web-based intergrated suite of the ZESA applications were users from remote areas connect to the ZESA systems because of their poor connection to the local network. Using this system End-users will open, submit, track and follow on their tickets. This system basically involves two groups, End users who raise support tickets and help-desk staff agents who respond to support tickets.

1.2 Background of organisation

Following the passing of two Acts by the Parliament of Zimbabwe, the Electricity Act (Chapter 13:19) and the Rural Electrification Fund Act (Chapter 13:20) comprehensive reforms have since been experienced in the electricity industry. The Electricity Act also ushered in the formation of five successor companies, the Zimbabwe Power Company (ZPC), Zimbabwe Electricity Transmission Company (ZETCO), Zimbabwe Electricity Distribution Company (ZEDC), ZESA Enterprises and Powertel Communications. ZEDC and ZETCO later became one company named ZETDC, which is responsible for the transmission and distribution of electricity. In line with the approved structure, all power generation assets and operations are under ZESA Holdings generation subsidiary, the Zimbabwe Power Company (ZPC) formed in October 1996.

1.2.1 Organisational structure

Buchman and Huczynski (2004) define an organizational structure as the formal system of task and reporting relationships that controls, coordinates and motivates employees so that they work together to achieve organisational goal. Rosengren, K.E (2000) states that an organisational structure contains positions characterizing of activities that employees seek after and therefore making room for individuality in an organisation, which makes sure that every employee has clear objectives of what is expected of them and work towards those objectives. The organisational structure consists of the managing director who controls the board of the several directors from

different departments in the organisation. The senior I.T manager controls the I.T department with three sections which are the Financial, Commercial and the Hardware section. Each section is headed by a chief systems analyst who controls the systems support officers and the systems analysts. The figure below shows the organisational structure of **ZESA** comprising of the departments that the researcher is going to be focusing on in this project.

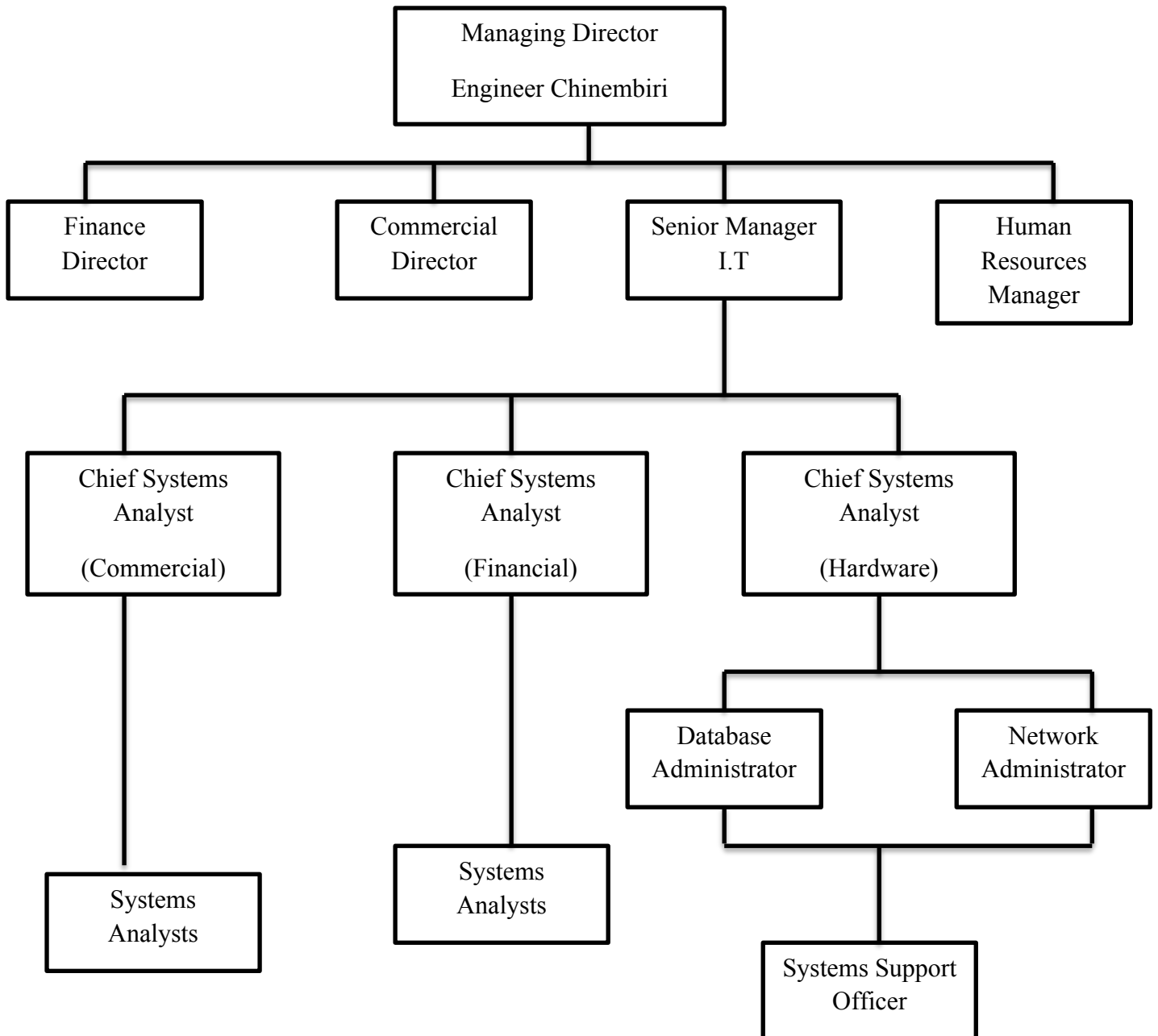


Figure 1.1 Organisational Structure of ZESA Holdings

1.2.2 Mission Statement

Rollison and Broadfield (2002) quote two scholars Barney and Griffin (1992) who state that a mission is normally taken to be a somewhat global statement of an organisation's goals, which expresses the fundamental reasons for its existence. Daft (2008) defines a mission statement as a broad method for giving importance of an organisation's inspiration which then helps that particular organisation to be perceived from whatever different associations of near kind.

The mission statement of ZESA Holdings is commitment to the customers of Zimbabwe and regions by providing them with quality electricity, telecommunications services and engineering, at competitive prices and also creating value for the stakeholders.

1.2.3 Vision

Rollison and Broadfield (2002) define vision as the affectability to changes in a organisation's domain, together with a precise impression of the heading in direction which the organisation must take if it is exploit environmental or ecological changes. The vision of ZESA holdings is to be a leading service provider in supplying dynamic electricity, engineering and telecommunications.

1.3 Problem Definition

Hass and Springer (2014) state that, in conducting a research the most critical step is the problem definition. They further agrees that stating the problem will obviously give the heading to the whole research processes.

The Zimbabwe Electricity Supply Authority IT department uses obsolete methods of supporting their end users. Currently if a user encounters a problem with one of the systems (SAP,3E,DCS,ICS), they either make a phone call or send an email to the super users of the systems or the support agents. These methods are inefficient because sometimes the phones will be engaged and support agents may delay to respond to an email. The end users sometimes get frustrated and end up contacting the top managers reporting their issues and blaming I.T for their inefficiency. Users at times contact an I.T personnel who do not specialize in that particular application and the personnel will end up referring the user to a personnel who is specialized for that particular job and thereby causing delays.

Developing a system that monitors the help desk operations and statuses of the super users and the systems support officers will help to instigate corrective action if necessary.

1.4 Aim

To develop a system that enables users to submit I.T related issues that are responded to by the support officers.

1.5 Objectives

Richman (2002) suggests defining the main objectives of the research as the next step after clearly defining the problem at hand that the particular project or research will address. Rollinson and Broadfield (2002) define an objective as a transient declaration of results that have to be accomplished. For each and every project or research to be successful, objectives should be clearly defined. Well-defined objectives must be SMART, thus they must be specific, be easy to measure, be achievable, realistic and time bound. In relation to that, the objectives of this research are as follows:

- To develop a system that locks tickets once a support staff member has started working on it to prevent another support staff member from working on the same ticket.
- To develop a system that will allow a department to assign and transfer tickets to a better suited team if it has been routed to a team that is not best suited for the solution.
- To develop a system that sends an automatic reply to the end-user once the ticket has been received.
- To develop a system that keeps track of the time that is spent by a support officer whilst resolving an issue.
- To develop a system with a dashboard where the status of the help-desk operation may be monitored.
- To develop a system with a portal whereby a users can check the status of their support requests by providing the tracking identity.

- To relay information to users through the email when a ticket changes its status to avoid having to check the status of the ticket before it has been resolved.
- To develop a system with a canned response feature which will expedite support officers response time when attending to common user issues.
- To develop a cross platform ticketing system that is compatible with all modern desktop and mobile browsers for iOS, Windows phone and Android operating systems.

1.6 Research instruments and methods

According to Valencia (2016) the research section should include portrayals of the instruments utilized in a research study. This ticket management system involves three development tools and research techniques. The tools that are going to be used in this research are MAMP web server which will be responsible for creating a database that will store the helpdesk information, Macromedia Dreamweaver an application development tool used in designing web applications and Microsoft Visio for drawing flow charts, data flow diagrams and entity relational diagrams which are going to be used in the Design stage of this research.

Questionnaires, interviews and observations are the research techniques that are going to be used in this research study.

1.7 Importance of the study

ZESA I.T Support Ticket Management System will enable end users of applications used at ZESA to get the right assistance and also to create a formal platform where the I.T personnel can support any queries from the users. It will allow the helpdesk activity to be monitored by the superiors and it will also make communication easier between users and the support teams.

1.8 Limitations

Stommel and Wills (2004) state that numerous researches are affected by different limitations which include design and measurement and this is probably unavoidable, hence they must be recognized and attended to with appropriate measures. The following limitations were recognized whilst conducting this research and the possible solutions to countermeasure these limitations.

One of the limitations that the researcher noted is that of internet access. This system will be notifying users if their issues have been resolved through their emails and also notifying helpdesk agents of any incoming support tickets through the email so that they do not have to visit the helpdesk frequently to check. This means whenever the internet is down, the responses will be sometimes delayed if the helpdesk agent do not visit system. Therefore there should be alternatives like modems especially for users from remote areas who use the webmail to access their mails.

Another limitation is that of acceptance by the users. Users may not participate or use this system because of resistance to change. Therefore the users must be taught how this system will benefit them in order to make them participate.

Financial costs associated in this project presents itself as a limitation, however ZESA has shown eagerness by providing finances for this project and it has indicated that it can manage the budget that the researcher has came up with that will be shown in the next chapter.

1.8 Conclusion

This chapter has indicated that the main aspects of this project are the background of the organisation, the objectives of the proposed system and the limitations. The problems that the organisation is facing were also indicated therefore leading to the proposal of developing a system that will rectify and reduce these problems. The following chapter will mainly be focusing on the feasibility of this project and the planning.

CHAPTER TWO: PLANNING PHASE

2.1 Introduction

Ghallab et al (2004) defines planning as the reasoning side of acting. Considering technical, economic, social and operational feasibility will contribute to the effective decision making of the project. The planning phase discusses the functionalities of the system and how feasible it is. It also indicates the business value of the project and explains it in economic terms using different calculations. It also produces the dangers or risks that are likely to occur in the project's development life cycle and ways to counter these risks. To conclude the feasibility of the project, the work plan is then given in the form of Gantt charts and tables.

2.2 Reasons for developing the system

It is important to be well-versed and informed of the project's business value and put it into effect otherwise the management and the project team will not receive the necessary finances it requires. It has to point out the tangible and intangible benefits that have to be delivered when the system is fully functional. Therefore that is why examining the risks closely and the feasibility of the project are needed. The following are the reasons why the system is being developed.

- To reduce the time taken by users to get a response from the helpdesk agents.
- To assist the users in directing there queries to the intended helpdesk agents.

2.3 Business value

Hass (2008) asks the question that helps in directing the aspect of business value, what should a business anticipate from the utilization of information and technology? In this study, the I.T Support Ticket Management system is going to raise the business value of ZESA. He then answers this question saying information technology should provide cutting edge services at minimal costs.

After the IT Support Ticket Management System has been implemented, the interaction between users and the IT support staff will become more efficient by enabling support agents to respond quickly to user queries. It will also save time and resources on manual and repetitive help desk tasks. Helpdesk agents can also be tracked and monitored in real time by their superiors and this will improve the

operational efficiency of the systems. This system will allow the organization to establish seamless communication for end-users and external end-users who will be requesting for IT services and help desk agents who will be supporting the end users by fulfilling their requests.

The main categories of the business values are simplified into:

- **Organizational value:** Ideally, ZESA will have a cutting edge administration, a good technological reputation and an enhanced image of service provision and this will boost the goodwill of the organization.
- **Administrative value:** The I.T Ticket Management System will bring administrative value to the organization by offering services that are better through impressive administration to the end users.
- **Clients' value:** A lot of time will be saved and other productive activities can be done in the time saved. Costs will be reduced by these productive activities, which include support call durations and volumes.
- **Operating value:** End users will be guaranteed that their issues will be correctly logged and assigned in the system instead of getting lost or not being attended to.
- **Employee's value:** It will increase the productivity of the employees since end users will not stop working due to technology problems since their queries will be resolved in an automated way.
- **Security value:** Information will remain confidential and secure and the system's communication channel will be maintained by an electronic database.

2.4 Feasibility analysis

Bruce Langdon (2000) states that before starting a project, there is need for assurance that there is a good probability for the success of the project, hence the need to take the appropriate steps in timing the project and calculating its feasibility. Feasibility study is a short focused study that checks if the system contributes to the organisational objectives, if the system can be engineered using current technology, if the system can be developed within a reasonable budget and if the system can be integrated by other systems that are used Laplante (2007). Stimpson (2004) critically

points out the aspects that have to be looked at when carrying out a feasibility study which are:

- Technical feasibility
- Economic feasibility
- Technical feasibility
- Operational feasibility

2.4.1 Technical feasibility

The real fear of this aspect is mainly to examine and assert if it achievable to develop the system and also including the machines (hardware) to be used and the overall public that is going to be included by asserting to see if the users of the system that is being worked on have the obliged abilities to use it Mathers (2006). Rosenblatt (2012) goes on to say, Technical feasibility is comprehensive of determining the achievability of a project taking into account the current state of technology that is available.

The following hardware and software are going to be needed to carry out the project:

Hardware and software requirements

Quantity	Component/Item	Specifications	Available
4	HP PRO 3500 SERIES MT	500GB HARD DRIVE 4GB RAM 3.20GHz Processor Speed Intel Pentium G2020	3
2	SERVERS	1TB HARD DRIVE 8GB RAM 3.20Ghz Processor Speed Intel Xeon	1
1	HP PRO 300 PRINTER	Colour Printer Network port	1

Table 2.1 (a) Hardware Requirements

Quantity	Component	Availability	Comment
1	Windows Operating System	Yes	The I.T department has many licensed operating system that are ready for installations whenever required
1	System Center Endpoint Protection	Yes	The organization has agreed to purchase the anti-virus to ensure the success of the project
1	Microsoft Office 2013	Yes	The I.T department has many licensed Microsoft products that are ready for installation whenever required
1	Macromedia Dreamweaver	Yes	The developer has managed to download the software free of charge on the internet
1	Xampp	Yes	The developer has managed to download the software on the internet

Table 2.1 (b) Software Requirements

The project can be carried out without any anticipated technical problems since the technologies that are being proposed are within the organization and easily accessible.

2.4.2 Economic feasibility

Kendal (2006) states that the key aspect that economic feasibility practicality looks at is the organization's budgetary and financial muscle and assets likewise considering the costs the organization is likely to incur during the development, maintaining and operation of the new system. Economic feasibility according to Shelly and Rosenblatt (2010) is a circumstance that arises when the estimated expenses of a project (which incorporate on-going support) are sensibly exceeded when compared against the anticipated advantages of that project. When the system is fully functional its benefits will outweigh the costs that were incurred in developing it. The system has minimum

initial and operational costs since the organization already has the software and hardware that is required to develop the system.

Development costs

Scarborough and Zimmer (2005) define development costs as the total related costs that are encountered in the whole development process of a project. In simple terms it is the cost that is incurred during developing the new system. The table below shows the development costs that are going to be incurred by the new system.

Component	Cost
Hp client server (x15)	17 750
Hp backup server (x15)	14 625
Developer's allowance	800
System's web installation	150
Avira anti-virus (x30)	350
Total development costs	31 675

Table 2.2 Development costs

Operational costs

Operational costs are costs which continue happening despite meeting all the costs of development Stoner (2000). These costs occur when the system is now being implemented and has been fully set up and from the time it starts working and the time it operates for whilst it is working. Operational costs are shown in the following table, which are the maintenance of the system and the training of the users over a period of 3 years and the grand total of these costs. The following table is going to show the operational costs that the researcher projected as from year 2017 to 2019, which includes maintenance and training.

Operational cost	2016	2017	2018	Total
	US \$	US \$	US \$	
Maintenance	1 200	1 200	2 200	3 600
Training	5 500	-----	-----	5 500
Grand total	6 700	1 200	2 200	10 100

Table 2.3 Operational costs

Tangible benefits

Barnes & Xu (2001) define them as benefits that can be communicated or measured in figurative terms. Lucey (2002) goes on to say that the benefits of the tangible benefits have qualities that are quantifiable and can attract and reflect to an investor immediately. The table below shows the tangible benefits of the project from the year 2017 to 2019 and their totals.

Benefit item	2016	2017	2018	Total
	US \$	US \$	US \$	
Paperwork reduction	13 000	13 000	13 000	39 000
Time enquiries reduction	6 500	4 500	3 500	14 500
Improved volume capacity	12 000	15 000	16 500	43 500
Grand total	31 500	32 500	33 000	97 000

Table 2.4 Tangible benefits

Intangible benefits

Lucey (2002) defines intangible benefits as benefits that will be given back to the investor's investment and cannot be quantified because they are unable to shape into a structure that is physically quantifiable. Barnes & Xu (2001) state that these benefits cannot be felt, touched, quantified or measured by an individual. The noted intangible benefits were as follows:

- Reduction in workload
- Organisational image improvement
- Customer satisfaction will be increased
- Employee moral will be increased
- Corporate goodwill will be increased

Investment appraisal

Geddes (2002) defines it as a method can be used hand in hand or interchangeably with the term cash budgeting. Rohrich (2007) defines it as a method that guarantees the collection of important data, which is identified with all the business alternatives available to an organization thus empowering decision makers to make decisions without overlooking the organization's goals and missing the target. The procedures that are used with this method are discussed in the next sub headings.

Cost Benefit Analysis

Cadle and Yeates (2008) defines it as the process of identifying and, where possible, quantifying the costs of undertaking a project and its expected benefits, with a view to determining whether the project can be justified. Brent (2006) defines cost benefit analysis as the assessment of the total value of the current benefits set in contrast with the total expenses, taking into consideration the different constraints that can bias this evaluation. The following table shows the cost benefit analysis of developing the system.

Item	2016	2017	2018	Total
	US \$	US \$	US \$	US \$
Tangible benefits	31 500	32 500	33 000	97 000
Operational Costs	(6 700)	(1 200)	(2 200)	(10 100)
Net benefits/costs	24 800	31 300	30 800	86 900

Table 2.5 Costs and Benefits Analysis Table

Net Present Value.

Cadle and Yeates (2008) define it as the difference between the present values of the cash outflows of a project and the present values of the cash inflows, all future cash flows being adjusted to reflect the present day of money. The difference between the total contributed and the present estimation of future cash flows is known as the net present value and can outcome as either positive or negative Sangster (2004).

The researcher is going to use an interest rate value of 15% over a period of 3 years.

$$N.P.V = \frac{\text{Total benefits} - \text{Total costs}}{(1 + r)^n}$$

$$(1 + r)^n$$

When is the number of years and r is the interest rate.

Year	Net cash flow	Discount factor	Present Value
	US \$	15%	US \$
0	(31 675)	1.000	(31 675)
1	24 800	0.870	21 576
2	31 300	0.756	23 663
3	30 800	0.658	20 266
NPV			33 830

Table 2.6 Net present values for 3 years

The table above shows the assessed outcomes of the NPV over a period of 3 years and a positive result of **\$33 830** was calculated simultaneously and thereby indicating that the project can be done.

Return on Investment

According to Horngren et al (1996) a better test of profitability is the rate of return on investment (ROI), which is income (or profit) divided by the investment required to obtain that income or profit.

$$\text{“ROI} = \frac{\text{Average annual profit}}{\text{Development costs}} \times 100$$

$$\text{ROI} = \frac{28\,967}{33\,830} \times 100$$

$$= \underline{86\%}$$

The general rule is that; a positive ROI value demonstrates that a project is feasible consequently the above figure of 86% mirrors the feasibility of this project.

Payback period.

Horngren et al (1996) define payback period as the measure of the time it will take to recoup, in the form-of cash inflows from operations, the initial dollars of outlay. Romney and Steinbart (2012) state that the payback period is the number of years required for the net savings to equal the initial cost of investment. It can be expagorated as the amount of time required to recuperate the expense of an investment. This payback period is a vital determinant of whether to embrace the project subsequent to the fact that long payback periods are not favourable in the investor’s interest, the project with the shortest payback period is usually selected (Romney & Steinbart (2012). The payback period of this project is calculated in the following table.

Year	Annual cash flow	Balance
	US \$	US \$
1	(31 675)	(31 675)
2	31 500	(175)
3	32 500	-----

Table 2.7 Payback Period

Payback period = 1 year and $[(175/32\ 500) * 12]$ months

= 1 year 1 month

The lesser the payback period, the more feasible the project is, consequently for this situation, the payback period is 1 year 1 month hence this is a feasible project.

2.4.3 Social feasibility

Kendal (2006) state that The main focus is fundamentally on the employees' conduct or behaviour that is in relation to their patterns and levels of interaction after the implementation of the system.. The impact of a project on the workers of an organisation (likewise taking into consideration their possible response) is what is referred to as social feasibility Barnes and Xu (2001). Employees need to be closely assessed on how they will interact and react to the system after implementation of the system since they are the users of the system. Computerising the current helpdesk will reduce the workload that is done by the employees and also the employees will have time to spend with their families due to the proposed system and improve their social time.

2.4.4 Operational feasibility

The new proposed system once in use ought to turn out to be more efficient and viable when contrasted with the current manual system for doing things and should enhance the overall helpdesk process and the operations of the ZESA IT department. Rosenblatt (2012) states that operational feasibility is more oriented or concentrates on issues which include the use of the proposed system after it has been implemented. Rodger (2005) goes on to say that it is imperative to look at the usefulness of the newly proposed system in contrast with the current working system in order to be able to fully appreciate the new system's feasibility in terms of its operational. In order to accomplish this, specific angles about the system ought to be closely looked at and in order to have a quantifiable examination of the system's usefulness identified.

- **Joining of hierarchical activities:** The proposed system is equipped for coordinating a number of ZESA IT department's helpdesk activities, for example, user ticket queries, assigning of tickets to the intended helpdesk agents and ticket responses back to the users.
- **Objective conformity:** The new system is comprised of functions that will be able to meet the fundamental objectives that will enable users to raise support tickets which can be responded to by the help desk agents on a web interface.

- **Time:** Time is conserved on the proposed system and it is considered as an asset to the organization by enabling users to save time and effort needed to reach the IT helpdesk agents for different applications and services that they provide and they can be served concurrently from their offices and wherever they will be as long as they are connected to the ZESA local area network or internet access since it is web based.
- **Speed and accuracy:** Speed and accuracy are guaranteed in the proposed system and will help in speeding up the time taken to respond to user queries and also the accuracy of directing the queries to the intended helpdesk agents therefore avoiding any inconveniences to the users.

Feasibility conclusion

After scrutinizing the feasibility study closely, the researcher uncovered that costs associated with the development of the new system contrasted with points of interest that this system is prone to bring are far significantly less, thus this researcher construes it is attainable to proceed with developing the I.T Ticket Management System.

2.5 Risk analysis

Heyman (2010) defines risk is the probability that a particular adverse event occurs during a stated time period, or results from a particular challenge. According to Marchewka (2014) project risk management is a process that focuses on identifying, analysing and developing strategies for responding to project risk efficiently and effectively. Risk analysis and assement is mainly carried out to find out what risks and opportunities that have to be looked at. As said before, this is a low spending budget with negligible economic dangers. Quite a bit of what is required is as of now in the organization and what should be gained is accessible and available at reasonable costs, the following risks were recognized and furthermore included are the measure to control them

- Unapproved access by users or hackers either purposefully or unintentionally, they show up as a risk with the possibility to hurt both the organization and in addition its clients either by denying service to the users. To minimize this

danger defence components, for example, firewalls and access controls will be utilized.

- Gard (2006) defines a computer virus as a program that, in one way or the other, infects other programs by either modifying or propagating or has the potential to do so. The basic purpose of a computer virus was to damage the program and spoil the operating mechanism. Because of this system and the hardware and operating system of the system there is going to be installations of software like AVG to guard against infections that can also work as one with System Center Endpoint.
- The hardware and the software of the system is going to be protected with up to date AVG anti-virus that work hand in hand with System Center Endpoint in response to the risks mentioned above.

2.6 Project work plan

Roeder (2011) states that the work plan is helpful as a tool to manage certain aspects of the projects since it clarifies what needs to be done, what the dependencies are and also how long it will take. In simpler terms, a work plan illustrates the project goals to be accomplished and summarises the tasks and schedules to accomplish the project goals. A work plan is also known as a project plan or a feasibility or proposal report. The specialist has used the Waterfall model as the System Development Life Cycle. It is a structured software development tool and tasks are executed sequentially. Not just has the model been utilized a few times as a part of this organization (which then assesses its adequacy by surveying how it has influenced other comparable projects). For this specific project, the time distribution for each distinct stage is reflected in the work plan table and Gantt chart indicated soon after this section.

<i>Phase</i>	<i>Start</i>	<i>End</i>	<i>Duration (weeks)</i>
<i>Project Introduction</i>	<i>18/05/2016</i>	<i>31/05/2016</i>	<i>2</i>
<i>Project Planning</i>	<i>01/06/2016</i>	<i>22/06/2016</i>	<i>3</i>
<i>Project Analysis</i>	<i>23/06/2016</i>	<i>14/07/2016</i>	<i>3</i>
<i>Project Design</i>	<i>15/07/2016</i>	<i>05/08/2016</i>	<i>4</i>
<i>Project Coding</i>	<i>06/08/2016</i>	<i>31/08/2016</i>	<i>3</i>
<i>Project Testing</i>	<i>01/09/2016</i>	<i>08/09/2016</i>	<i>1</i>
<i>Implementation</i>	<i>09/09/2016</i>	<i>16/09/2016</i>	<i>1</i>
<i>Maintenance</i>	<i>16/09/2016</i>	<i>23/09/2016</i>	<i>1</i>

Table 2.8 Timing project schedule

Gantt chart

The Gantt chart was first introduced to the world over a 100 years ago by an American management consultant named Henry Gantt brought about so many innovations but is mostly remember for this chart which was named after him Graham and Portny (2011). Bruce and Langdon (2000) agree that the gantt chart lists tasks on the left and the project time scale in weeks across the top. The bars show when tasks start and finish, providing a clear visual overview of project tasks and timings. In simpler terms it is an outline that fills the need of showing the calendar timetable of the task. To accomplish this, it depicts the time range of the project completely broken down into sections. The following table below shows the project's gantt chart with phases and weeks that will be taken to complete the project.

Time (In Weeks)

ACTIVITY/ PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Introduction	■	■																
Planning			■	■	■													
Analysis						■	■	■										
Design									■	■	■	■						
Coding Process													■	■	■			
Test Phase																■		
Implementation																	■	
Maintenance																		■
Documentation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Table 2.9 Project’s gantt chart

2.7 Conclusion

In conclusion it can be seen that the IT Support Ticket Management System has benefits that outweigh the risks and also it has high returns and a short break even period of 3 years. An I.T department that is already in place will improve the use of business application and the internal applications that are used in the organization and this will raise employee morale and productivity. In the following chapter, the researcher will discuss in detail what happens in the analysis phase.

CHAPTER THREE: ANALYSIS PHASE

3.1 Introduction

This chapter gives an image of the existing system bringing out its weaknesses and moderating the need for employing the proposed system. This chapter also carries out the explanation and justification of the techniques that are used to gather data to complete the study. Available alternatives, which are in-house development, improving and outsourcing and also functional requirements of the new system, are discussed at the end of this chapter.

3.2 Data gathering techniques

Mathers (2000) states that data gathering allows the researcher to identify the weaknesses of the current system and cater with the appropriate solutions in the proposed system as desired by the users. The instruments that are going to be used to collect the necessary information and used to explore the weak areas in the current system are as follows:

- Interviews
- Observations
- Questionnaires

3.2.1 Interviews

According to O'Brien (2011) an interview is a conversation between two or more people with a common purpose. Those who are part of the system especially the users will be interviewed so as to get an expanded detail of the problems and difficulties they are facing with the current system and their requirements on the proposed system.

Advantages

- Face to face interviews gave the interviewer the freedom to explore unexpected information since there was direct communication.
- Less time was used in conducting the interviews compared to questionnaires and observations.

- There was immediate and direct communication with the actual users of the current system.
- The interviewer was able to note gestures and motions and this assisted the interviewer in digging more relevant data that could not be dug through writing.
- Interviews are versatile and therefore were easy to combine with other data collection techniques.
- The interviewer was able to collect rich detailed qualitative data and also enabled the interviewer to understand the reasons for certain actions.

Disadvantages

- The technique was found to be vulnerable to bias.
- The technique was found to be inadequate for collecting quantitative data
- To yield the most satisfactory results it was discovered that the interviewer must select the right interviewees for the research.
- Some interviewees were not feeling comfortable to express themselves by the fear of being labeled or victimized.

Findings from interviews

The researcher found out that the interviews enabled direct communication with the users and the management. The users were able to communicate the challenges that they are facing with the current system. A lot of time was saved during the interviews since the responses were instant and the researcher could also see the motions and gestures of the interviewees. The interviews were successful as the majority individuals that were being interviewed complied and supported the idea of a new system and therefore having a computerized system. The vast majority of the individuals who were interviewed deemed the Ticketing system as a “strategic” asset to the organization.

3.2.2 Observations

According to Cliff (1994), an observation is done through watching the clients and users of the existing system undertaking their work and evaluating the processes and

procedures involved. In simpler terms, an observation is the process of grasping and watching how a task or job is done whilst it is being performed.

Advantages

- First hand information was gained and nothing was hidden or distorted from the researcher.
- They caused minimal disruptions to the employees because most employees were unaware that they were being observed.
- The technique enabled the researcher to collect highly accurate and reliable data.
- Observations did not disturb the workflow of the organization since no time was required from the users, as the answers were coming out as they were working.
- It also allowed the researcher to comprehend the processes involved in the current system and to acquire other details that cannot be mentioned in questionnaires and interviews.

Disadvantages

- The information that was collected relied on what the researcher observed or saw as useful or beneficial to development of the system.
- This technique did not explain or give a reason why employees behave the way they do.
- The technique was discovered to be susceptible to bias because most employees performed better when they were not being observed.
- The technique was found to be inefficient especially when it was used to collect quantitative data.

Findings from observations

The researcher carried out the observations at ZESA head office and posed as an undercover user in some cases to figure out how the support officers would respond and observed that they would take time to pick up the calls and in some cases if they

did, they would take forever to attend to the problem. Also the researcher found out that there are no measures that are imposed on the password reset policies, as the researcher would pose as a user who would want his account password reseted and the support officers would just reset the password without any authentication or verifying if it's a genuine user.

3.2.3 Questionnaires

Kimberly (2006) defines questionnaires as a set of arranged questions usually answered sequentially by a number of certain individuals to obtain information for a particular research. They can be designed to enable users to air out their views without disturbing what they will be doing during work since they can be filled out during their spare time.

This method can either be open ended or closed ended. Open-ended questionnaires allow the respondent to provide answers in their own words whilst the latter has a list of predetermined possible answers from which the participant chooses. The underlying assumption of this technique is that a characteristic or perception can be described or captured accurately through self-reporting.

Advantages

- It is an easier method of data gathering than other data gathering methods.
- The technique was found to be cheaper than other methods especially when it was used to collect data in wide geographical areas.
- The technique reduced bias because they were administered to a larger pool of employees.
- The technique allowed anonymous participation by the users and they were more comfortable to express their views since there was no fear of being victimized.
- The technique allowed information to be gathered from a lot of people in short period of time.
- Most employees were already familiar with this technique.

Disadvantages

- Some respondents chose not to answer crucial areas of the questionnaires.
- The technique had a low response rate because most respondents did not feel obliged to fill them.
- Since the researcher was absent when they were completed, he never knew who completed the document.
- The technique was unable to probe for more information from respondent.
- There were other complex system activities that were too difficult to accurately represent using words.

Findings from questionnaires

The researcher found out that respondents provided unbiased answers, as they were free to air out their views without the fear of being victimized by their colleagues. This research method was also convenient for the respondents since it did not disturb them from their normal working activities and it enabled them to respond at their own pace. After going through the questionnaires the researcher figured out that most of the respondents were complaining about the existing system.

3.3 Analysis of the Current System

System analysis is done to expose the strengths and weakness of an existing system Stair & Reynolds (2012). The Zimbabwe Electricity Supply Authority IT department uses obsolete methods of supporting their end users. Currently if a user encounters a problem with one of the applications which are Systems Application Program (SAP), Eclipse Enterprise Edition (3E), Design and Construction System (DCS), Integrated Customer Service (ICS) and other hardware or software related problems, they either make a phone call or send an email to the super users of the systems or the support agents. These methods are inefficient because sometimes the phones will be engaged and support agents may delay to respond to an email. The end users sometimes get frustrated and end up contacting the top managers reporting their issues and blaming I.T for their inefficiency. Users at times contact I.T personnel who do not specialize

in that particular application and the personnel will end up referring the user to personnel who is specialized for that particular job and thereby wasting time.

3.4 Data Analysis

Yeates and Wakefield (2004) define data analysis as the process of using logical technique to evaluate and illustrate how it flows using the inputs, processes and output.

3.4.1 Context Diagram of the Current System

Denis and Wixom (1999) define a context diagram as a diagram that denotes how data flows through an information system and describing the processes to be considered. In other words, it is a sketch or a drawing of the system, which reflects how data flows in the current system. The context diagram of the existing system has three entities, which are the Internal end users, External end users and the Support officers. The internal end users are the users who are found within the organization and are part of the ZESA staff. The external end users are those that are not part of the organization, but work as agents for example agents who sell electricity prepaid tokens. The support officers are the I.T staff that is responsible for attending user queries that are I.T related and have something to do with the systems.

The internal or external user submits a query to the system by either calling the helpdesk or visiting the I.T department physically and the designated support officer attends to the query and sends back a resolved response back to the user. The following diagram shows the detailed structure of the flow of information in the current system in the form of a context diagram.

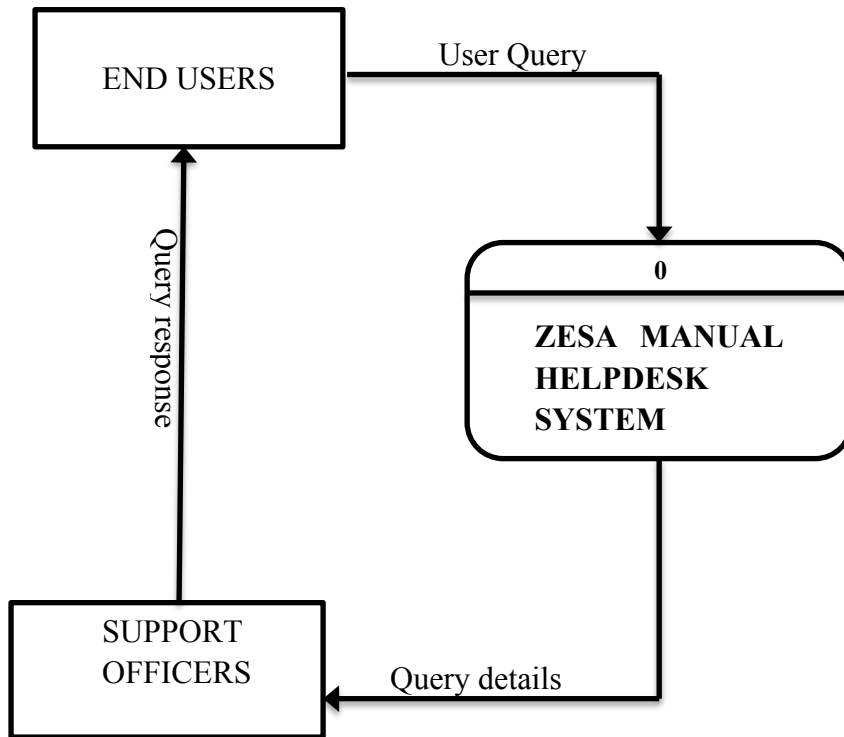


Figure 3.1 Current System Context Diagram

3.4.2 Data Flow diagram of the Current System

Denis and Wixom (1999) define a data flow diagram as a graphic representation of the information system entity, processes and the flow of data. It illustrates how data flows among the entities, processes and stored data. The data flow diagram is derived from the context diagram which is a level zero data flow diagram. The data flow diagram of the current system has the same entities as the context diagram and has four processes that are gone through which are stored in three data stores. The user contacts the helpdesk and one of the support agents logs the query and stores the unresolved queries in a query log sheet. The query is then troubleshooted until a solution is brought up and the resolved query is the sent back to the user. The resolved query is then stored in a resolved query log sheet for future reference and reporting. The data flow diagram of the current system is clearly explained diagrammatically in the following figure.

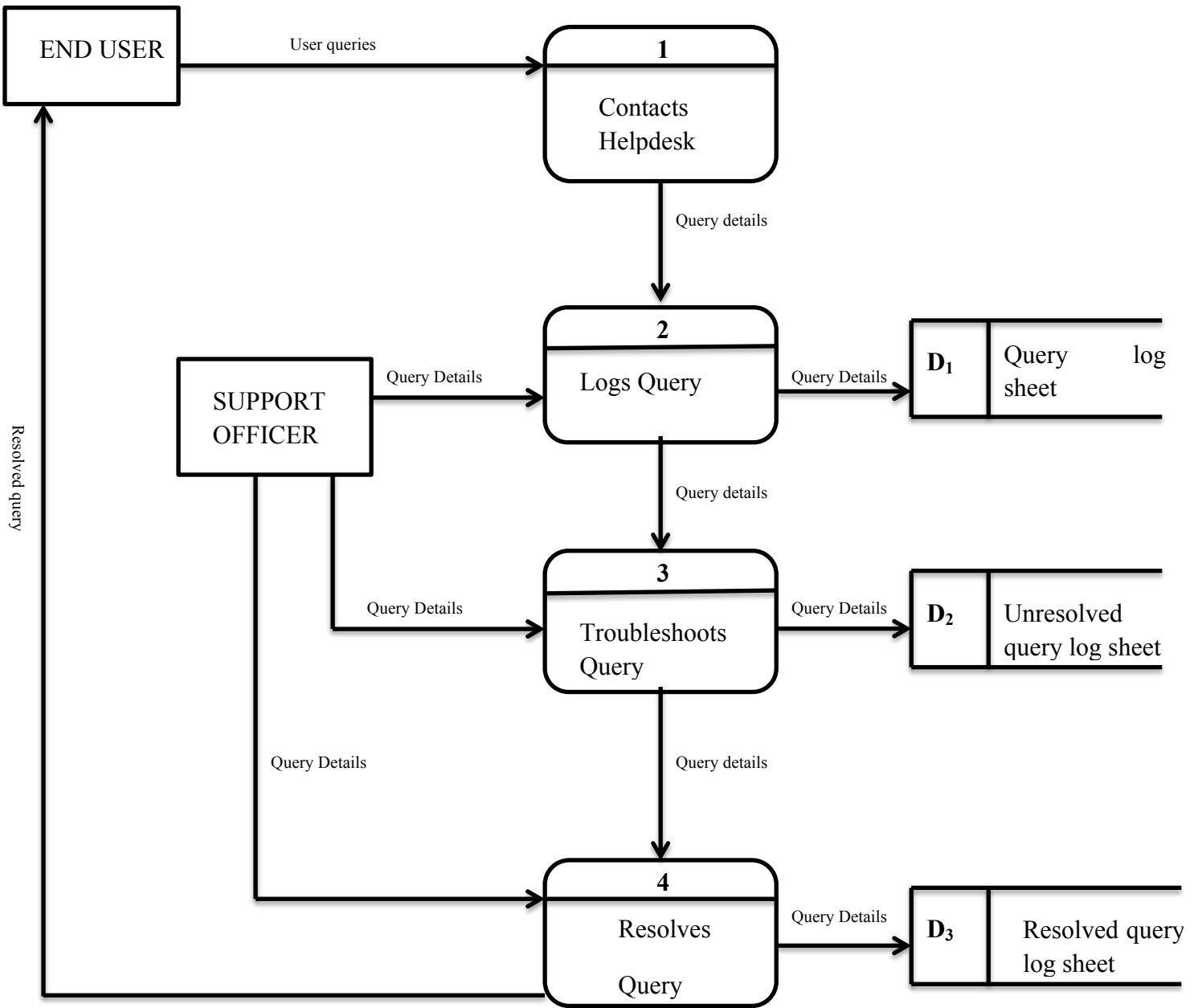


Figure 3.2 Current System Data Flow Diagram

KEY



ENTITY



PROCESS



DATASTORE



FLOW OF INFORMATION

3.4.3 Description of the current system

The ZESA I.T department helpdesk is responsible for assisting both end users and external end users if they face any problems whilst using any application. The users can contact the support officers by phone or email. Only users who are based at the head office have the privilege of visiting the I.T offices as another option for contacting since the System Administrators are based at the Head Office. The support officers then assist the users by giving them solutions to the problems they would have encountered. The support officers records all queries in a log book that will be combined at the end of each week for reports to the management. The queries that are recorded include, the User queries that were resolved and those that were not resolved. The resolved queries are sent back to the users and the unresolved are worked on until they are resolved.

3.5 Weaknesses of the current system

- a) Due to the use of the existing system, there is no single place to report technical issues. Users always wonder whether if they should call a member of the support team, programmer or an engineer if they encounter a problem.
- b) Issues are not solved and handled in the order they are received. The support team tends to attend issues of the superiors first even if they are not high priority saving major issues for later for other users.

- c) The current system does not provide a systematic approach for when the helpdesk team has to handle issues. It tends to try out different things at random to see if they work that are not governed by any protocols.
- d) The current system does not have a historical log of all the problems that are encountered in the systems. There is no documentation that can be referenced to if the issue comes up again.
- e) The current system is not transparent; it is difficult to determine the IT support team that is receiving the most support requests so that the management can allocate support resources efficiently
- f) Managers find it difficult to analyze IT trends and improve overall workflow. The system does not have a tracking ability such as tracking the time taken to resolve tickets.
- g) It is difficult to run reports to show many tickets were resolved in the past week, month, quarter and year for the IT department. The value that the IT professionals bring to the company is thereby not showed by identifying the technology problem areas.
- h) The current system does not ensure continuity; it is difficult to deal with issues if a team member leaves because the issues that might have been assigned to them will not be reassigned.

3.6 Activity Diagram

The diagram assumes a vital part of ZESA Holdings as in it basically separates the hierarchical structure henceforth giving point of interest into what every individual will be doing on their work.

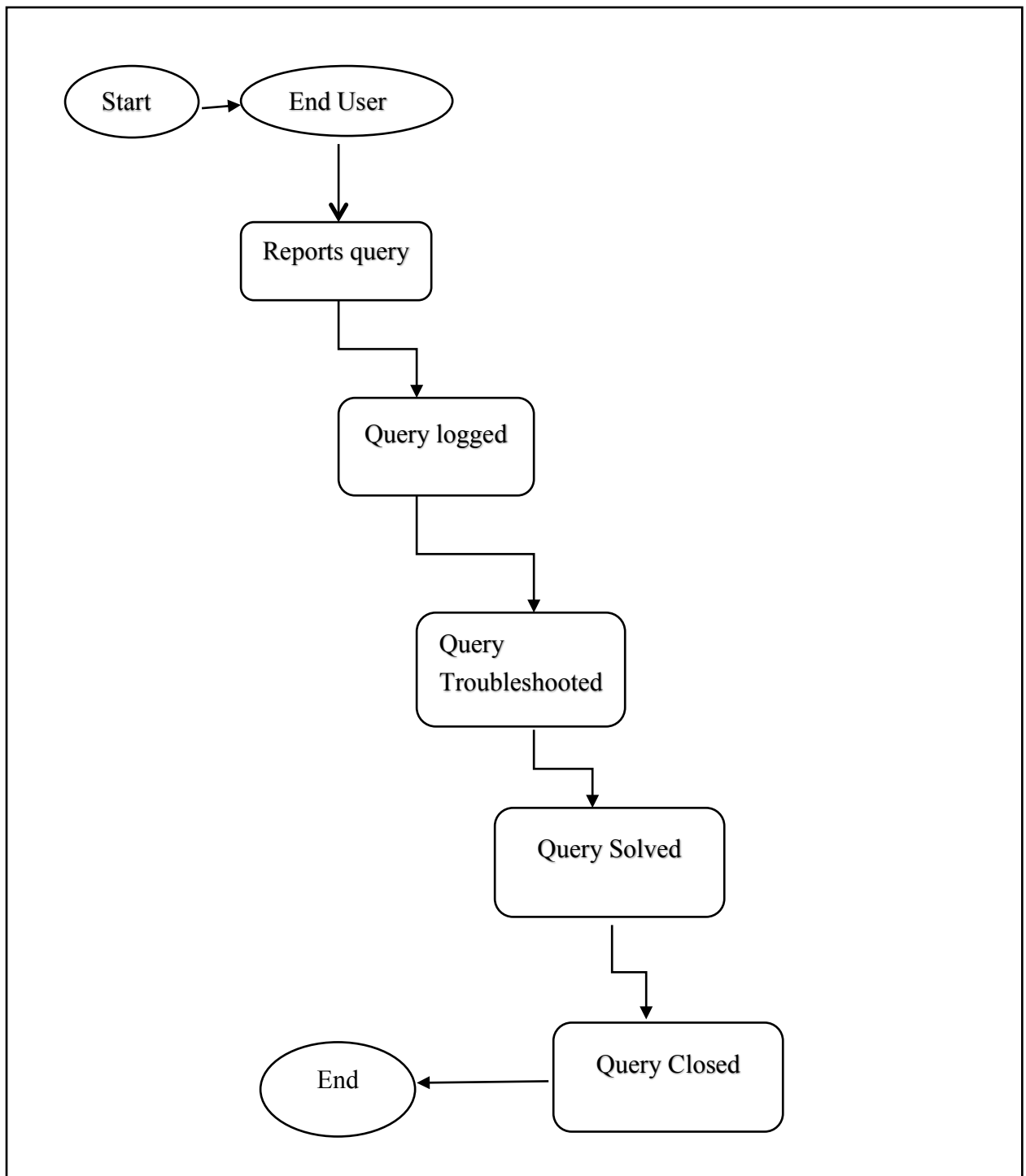


Figure 3.3 Activity Diagram

3.6 Evaluation of Alternatives

The previous chapter indicated that the feasibility study that was conducted indicated that the I.T Support Ticket Management System is economic and viable. The problems of the current system can be addressed in several ways that include:

- i) Improvement of the current system
- ii. Outsourcing
- iii. Off-the Shelf packages
- iv. In-house development

3.6.1 Improvement of the current system

Improving the current system is simply modifying it to enhance its effectiveness. It does not throw away the existing system but improves some aspects of it. This alternative is less costly since development and operational costs will be less. However, improving the current system has the following advantages and disadvantages:

Advantages

- There is guaranteed privacy and confidentiality in the organization.
- Paperwork expense is reduced.
- The system will be equipped with basic operations and changes so less training and operational costs will be required.

Disadvantages

- It requires a lot of research compared to other alternatives.
- Upgrading and maintaining the improved system will be difficult.
- Improving the system will not make ZESA benefit fully to the extent it would have if it had computerized the whole system.

3.6.2 Outsourcing

Greaver (1999) defines outsourcing as the process of surrendering an organization's internal activities and decision rights to an external service provider. It can be simplified as a process of obtaining an application or software from an external source. This alternative has the following advantages and disadvantages:

Advantages

- The time required to have a new system is less.
- Employees are not affected of their daily activities.
- There is lower requirement of technical personnel.

Disadvantages

- It will be very costly to the organization since more personnel will be required in maintaining and installing the system.
- It might be difficult to understand and modify the source code provided due to different algorithms in the programming language that could have been used.
- Confidential and sensitive information can cause security to be breached during data gathering.
- Making them feel incapable of performing the job might demotivate the I.T department of the internal employees.

3.6.3 Off-the Shelf packages

Buying readymade software is another alternative for the organization. This alternative has the following advantages and disadvantages:

Advantages

- The organization will have a new system in less time.

Disadvantages

- Generalized requirements are met in the designed software.
- The documentation of the system is obtained by contacting the developer.

3.6.4 In-house Development

Shelly and Rosenblatt (2010) define in-house development as a process, which involves developing of software by the internal members of an organization especially the I.T department in order to address a particular problem, brought about by the current system. The alternative of in-house development is viable since the software industry is stable and there is proper funding.

Advantages

- It is more accurate and precise in meeting user requirements and other stakeholder requirements.
- There are no external parties involved to maintain or upgrade the system so there will be lower maintenance costs.
- The programming algorithms used will be familiar so the system will be easily modified or upgraded.
- There is a proper documentation, which can be used for future reference.
- There is guaranteed security
- There is low development costs because personnel will be readily available.
- I.T department and other departments will be motivated, as they will rely on each other.

Disadvantages

- New ways of doing things and ideas that can be shipped in from other organizations can be completely shut out.
- It takes time to complete since the I.T department will be mainly for support services and not for software development.

3.6.5 Recommended Alternative

After assessing and going through all the different alternatives and weighing out their advantages and disadvantages it can be seen that the alternative of in-house development outweighs other alternatives and will benefit the organization more. Therefore the recommended alternative that can solve and address the problems that are being faced in the current system and that can also keep private and confidential information secure is in-house development.

3.7 Requirements Analysis

Requirements analysis is done to check if the user and stakeholder requirements are met in the new system. It is divided into two categories, which are:

- a) **Functional Requirements:** These are the essential functions to be given by the new system (Sommerville, 2008).
- b) **Non-Functional Requirements:** It focuses on the constraints that may be encountered when developing the new system (Sommerville, 2008).

3.7.1 Functional Requirements

- 1) **Login**
 - The new system must have a login function to make sure that authorized users can only access the I.T Ticket Management System portal.
- 2) **New Issue Management**
 - The new system will provide way for the support officers to handle issues that are reported through a web interface to the Helpdesk
- 3) **E-Mail Notification**
 - The I.T Ticket Management system should offer user with means of communicating. An E-mail notification should be sent both to the user and the support officer when a user's query is sent and when the support officer receives the query or issue. The user should be kept well informed of the status of its ticket and progress if the support officer updates an issue.
- 4) **Search Engine**
 - A powerful tool that enables users to track their issues and filtering issue records that they see what they want in the system.
- 5) **Report Generation**
 - The new system must be able to facilitate the personnel with generation of reports for the management decision-making and analysis.

3.7.1.1 Use case diagram for I.T Ticket Management System

A Use case diagram is a diagram that shows the relation that is between the users and the system itself (John and Wald, 2004). The following diagram shows the different ways in which the users of the system can use the I.T Ticket Management System.

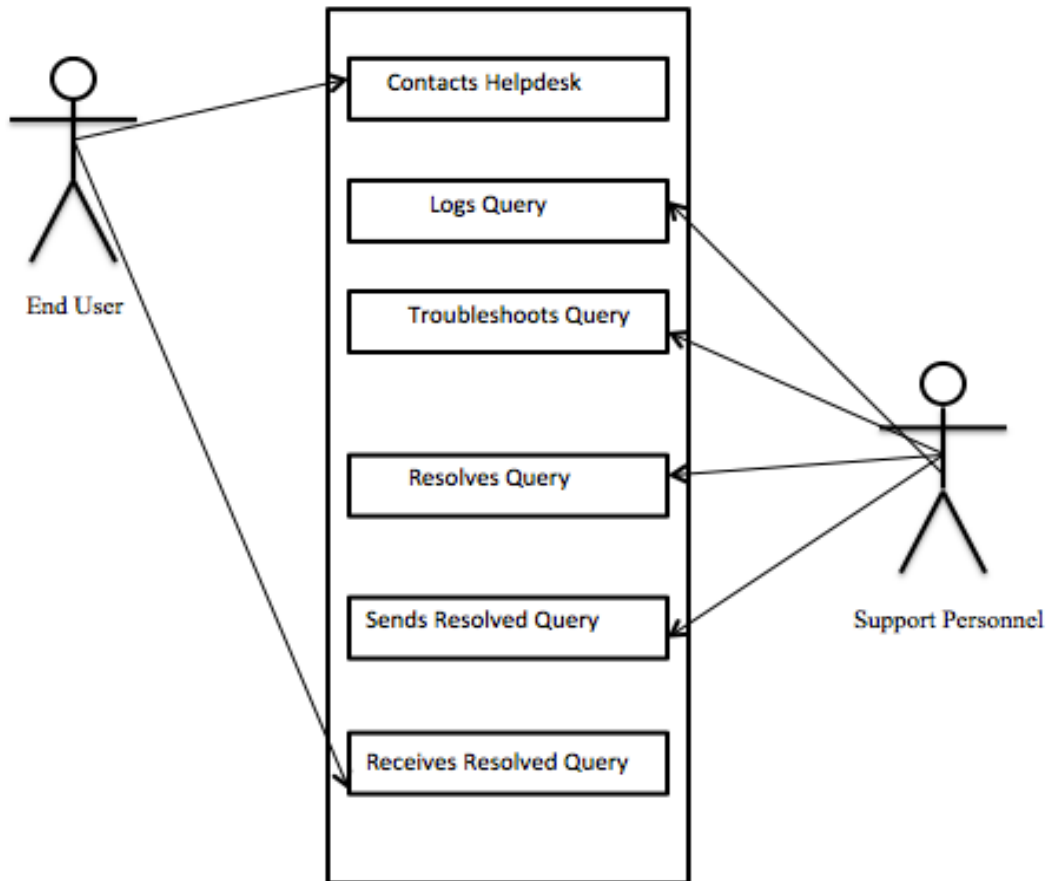


Figure 3.3 Use Case Diagram for ZESA I.T Support Ticket Management System

3.7.2 Non-Functional Requirements

1) Security

- Privacy and confidentiality of information will be maintained by the use of access control methods such as passwords and user accounts.

2) Performance

- The processes of the system will be speeded up by the concurrent usage and access to the system

3) Operation

- It is an easy to use system, which will be accessed on the Local Area Network or through the World Wide Web.

4) Supportability

- The system will be easy to install and configure and will also incorporate features that are supportable which will result in a more efficient system and will reduce operational and maintenance costs.

5) **Usability**

- The system will increase the productivity of the users because it will be easy to use and the time taken to accomplish tasks will be less.

6) **Reliability**

- The system shall serve its intended purpose by performing in a behavior that the users require it to.

3.8 Conclusion

At this juncture having dealt with the analysis of the current system and data gathering methodologies that were used to spot the weaknesses of the existing system, the functional and non-functional requirements that were defined from the weaknesses of the existing system to come up with the proposed system. The researcher is going to proceed to the next chapter or phase, which is the design phase, where the design and development features of the newly proposed system are going to be discussed.

CHAPTER FOUR: SYSTEM DESIGN PHASE

4.1 Introduction

The actual design of the newly proposed system is done in this phase. It focuses on the aspects of the proposed system like how it will be designed, how the database is going to be designed, the functionalities, security measures and the network infrastructure of the new system (Heathcotte, 1997).

4.2 System design

According to Shelly (2005), system design is the stage of evaluating the physical segments and resolve how the new system will be resembled, how it will be working and how it will be designed. This phase has to yield a versatile system with the expected components such as consistency, efficiency and maintainability. This phase will focus on how the ZESA I.T Support Ticket Management System will function and how it will be developed. System design is referred to as the center course where is noticed that the designer can reason critical and valuable details of interest conveyed amidst system requirements analysis into a genuine design and development. The progression however of this system will put remarkable centrality on the going with appearance more or less.

- **Functionalities:** The proposed system must be an answer for the issue problem statement intending to say it should acquire all the essential functionalities that are required by the users.
- **User friendliness:** The I.T Support Ticket Management System should be easy to work with and navigate through, which will not lead the users to ask for assistance whenever they want to operate the system.
- **Reliability:** The system should likewise be solid aiming to say it must play out each and every arranged limit that it was intended for and also set something aside for its proposed life range under those conditions in which it was made for.
- **Maintainability:** Keeping the system in place not surprisingly should not be troublesome or difficult.
- **Security:** The system must give an adequate level of data security to ensure that they are no control of user information and other basic data in the system.

The system should give an adequate level of security and protection. Only those with the foreordained rights should have the ability to utilize the system.

- Competence: The proposed system will undoubtedly fulfill the user prerequisites and requirements from the time when its improvement was done after a consummation of an intensive analysis of the present system.

4.2.1 Context Diagram of the Proposed System

According to Pierce (1992) A context diagram is an information stream chart demonstrating data flows between a summed up application inside of the area and alternate elements and reflection with which it imparts.

The context diagram of the proposed system has the same entities as the old system except that the new system has an administrator who manages the system. The internal and external users were combined to become just end-users who are the ones who create tickets. The created tickets are then assigned to a support officer automatically by the system and tickets can be reassigned to another support officer who would be best suited for the issue. The support officer resolves tickets by logging into the administration panel and they can also create, view or edit tickets depending with their permissions. The resolved ticket is then sent back to the user and the ticket status changes to closed after the response is sent back to the user. The administrator is responsible for creating new users and managing the several departments that are found in the I.T section. The context diagram of the proposed system is shown in the following diagram.

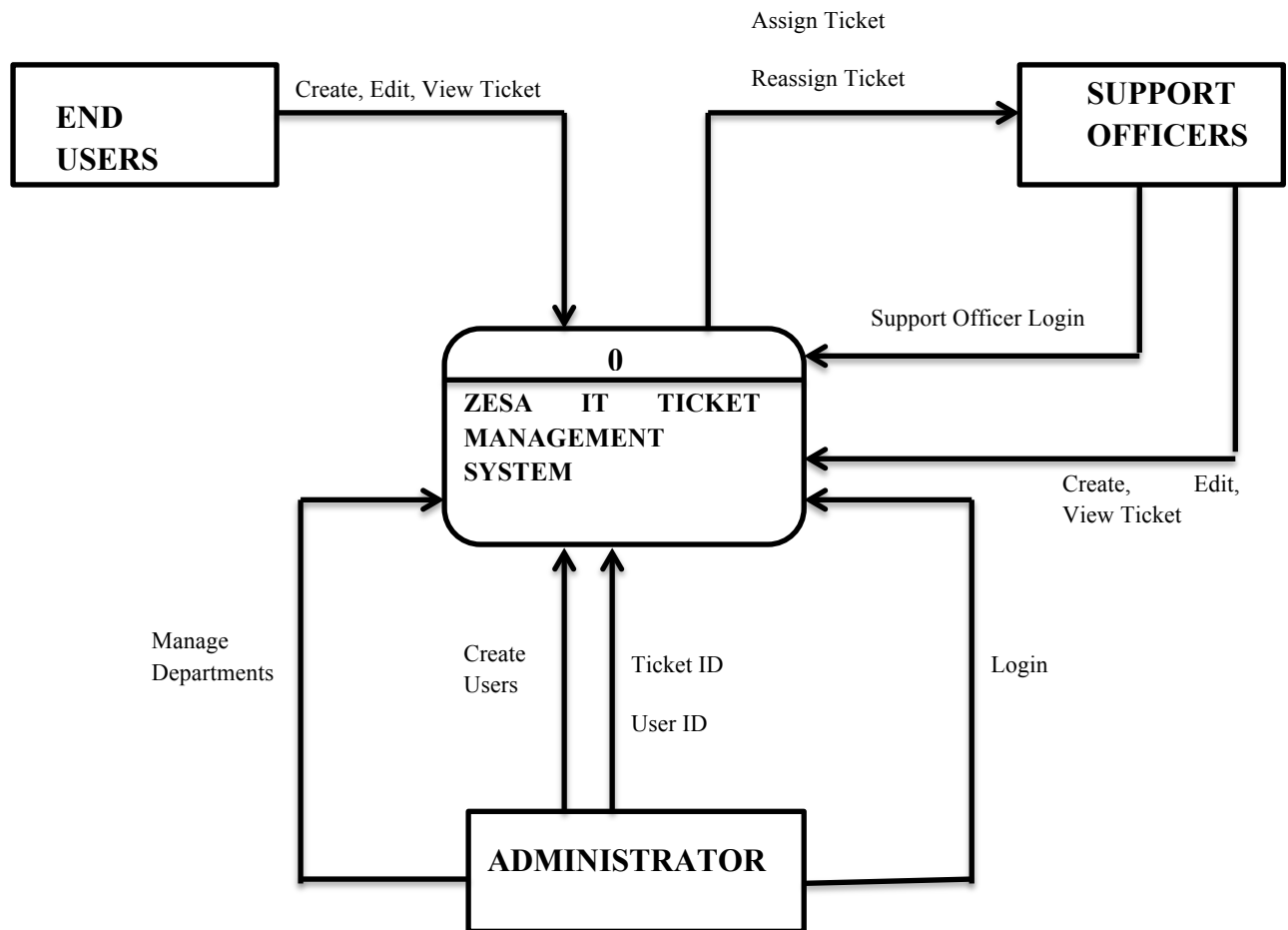


Figure 4.1 Context Diagram of the proposed system

4.2.2 Proposed System Data Flow diagram

Michael (2012) states that, a data flow diagram (DFD) is a drawing that shows how a system's environmental entities, processes, and data are interconnected.

The data flow diagram of the proposed system has three entities, seven processes and three data stores. The user creates and submits a ticket addressing the issue that needs to be resolved. The ticket is immediately picked up by a support officer of the designated department and works on it. The ticket details are then automatically stored in the database of the system till the support closes the ticket. The support officer then responds to the ticket that would have been created by the user and the user receives an email notification if the ticket changes its status. If users have no access to email and wants to check the status of their ticket, they can track their

tickets using a tracking ID that is generated upon submission of a ticket. The following diagram shows the data flows of the proposed system as explained above.

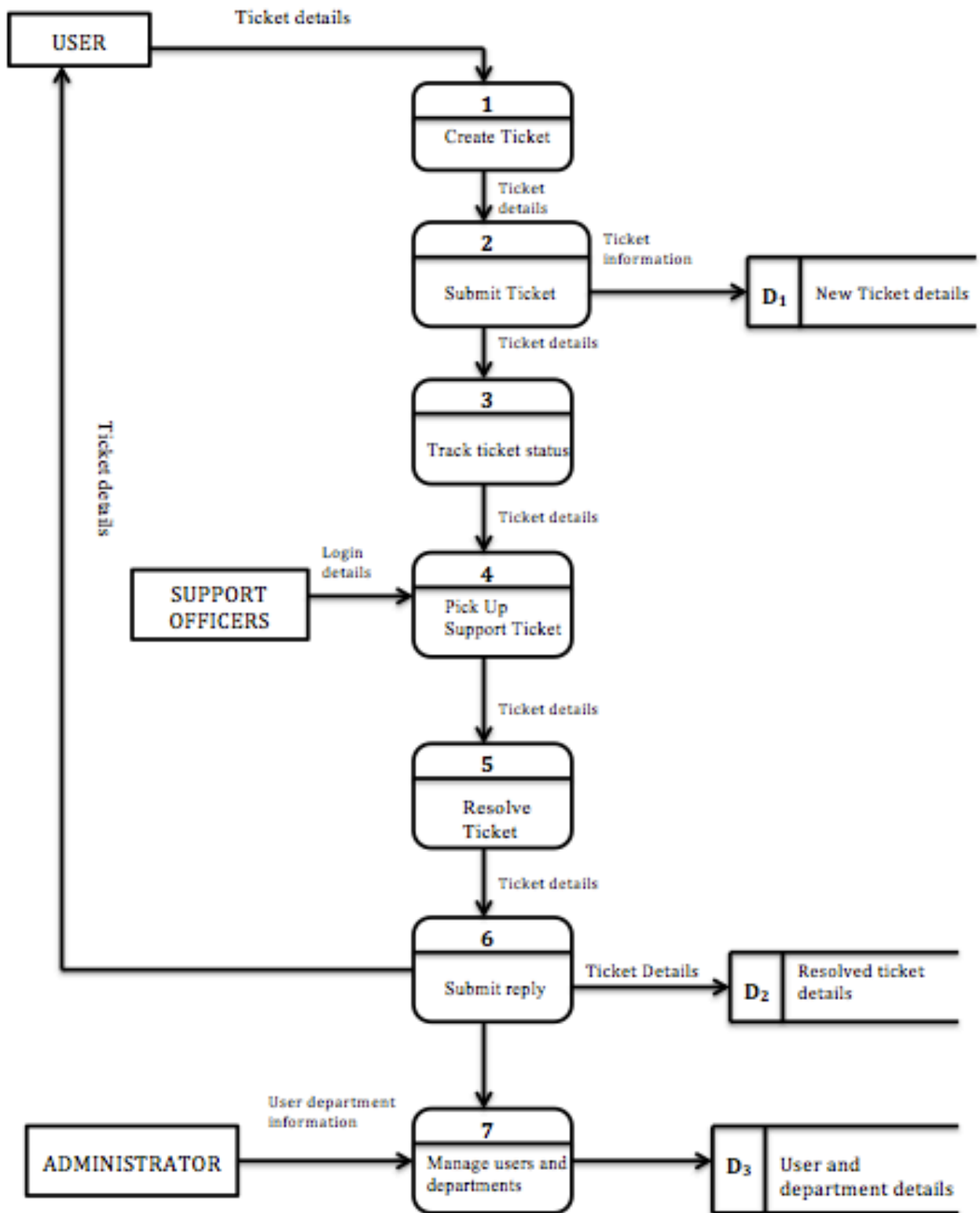
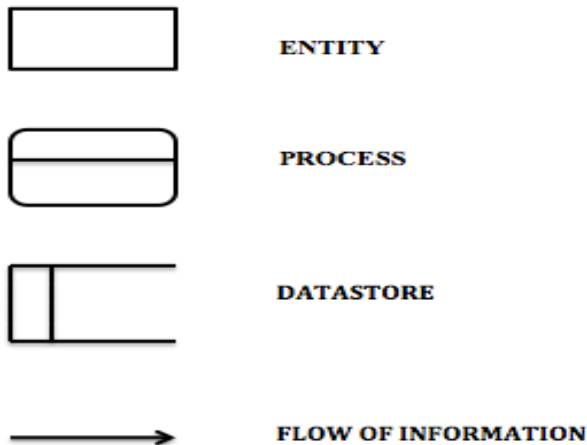


Figure 4.2 Data Flow Diagram of the Proposed System

KEY



4.3 Architectural Design

According to Miller (2010) architectural design looks at the hardware setup and configurations of the system to be done and shows how the components of the new system are going to be linked together to give the setting in which the system will operate in. It shows the prerequisites needed for the I.T Ticket Management System to function in the way that the users expect it. The prerequisites that are needed include the software and the hardware of the system. The design of the database and the network infrastructure of the system will be discussed in this phase.

However, it has been anticipated that the required parts of the I.T Ticket Management System are remarkably impacted by the designing arrangement to be done to the system. The researcher will in like manner consider the level of diverse nature of the system, on the other hand furthermore consider the point where the combination is done and the modules of the system that are designed for the users and clients and the system's environment. The diagram below shows the server architecture of the I.T Ticket Management System which exists in three parts which are the Presentation Tier which has the clients, the Business logic tier which has the internet and the web servers and lastly the Data or Resource tier with the existing information systems at ZESA and the database server.

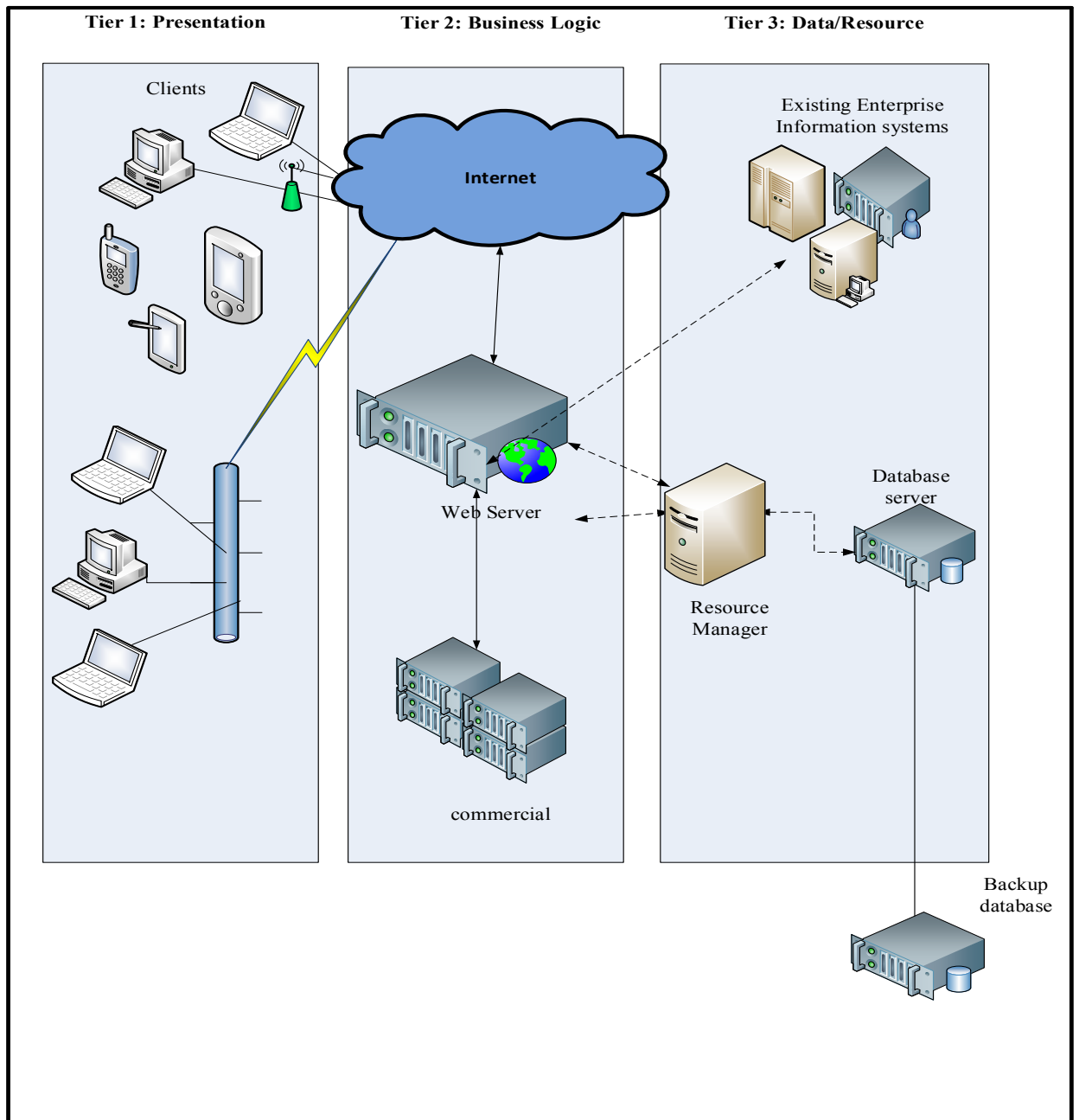


Figure 4.3 ZESA I.T Ticket Management System Server Architecture

4.4 Physical Design

Miller (2010) states that this design phase consists of the advancements of the properties of the system beginning with a set of procedures that are intellectual and the areas of information and their modules which include the information modules. The main purpose of this design phase is to show how the system is made up with the hardware and physical components so that they will be effective communication in the entire system. A local database is going to be used by all the users who interact

with all the ZESA applications and local area network and Internet (for external users) will be used to query and access the database. Authorizations and rights into the database are going to be managed from different regions because the servers will be arranged in a manner that is accessible. The diagram below shows the physical design of the proposed system, which includes the local area network and the servers.

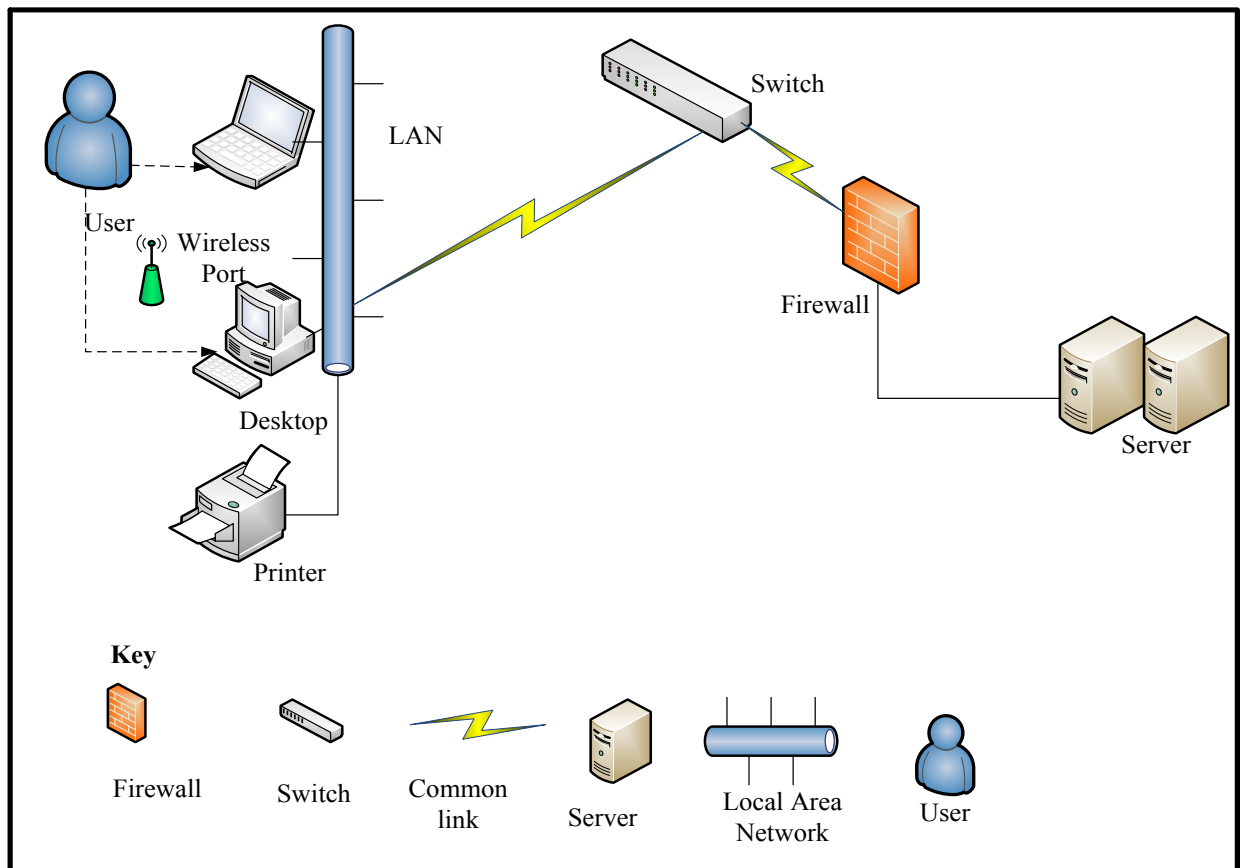


Figure 4.4 Physical design of the I.T Ticket Management System

4.4.1 Interaction between the Hardware and Software

The utilization and examination of the proposed system is done in this stage. The commended software and hardware of the system will be examined and other necessities that will be needed will also be examined and utilized. The interaction shows how communication with the database will be established. The diagram below shows the software components that will be required.

4.5 Database Design

Adams (2010) states that a database design is the methodology of adding to a well inclusive and completely detailed data that is used for the development for the real database. A database administrator will be needed in the design of a database that supports different techniques of sharing, developing, manipulating and maintaining of data. The database will be able to work concurrently so that users can access it at the same time simultaneously. The unique identifier, which is the primary key, will be used in the table of the database and the table format to store in the database. When information is shared in the database, security procedures are followed to make sure that the users can only see the information that they are allowed to so that the data remains consistent and cannot be lost. Data needs to be normalized so as to eliminate data redundancy and the ANSI SPARC model is used to show how the database is viewed.

External Level

According to Coronel and Morris (2014), it joins different outside developments or customer points of view and this level portrays that an area of the composed database is either applicable to a particular customer or client. However, can be said to be typical for a customer to need simply particular areas of the database containing specific procedures or records and sensible associations between these records.

The Conceptual Level

According to Coronel and Morris (2014), the conceptual level of this model dwells much more on the entities, information sorts, connections, client operations and the limitations. This composition can be seen as an all-around decided (prototype) model of the schema and must be arranged ensuring that its structure will stay tolerably unaltered in the database as time advances.

The Interval Level

According Coronel and Morris (2014), the internal level basically has its own blueprint that is internal which portrays the physical storage structure of the actual database. The internal view of the database basically defines the different methods that are used in storing different types of records. It also looks at how the stored data

is presented and the indexes that exist, the sequence that the proceedings are stored into the database. Therefore, it is primarily apprehensive with the loading details which are normally not a legitimate model of the database. The diagram below shows the ANSI-SPARC model indicating the different levels that were mentioned above.

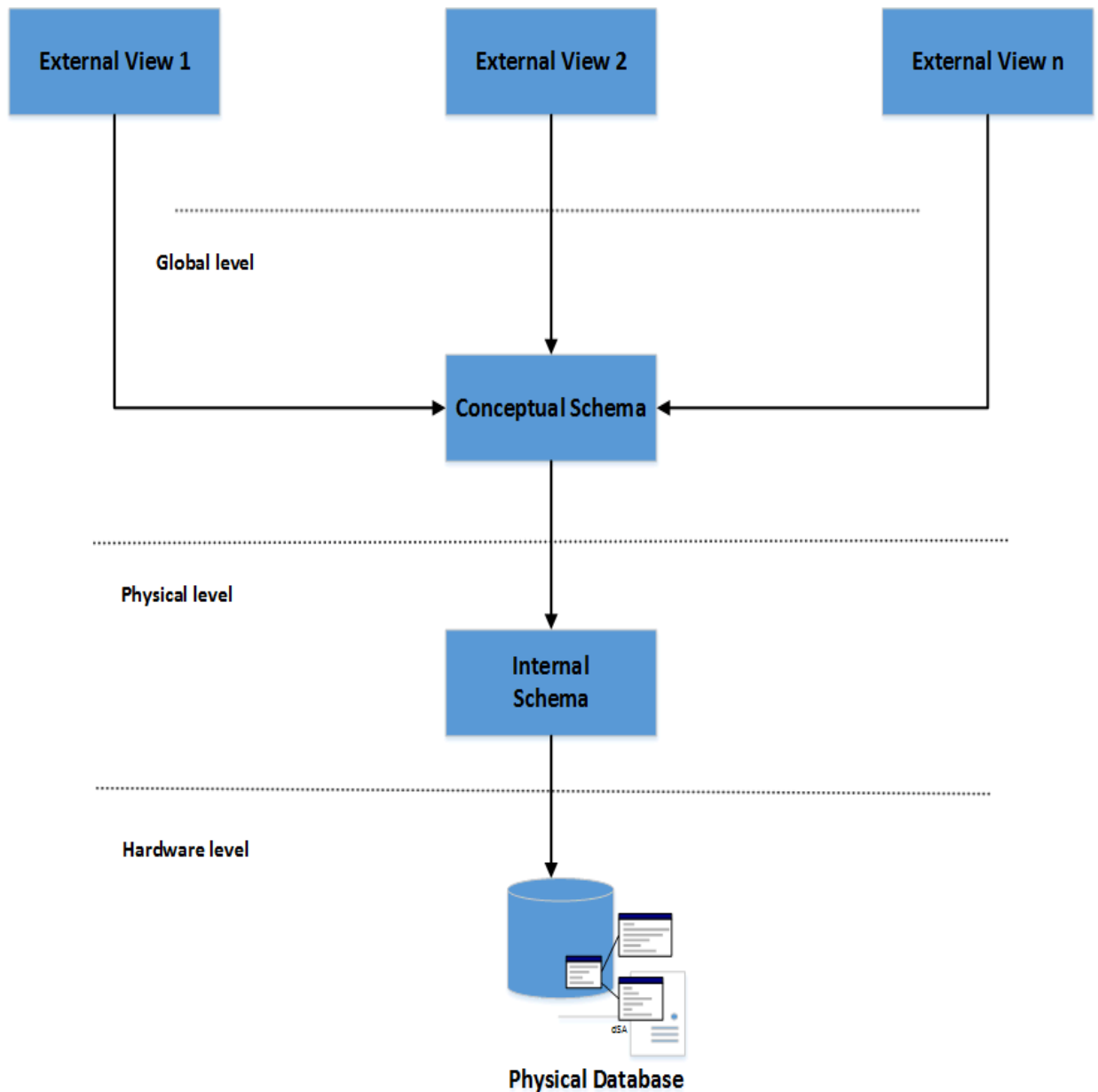


Figure 4.5 Database Architecture

(Source: Eaglestone, 2000)

4.5.2 Enhanced Entity Relationship Diagram

An enhanced entity relationship diagram can be defined as a diagram that is represented graphically showing relationships among different entities and is usually used in representing data within an organization which us within certain information systems and databases and how more than two entities link (Conger, 1994). This diagram is perfect data model for the proposed I.T Ticket Management System and it will represent the entities that will be found within the system and their links. The diagram below shows the entity relationship for the proposed system.

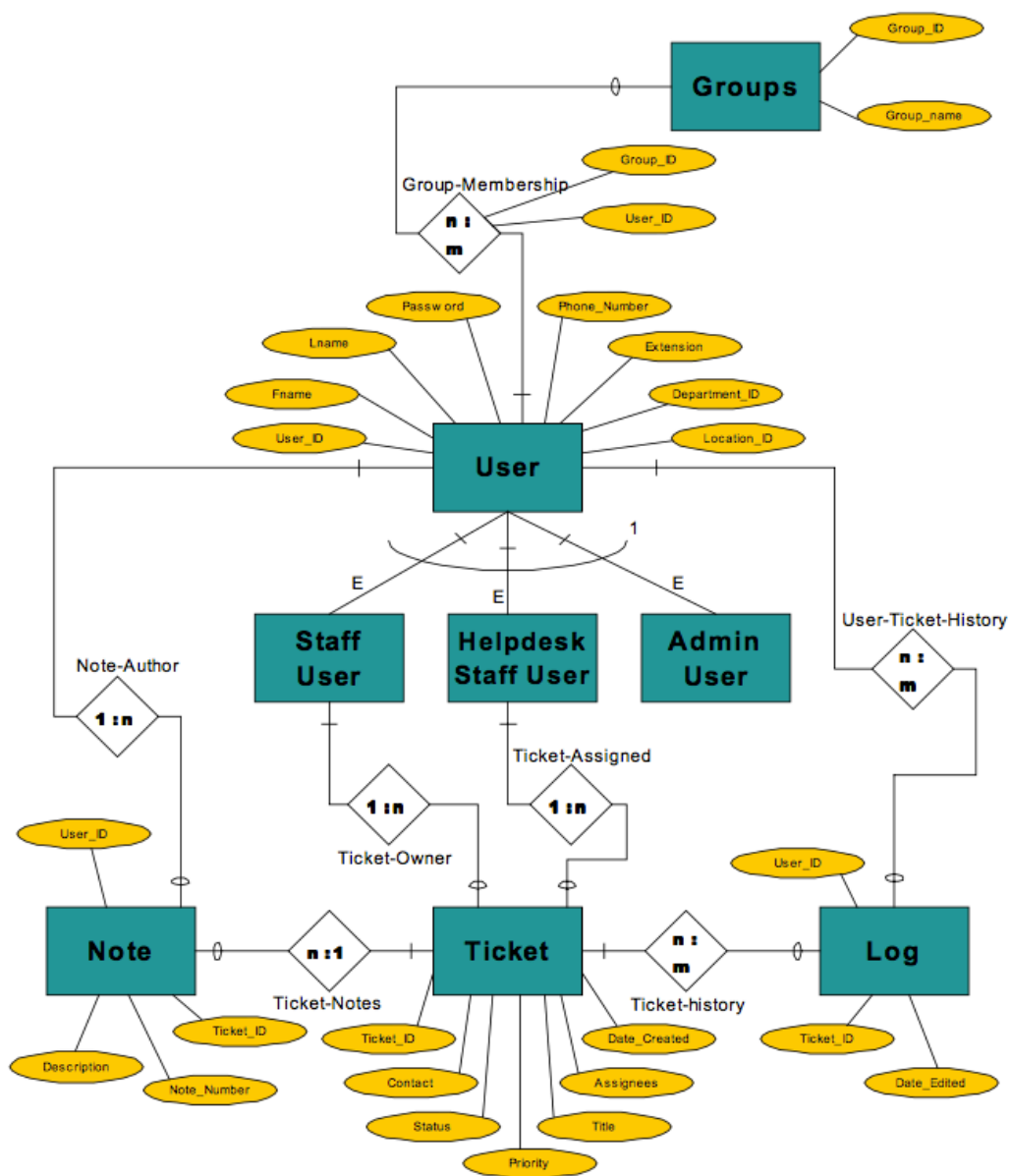


Figure 4.6 Enhanced Entity relationship Diagram of the proposed system

KEY



ENTITY



Relationship



Attribute

4.6 Program Design

Ulrich et al (2000) define program design as the designing of different modules in the system, classes and functions and design that is managed by the interface and how users will connect with the interface of the proposed system for it to work from what they were anticipating. The interface must be well understood by the users and also easy to use since it is the one, which will be acting as a medium between the users and the database. The forms that are going to be used to demonstrate the program design are the sequence diagram, the package diagram, the sequence diagram and the class diagram and are going to be discussed below.

4.6.1 Package diagram

Conger (1994) defines a package diagram as a segregated structure of the system that defines how system modules and their connection will be broken down. The different classes that are found in the ZESA I.T Ticket Management System are bundled up together to lessen the complexity and difficulty to a user not having a full understanding of the proposed system. ZESA I.T Ticket Management System has a platform whereby users can easily get assistance of any problems they encounter with the different I.T related problems through the use of the Internet or web interface. The user creates a ticket, which is attended to by the intended assigned helpdesk agent. The helpdesk agent works on the ticket and sends a reply back to the users. If the reply is resolving the issue the helpdesk agent then closes the ticket. On circumstances whereby more explanations from the user, the ticket remains open as the helpdesk agent would have requested for more explanations.

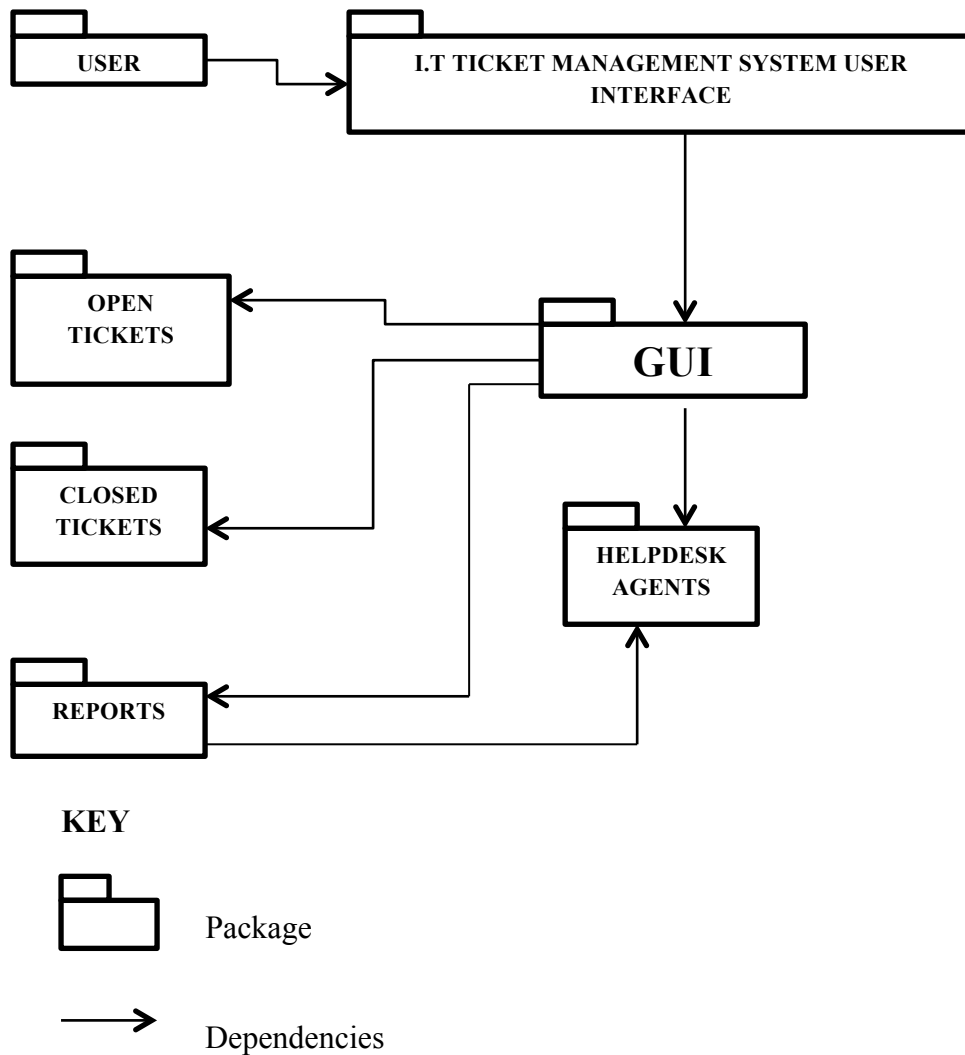


Figure 4.7 Package diagram of the proposed system

4.6.2 Sequence Diagram

Amihan and Berhim (1996) define a sequence diagram as a diagram that shows the responded activity and gives a way in which things are done in the system. They are a collection of diagrams that are organized in an orderly manner and the logical order in which activities are done. A sequence diagram shows the procedures and stages that are carried out in the system. The diagrams below show two scenarios of the activities that are done by the users of the system, mainly the end users and the administrators. When the user visits the helpdesk, he can create, edit or view a ticket. A ticket is defined with a ticket number and a tracking ID and a user can use this if he wishes to

view or edit past tickets. The system administrators and the support officers' main tasks are running reports, creating users and responding to tickets that are submitted by the end users. The administrators have credentials that they use to login to the system and the login portal is hidden from the users for security purposes. The following diagrams explain the two scenarios that have been discussed above.

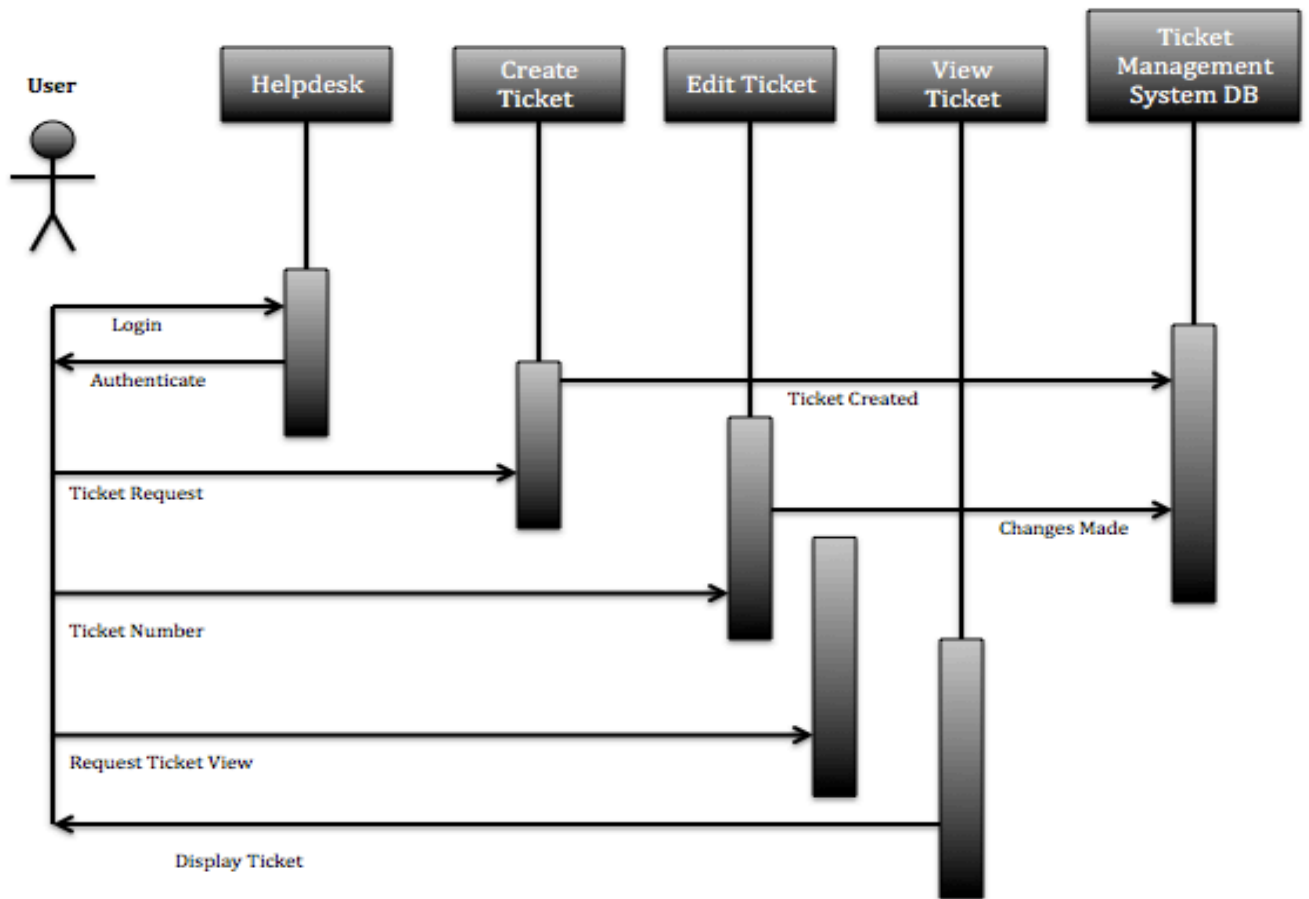


Figure 4.8 Sequence diagram for the User

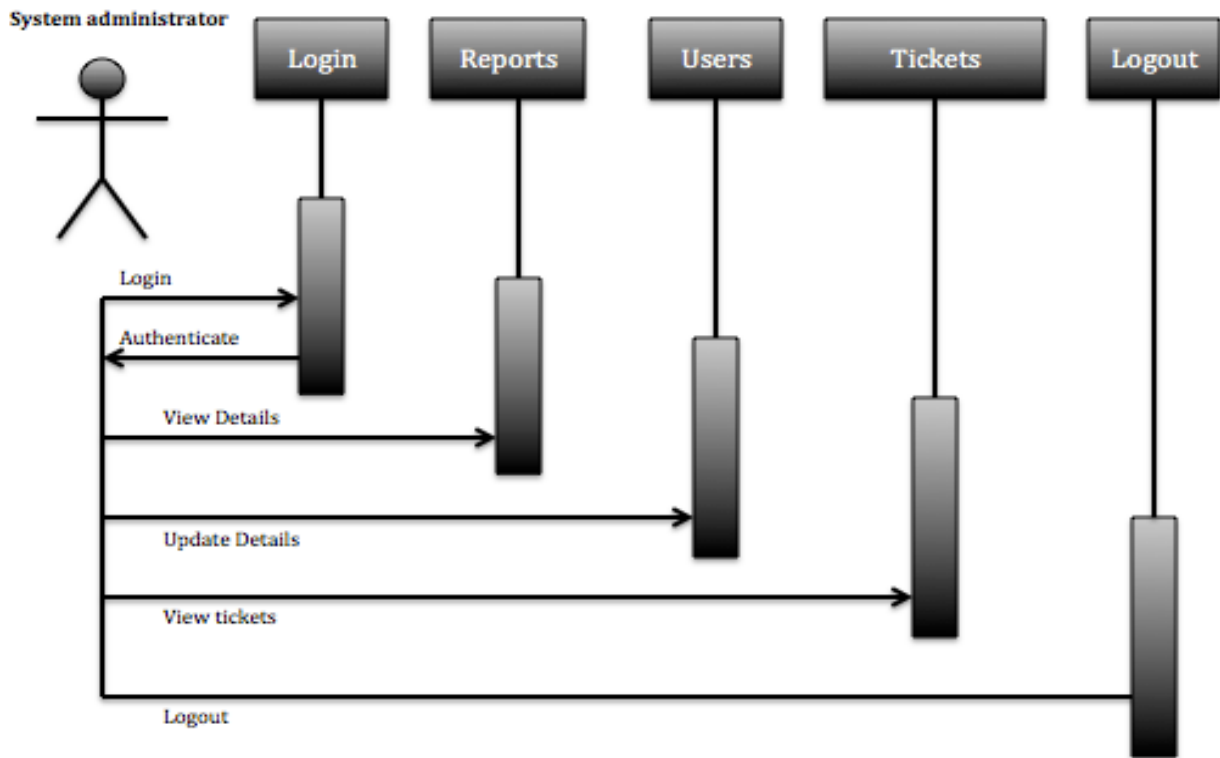
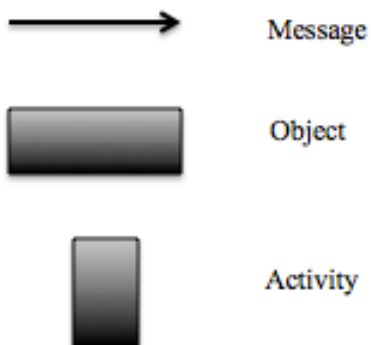


Figure 4.9 Sequence Diagram for the System Administrator

KEY



4.6.3 Class Diagram

Collins (2011) defines a class diagram as a diagram that depicts objects of the system and their connections. It can likewise be alluded to as a static composition diagram that demonstrates the way in which the system is created by showing the classes required in the system, their conduct and relationships. It additionally indicates characteristics or properties and attributes of every class.

The class diagram of the proposed system has five classes, which are department, note, user, ticket and log. Each class has its attributes, which are indicated by the

positive sign, and functions that are indicated by the negative sign. An asterisk and a number indicate the relationships between the classes depending on the classes, of which most of the classes in the diagram have a one to many relationships. The class diagram is shown in the following figure pointing out what has been explained above.

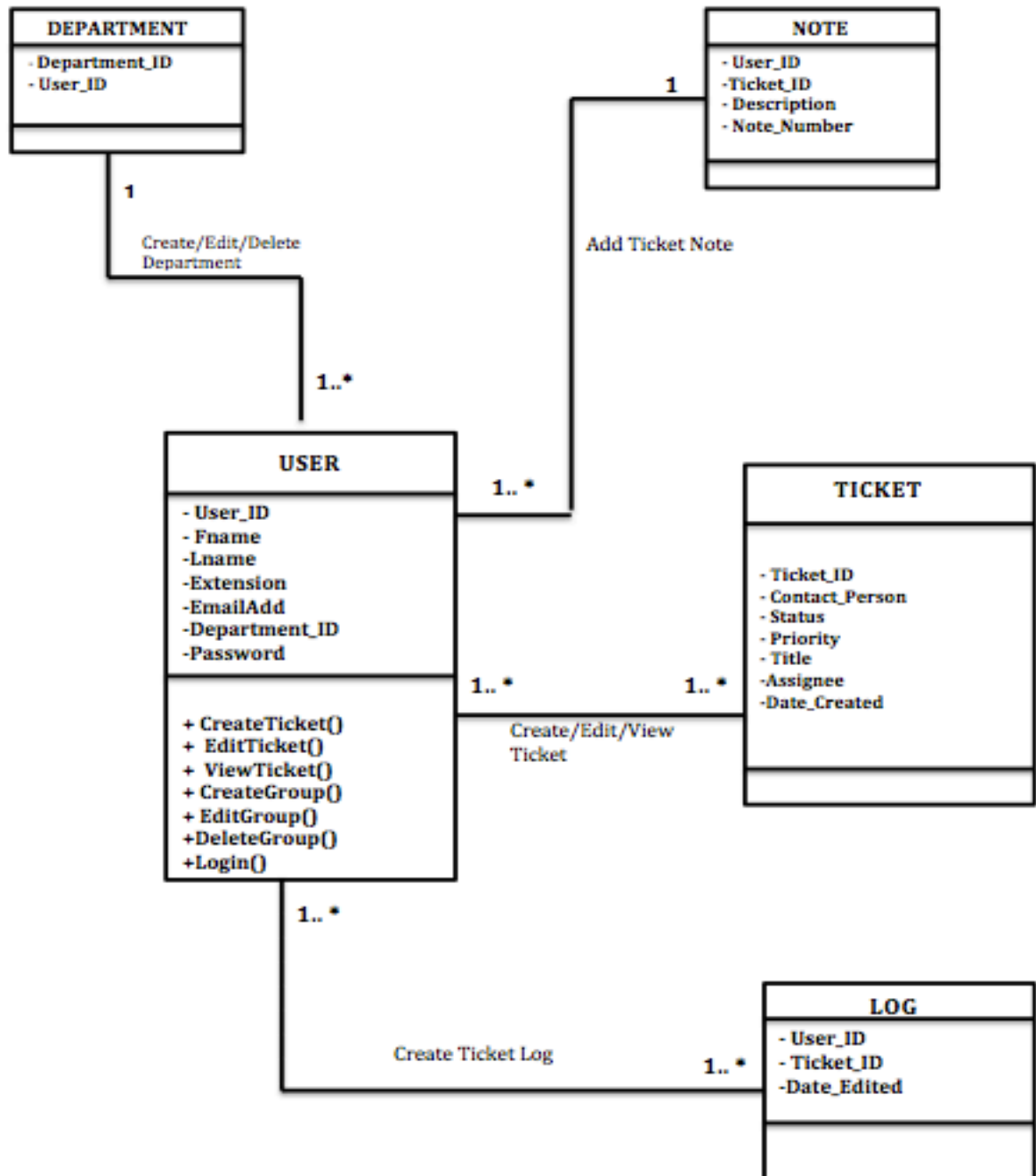


Figure 4.10 Class Diagram

4.7 Interface Design

Maier et al (2000) state that interface design is the design for the machines to be used when operating the system and it emphasizes on the user's ability to use the system without experiencing any difficulties. The interface for the I.T Ticket Management System will be showing the menu structure the interface will be displaying like and the information that will be fed into the system. The diagrammatic structure of the interfaces that are going to be used in the proposed system will be shown below:

Log in form

The log in form for the system is going to be used to authenticate the users of the system, which are the administrators, the helpdesk agents, and the naïve users and they will be required to authenticate themselves every time they want to access the system. The form will have two textboxes and a sign in button that will be used by registered users, helpdesk agents and administrators of the system to log in to the system.

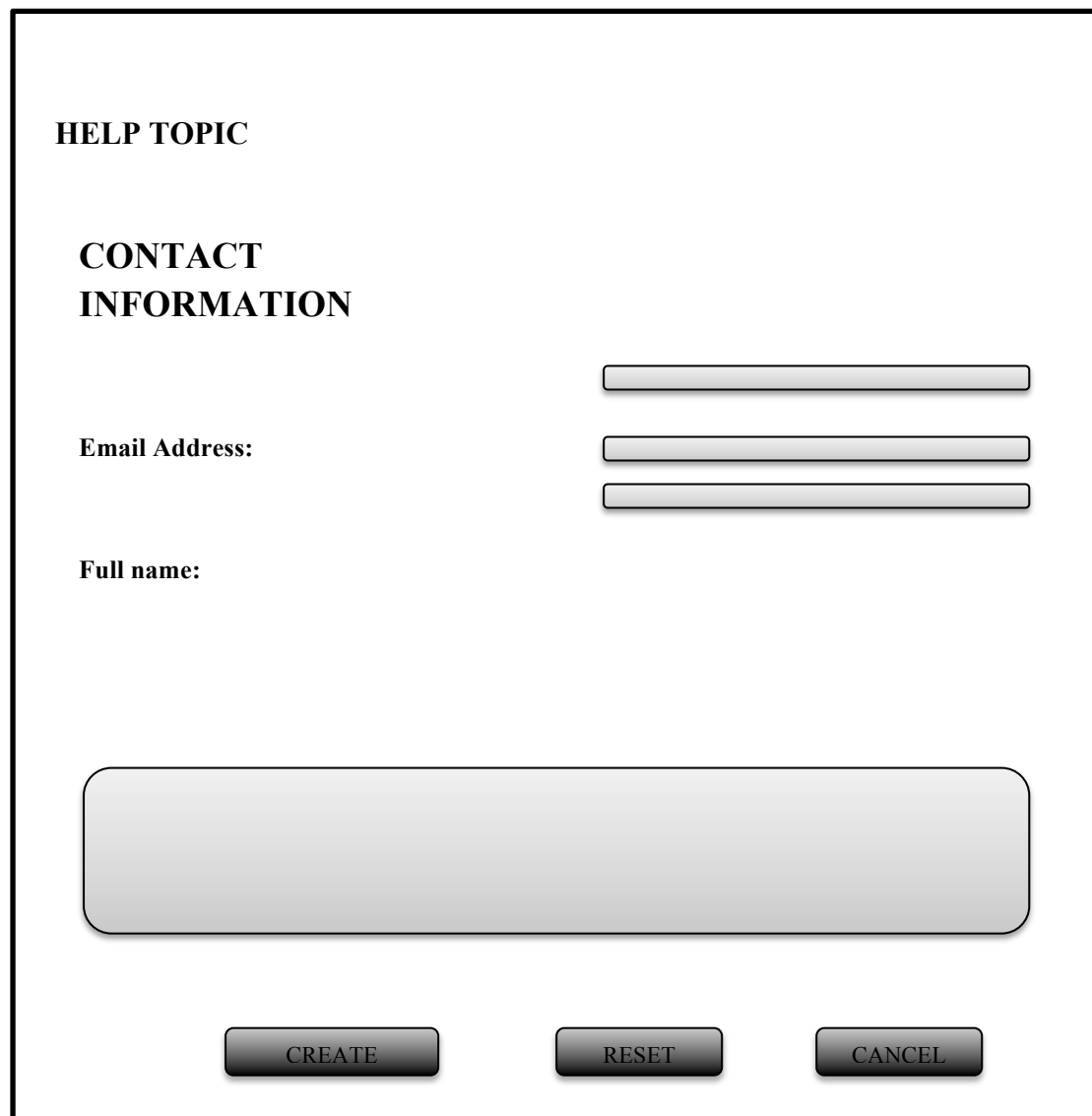
The diagram shows a login portal titled "I.T SUPPORT TICKET MANAGEMENT LOGIN PORTAL". At the top, there are three buttons: "SUPPORT CENTER HOME", "OPEN A NEW TICKET", and "CHECK TICKET STATUS". Below these buttons are two input fields: one for "USERNAME/EMAIL" and another for a password, represented by asterisks. At the bottom center is a "SIGN IN" button.

Figure 4.11 Log in form

Input forms

Ticket submission form

The user can create a ticket by entering their email address, full name, phone number and their queries in the textboxes provided and clicking the create ticket button. The user can also reset the textboxes by clicking the reset button and if they wish to navigate away from the form they click on the cancel button as shown in the figure below.

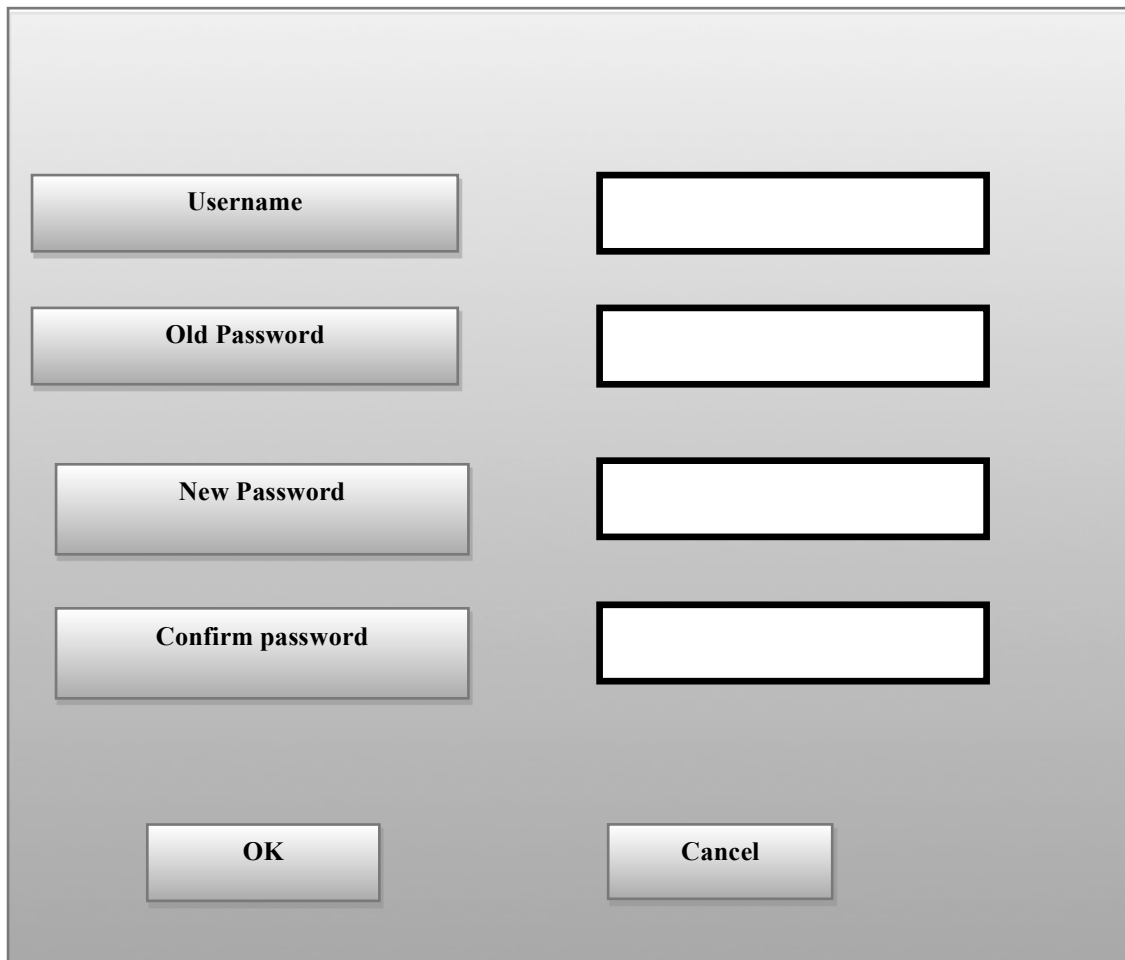


The figure shows a ticket submission form within a rectangular border. At the top left, the text "HELP TOPIC" is displayed. Below it, the section is titled "CONTACT INFORMATION". The form contains several input fields: a single-line text box, a label "Email Address:" followed by two stacked single-line text boxes, and a label "Full name:" followed by a large, rounded rectangular text area. At the bottom of the form, there are three buttons: "CREATE", "RESET", and "CANCEL", each with a dark background and light text.

Figure 4.12 Ticket submission form

Change password form

The change password form is meant for users who wish to change their passwords in the event of if they forget their current passwords or for security reasons. The form below shows the change password form, which applies to both the registered users and the helpdesk agents.



The image shows a change password form with a light gray background. It contains four input fields on the left, each with a label above it: 'Username', 'Old Password', 'New Password', and 'Confirm password'. To the right of each label is an empty rectangular input box. At the bottom of the form, there are two buttons: 'OK' on the left and 'Cancel' on the right.

Figure 4.13 Change Password Form

Tickets form

The tickets form show the Open, Closed and New Ticket submenus and a table showing the ticket number, date it was submitted, subject of the ticket, the user who submitted that ticket, priority of the ticket and the intended helpdesk agent for that particular ticket. The form will be shown in the following diagram:

Open Closed New Ticket

 Search

Ticket Number	Date	Subject	From	Priority	Replied By

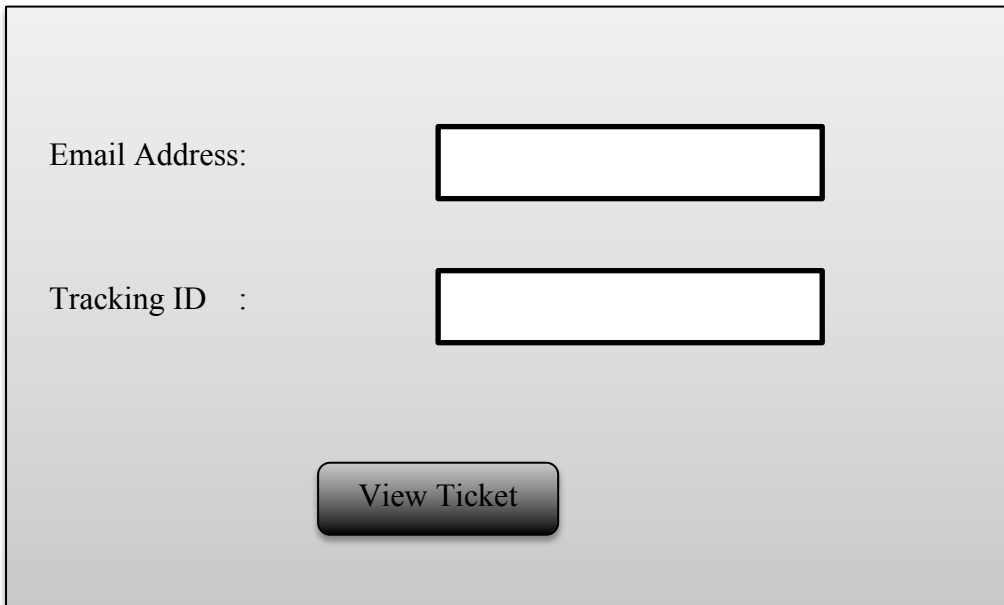
Figure 4.14 Tickets form

Output Design

Joanne (2006) states that whenever information is inputted an output will be required also. The output design shows how users will view the inputs of the system and this will be done in two ways and the system will be able to print out or export the output in any document form.

Check Ticket Status form

The users will be able to check the status of their tickets without having to log in to the system by simply entering the ticket number and their email address and the status of the ticket will be shown. The form below shows the form that the users will use to check for the status of their ticket.



The form contains two input fields: "Email Address:" and "Tracking ID :". Below these fields is a button labeled "View Ticket".

Figure 4.15 Check Ticket Status Form

Ticket Activity Dashboard Form

The ticket activity form shows the activity of the monthly ticket activity in a graphical manner and activity of the tickets can also be filtered by date for reporting. The diagram below shows the ticket activity form.

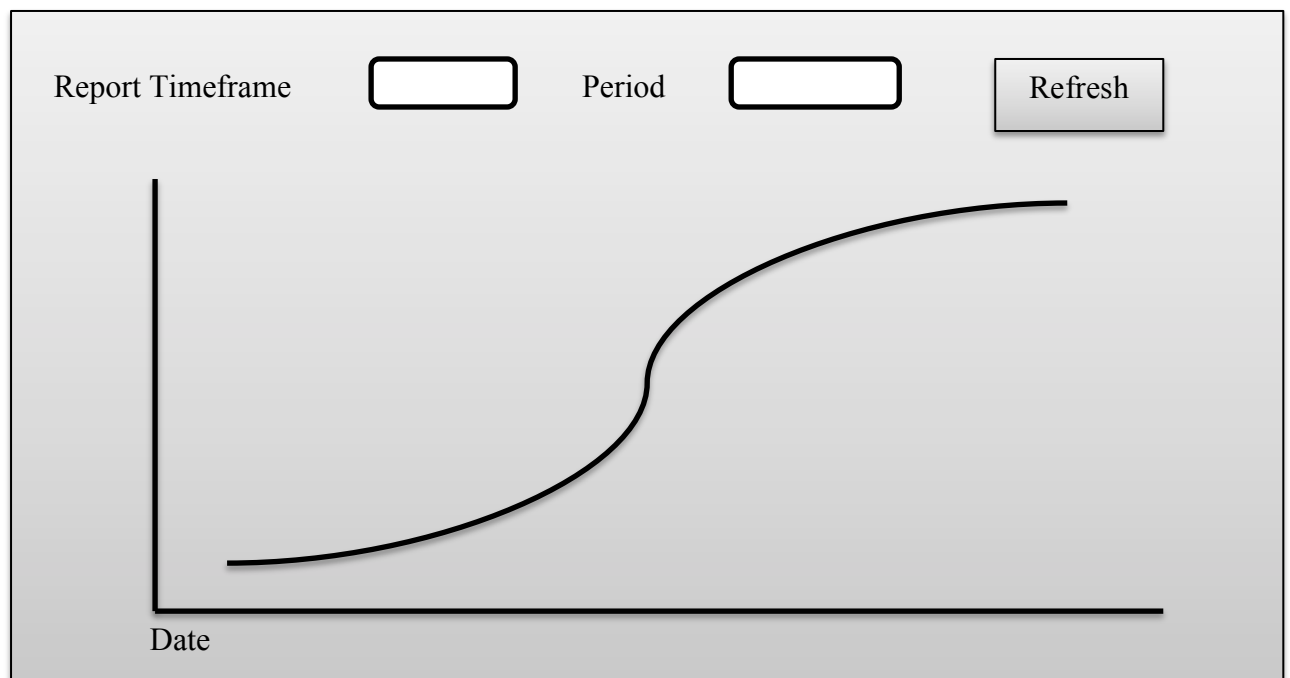


Figure 4.16 Ticket Activity Dashboard

4.8 Pseudo Code

Start

Enter password

{ Enter the username and password to be able to login into the system *}*

If password is correct then

View **Admin dashboard form**

Choose an option to use on the main menu

If option System Task then

Show System Task sub menu

Choose System Task sub menu option

Repeat option until you choose option to exit

End

Else

If option view Dashboard then

Show dashboard sub menu

Choose application sub menu option

If option Manage Users

Repeat option until you choose option to exit

End

Else

If option show Tickets

Show out inspector sub menu

Choose out inspector sub menu option

If option is in Admin panel then

Show admin sub menu

Choose out admin sub menu option

Repeat option until end of file

Else

If option is Settings then

Show Settings sub menu

Enter required form details

Repeat option until end of file

End.

End Repeat.

End.

{ End the program*}*

4.9 Security Design

Pierce (1992) defines security design as a methodology of software and hardware development that is meant to make systems free from weaknesses and vulnerabilities from attacks. To prevent a system from such attacks some measures have to be taken such as continuously testing the system, using authentication safeguards and adhering to secure programming languages. The system must be secure from unauthorized users to lessen the risk of manipulation and alteration of data. The data can be made secure by using effective programming skills and controls that can minimize system vulnerabilities. Making use of the passwords and levels of authorization, which check whether the user is an administrator, helpdesk agent or naïve user when logging into the system, can also make the system secure. The system will have two levels of security features, which are the principle levels and the authentication level.

The principle level security feature has permission to access the system itself and the current status of the system. The router and the switch will cater for this security feature and access records are organized on the router to block access from other sources. The authentication on the system may also be managed by setting static IP addresses to users so that unauthorized users cannot have access to the system. The other level will be there to aid the system incase if the first level is passed. The system will have a security feature whereby users have to log in to check their authenticity

4.9.1 Physical Security

The physical components of the system such as the hardware and the networks should be protected from different circumstances that can occur that may cause serious damage to the organization. The dangers include natural disasters, vandalism, fire and theft. Physical security's importance is usually underestimated in favor of other software related issues like viruses and hackers. Nevertheless, violations of the physical security can be done with little knowledge about computer systems on the attacker's side. Additionally, natural disasters and other physical security circumstances are part of life and are unavoidable in the long term.

The components that can be used to enforce physical security are by firstly placing barriers in the way of natural disasters and other physical circumstances that can harm the system. Secondly, the things can be placed to enforce security from such include surveillance systems, fireproof safes, safeguarding the servers with locks, smoke detectors, intrusion detectors and alarms. Thirdly, methods can be put in place to counter attack hackers and to recover quickly from natural and physical circumstances.

4.9.2 Network security

It is meant to protect the network infrastructure from exploitation, faults, modification and access from unauthorized users and thus making the infrastructure secure for users who are authorized to use it. The network security is audited by getting checked its enforcement measures to see how it would have improved aligning it with security policy. Auditing makes the network improve and organizations will also reflect how their policy is implemented on a regular basis.

4.9.3 Operational Security

Operational security is a process of identifying important information and by frequently analyzing activities that are linked with the ZESA I.T Ticket Management System operations. Identifying actions that can be detected by the system and determining the indicators that can be a danger to the system will be needed.

4.8 Conclusion

After going through a thorough analysis and an understanding of the system that is required by the organization the researcher has decided to build up the system that will have the capability to perform in a way that will please the users and their expectations. The researcher will build a system that is simple and easy to use using his knowledge he has acquired using the necessary tools that are required. The input and output forms of the system were designed in this phase and the data flow diagrams and the entity relationships in the system were also designed. At this juncture, the researcher is going to proceed to the next chapter, which is the Implementation phase.

CHAPTER FIVE: IMPLEMENTATION PHASE

5.1 Introduction

Stair and Reynolds (2013) state that the implementation phase is a stage where the technical, personnel and administration concerns are addressed and also where the hardware and software components of the system are reviewed and the installation and documentation procedures of the system are done. The system will be tested several times to check if there are any bugs and the developer will be able to resolve any problems encountered before the system is implemented in the organization. The testing of the system is done to check if it meets the user requirements and expectations. This phase involves the construction, installation, security, testing, the pseudo code and user training. The most crucial concern about the coding phase is to emphasize on the implementation of the system and making sure the system meets the objectives that were mentioned in chapter one. The ZESA I.T Ticket Management System goes through the implementation phase to enable it to carry out the different activities and operations. It also underlines how the system will be examined for faults and how they will be rectified.

5.2 Coding

Sommerville (2004) defines coding as a period of an application development project where the programmer writes the source code using an integrated development environment that will be assembled into an ultimate application program. Pressman (2005) also defines coding as a computer language showing logical methods and the execution of the actual commands. In simple terms it is the turning of the logic instructions into a program that can be executed by a computer. The system is going to be coded using PHP, which is a language for web development, sublime text which is a powerful text editor, MAMP server for hosting the site locally and MySQL for database management. The modules of the system were integrated after the system functionality had been developed into a fully functional working system.

The operations and functionalities that are required to manipulate the database were also built to perform queries. The operations that are used to manipulate the database include (SELECT) for data retrieval and (INSERT, UPDATE and DELETE) for manipulation. The modules found in the system are represented in the following

5.3 Testing

Software testing is the process of examining a software program to reveal the distinctions between the current and the expected conditions (which are, bugs) and to assess the functionalities of the software applications. Godfrey (1999) states that if a software program meets its objectives as stated by the end user expectations is considered successful. Testing helps to improve the software program by becoming error free and user friendly and software development is regarded incomplete if the testing phase is ignored. The following diagram shows the different steps that were used during the testing of the system and these steps are going to be discussed after.

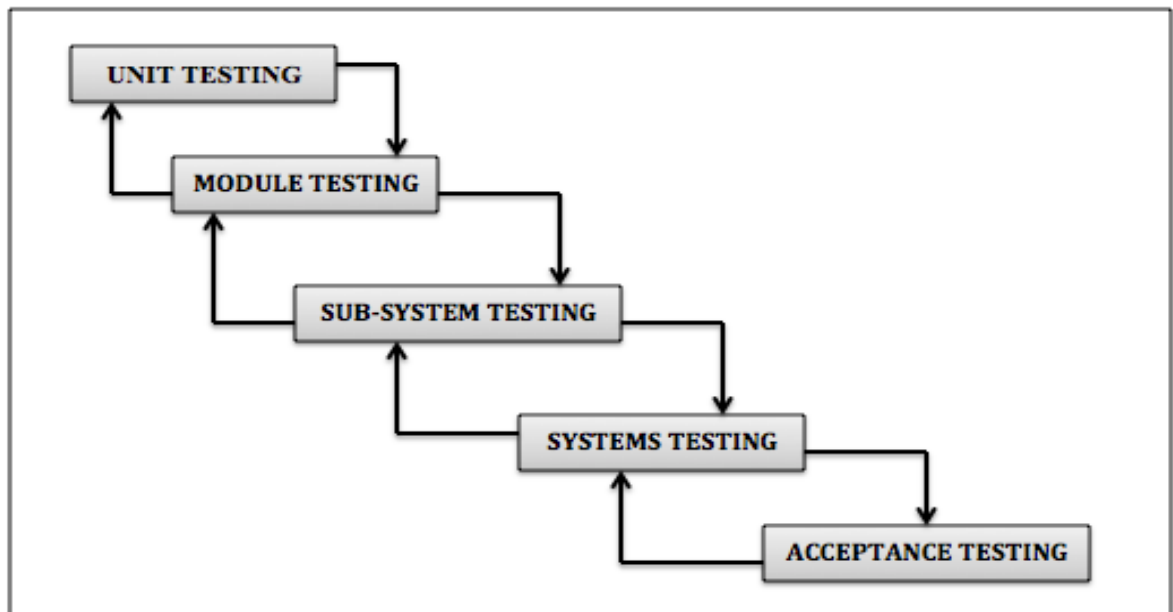


Figure 5.1 System Testing Procedures

KEY

 Testing Steps

 System flow testing

5.3.1 Unit Testing

Whitten (2003) defines a unit as the tiniest fragment of a computer program that can be tried and verified. Unit testing basically involves testing of a separate functionality during the development of the system that is when it was being coded. Initial tests were performed on the forms to see if they were performing in a manner that was expected by the users. The main objective of unit testing is to verify whether each unit is performing the required task. It is mainly done separately from other system unit. For example a web page was viewed as an independent unit and focusing on the input of details into the database by clicking the submit button.

5.3.2 Module Testing

In this step each module was formed and created individually and then linked to each other. The module testing was helpful in comprehending the validation that needs to be done on each module. Boehm (1981) defines a module as a collection of components that are dependent on each other with the same procedures and functions. Godfrey (1999) also explained module testing as a test of linked components of the system. The developer tested the components of all the modules using certain commands to check if the system is properly running. The main objective of module testing is to measure module reliability and functionality.

5.3.3 Sub System Testing

This step tests the collection of modules that have been integrated leading to the forming of subsystems. In this stage, the developer tests the interfaces of the system to detect if there are any mismatches. Beizer (2007) states that sub system testing is mainly for checking the functionality of different components of the system as standalone.

5.3.4 System Testing

Godfrey (1999) states that system testing is the testing of all the system components and processes. The sub modules that were tested above will be integrated to produce a whole system. The sub modules were tested to see if there are any bugs and errors, which would decrease the performance of the system as a whole. The system was verified if it was working correctly using live data and navigating through all modules to see if it is working perfectly. The integrated system was then tested using black box testing and white box testing, which is going to be discussed below:

5.3.4.1 Black Box Testing

Glenford et al (2004) defines black box testing which is also called functional testing as the testing which excludes the inner core of the system components and only concentrates on the outputs that are generated from the inputs that are executed in the system. It focuses mainly on the input and outputs of the system. For the I.T Ticket Management, black box tests were conducted by querying open tickets in the database and separated them using their priority listing the ones with high priority on top in a descending order in a way that the tickets will be listed according to their priority. In this scenario, all the open tickets will be displayed in the database but filtered according to their priority. So basically in black box testing, the tester will only know the inputs and outputs but will not know how the system will arrive at those outputs. The tester will not examine the code of the program and does not need to be a programmer to be able to perform this kind of test as Godfrey (2006) defines it as a technique whereby the internal construction of the system are not known by the tester.

5.3.4.2 White Box Testing

According to Godfrey (2006) white box testing is also known as glass box or open box testing which is a technique of testing software whereby there is explicit knowledge of the system and the internal things are used to select the test data. It reflects the inner structure of the system and it is a ratification procedure in which the programmers can use to debug the system to see if the code fails to perform what is expected of it. The person who will be testing the system needs to realize the performance of the code and will test the code by executing specific instructions and parameters. Validation and verification is done at each specific step of the code segment and reference is also done to the code at each step of execution.

5.3.5 Acceptance Testing

The main purpose of this test is to see how the end users of the system accept the system Beizer (2007). This test is done to determine the success or failure of the system. The acceptance test is done using the alpha and beta testing approaches.

- **Beta testing:** The actual data that is provided by the system is the one that was used to test the system other than incorrect data. Bugs and errors were captured and corrected.
- **Alpha testing:** In this approach, the system is supplied to the organization so that the users will have a feel of it and report any bugs and defects they

encounter whilst using it. The discovered errors and faults in the system are then fixed and the system will be ready to be used by the organization.

The results of the acceptance test were positive since the users accepted the system and errors that the users encountered were fixed.

5.3.6 Verification

Jiantao (2005) defines verification as a process of achieving certainty that the system corresponds to the objectives and specifications that were derived from the users expectations. Verification ensures that the system is working correctly before it is rolled out to the users and this is a very important stage.

5.3.7 Validation

Validation is done to ensure that the users of the system input what is right into the system. It is also done to ensure that the system is performing the basic required functions that are expected of it for example, to restrict inputting of invalid data by displaying a warning. The invalid data that a user might enter is a number in a text field that only requires alphabetical letters only. Tannenbaum (2005) defines validation as a process, which is concerned with building the right system for the users. The following screenshots are going to show the basic validations that were implemented in the system.

5.3.7.1 Validation of log in details

Validation of log in details tests whether the entered username and password exist or match with the ones in the database. If the username does not exist in the database the following message will be shown to alert the user.

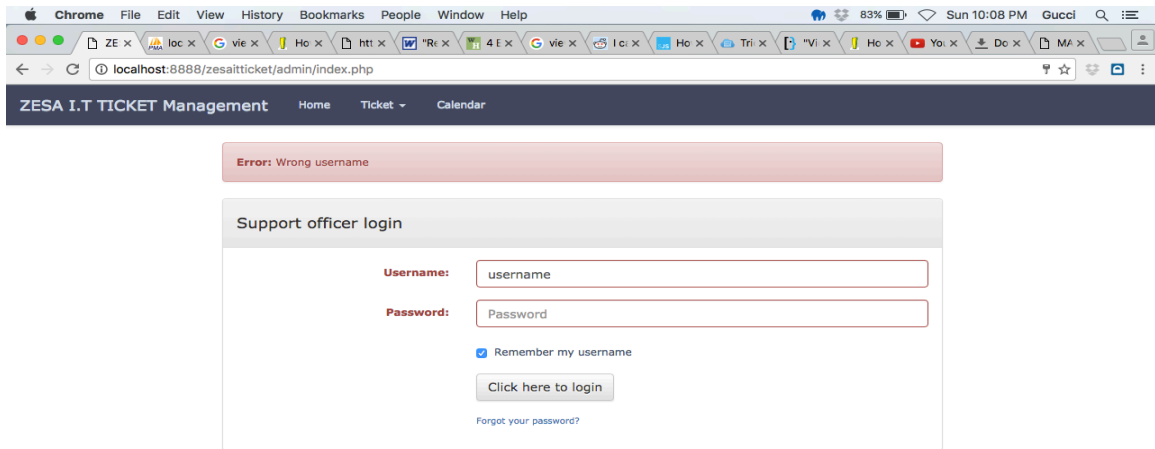


Figure 5.2 Username validation

5.3.7.2 Password validation

The support officers and the administrators are the only users of the system who have access to the login panel. Having at least five characters and also a password confirmation textbox validates the password that is created for the support officers. The following screenshots show the password character validation and password mismatch validation.

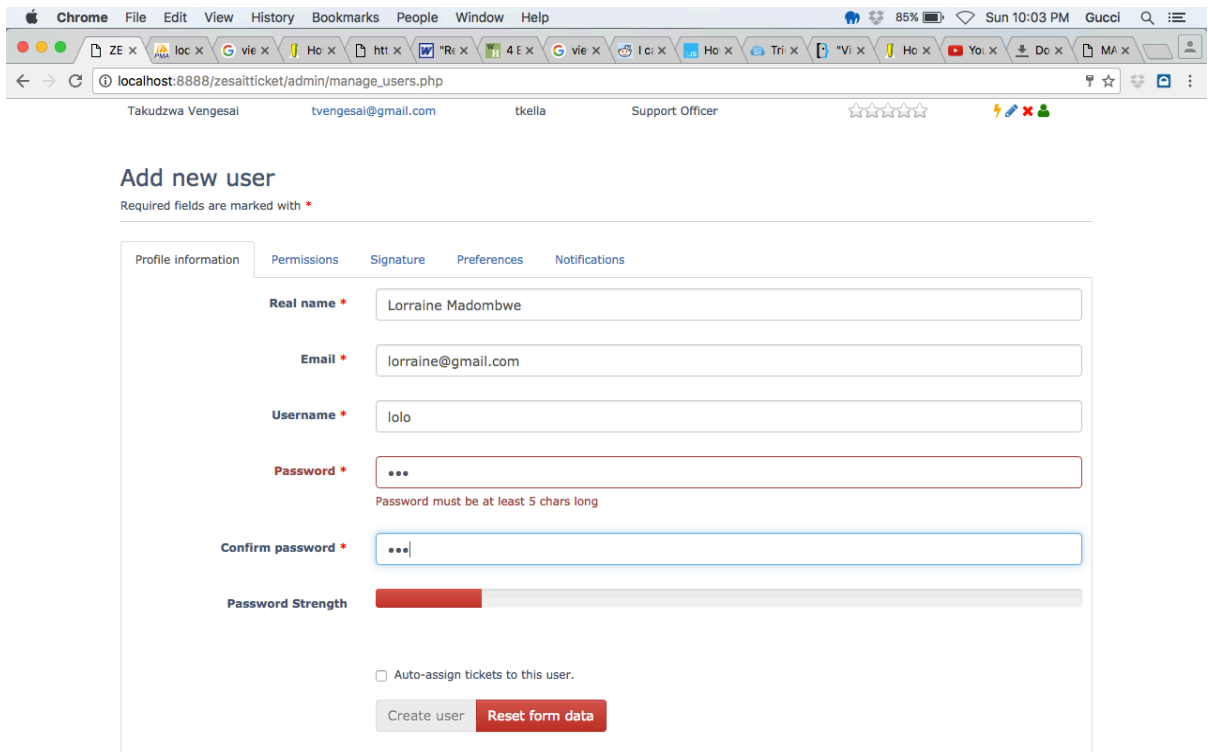


Figure 5.4 Password Character Validation

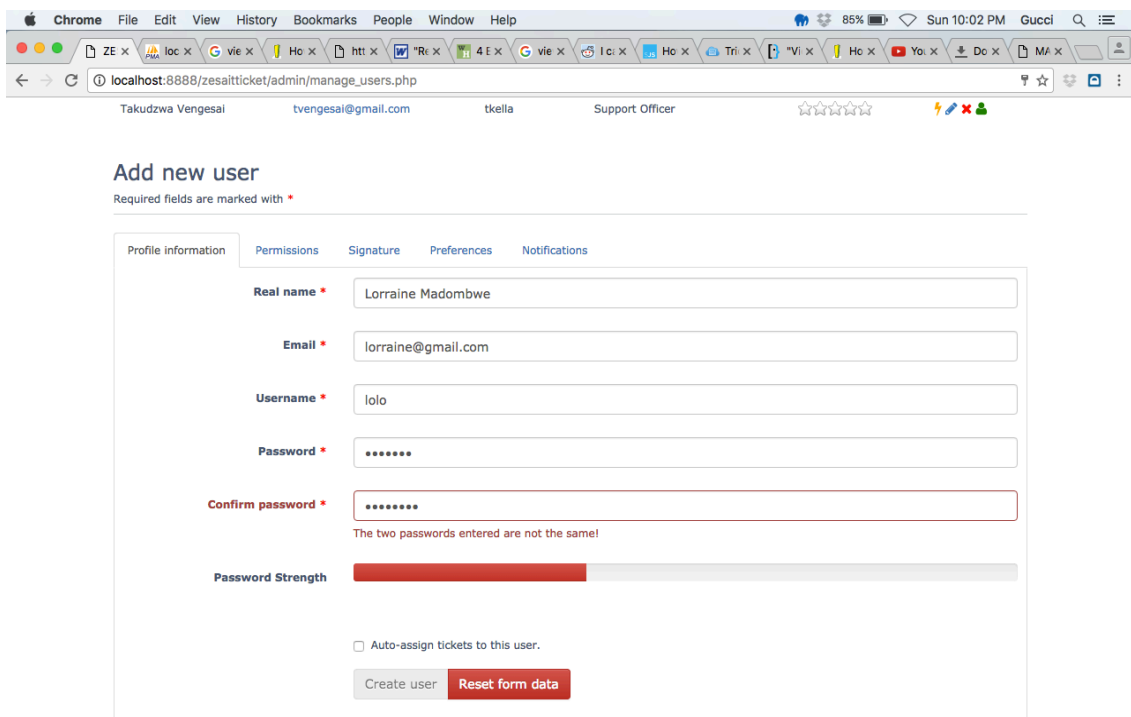


Figure 5.5 Password Mismatch Validation

5.3.7.3 Ticket ID validation

When a user submits a ticket, a ticket ID is generated that will be used to track the status of the ticket together with the email address. If a user inputs an incorrect ticket ID the system notifies the user with an alert saying that the ticket is not found. The

screenshot below shows the alert that the system shows when an incorrect ticket ID is submitted.

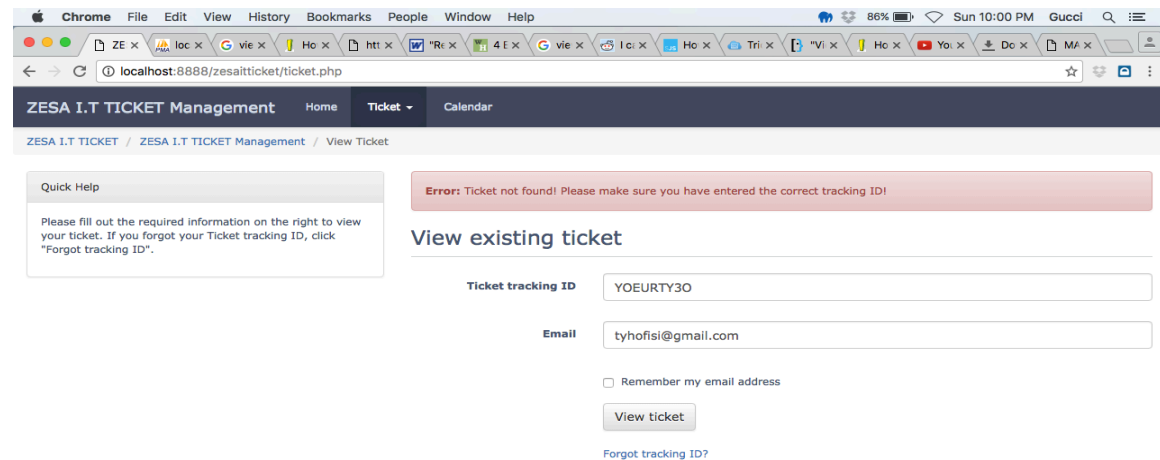


Figure 5.6 Ticket ID validation

5.4 Installation

Wiley et al (2010) define installation as the time in which the system that has been developed is implemented in the organization.

5.4.1 Installation Procedures of the ZESA I.T Ticket Management System

1. MySQL should be installed, if not softwares which conflict with MAMP or XAMPP should be checked or change the port number.
2. Install XAMPP (For windows) or MAMP (For Mac)
3. Run MAMP or XAMPP and create a database named ZESAit and import the database.
4. Copy the site into this path Applications/MAMP/htdocs (for mac) or C:/XAMPP/htdocs (for windows). The installation of the system will be complete after following these steps and what will be left is running the system.
5. To visit the homepage of the system, you type in the ip address of the server and the site name in the web browser for the users. The administrators and

support officer will have to add extra hidden url to access the login panel so that it can not be tempered around by the users.

6. A backup should be made frequently for both the database and the site on an external storage to avoid data loss in cases were the server crashes.

5.4.2 User Training

Laplante et al (1999) defines training as a process of showing the users of the new system how to operate the system. Training is very crucial because it enlightens the users on how to use the system and not to face any difficulties whilst using it.

User training was conducted to acquaint the users with the new system and the researcher conducted the training together with the I.T staff that understood the system. The top-level management was taught how to use the system and also the employees and the support staff was also taught how to generate reports for the managers. The trainees entertained the users' questions and the users were satisfied with the answers they were given. The users pictured the system as user friendly and easy to use since it is simple and easy to use. The researcher made the system easier for the users by eliminating the log in feature and making use of the tracking ID and email for users to check on their ticket statuses. The researcher did the training in separate groups by firstly training the I.T department and moving department by department. **SAP** users are the ones who usually encounter issues in their system so they were the ones who were given first preference and their tickets were automatically set to high priority whenever they submit a ticket. The Citrix users were the ones who were trained lastly since they barely reported to the helpdesk in the old system and also because they are located in remote areas without fiber connection.

5.4.2.1 Operational environment

The operational environment is tested before the file conversion starts. Access to the system was restricted to the users and the researcher used live data and was able to validate the changes and then attained user approval. The researcher observed all the components of the system that affect the performance of the system such as:

- Software configuration
- Hardware configuration
- The programs of the operating system

- Resources of the network
- Utilities

The researcher found these system components to be effectively functioning before loading the programs.

5.4.2.2 File conversion

The files are transferred to the new system after the users have verified the results of the process of testing. The conversion process has to be done by programs, which are specifically designed for that. The conversion of the files will be done outside working hours and also weekends because the files will be in use when the users will be using the system. The file conversion is done after the operational environment has been conducted and also after the user training is complete.

5.4.3 Parallel conversion (Recommended method)

The installation of the system is going to be done using parallel conversion. Crocket (2008) defines parallel conversion as when the new system is introduced into the organization whilst the current system is still in use. French (1997) goes on to define parallel conversion as the running of the new and the old system concurrently using similar inputs. The outputs of the two systems will be compared and the distinctions will be fixed. The benefit of parallel conversion is that it ensures that if the newly introduced system fails, the current system will continue being used without causing any confusion. The risks of failing to meet the user requirements will be reduced if this method is used. Activities like user training, system changeover methods such as pilot operation, parallel running, direct changeover and file conversion will be carried out in this phase. The following diagram shows the procedures of parallel conversion were the results of the new system are compared with the results of the old system.

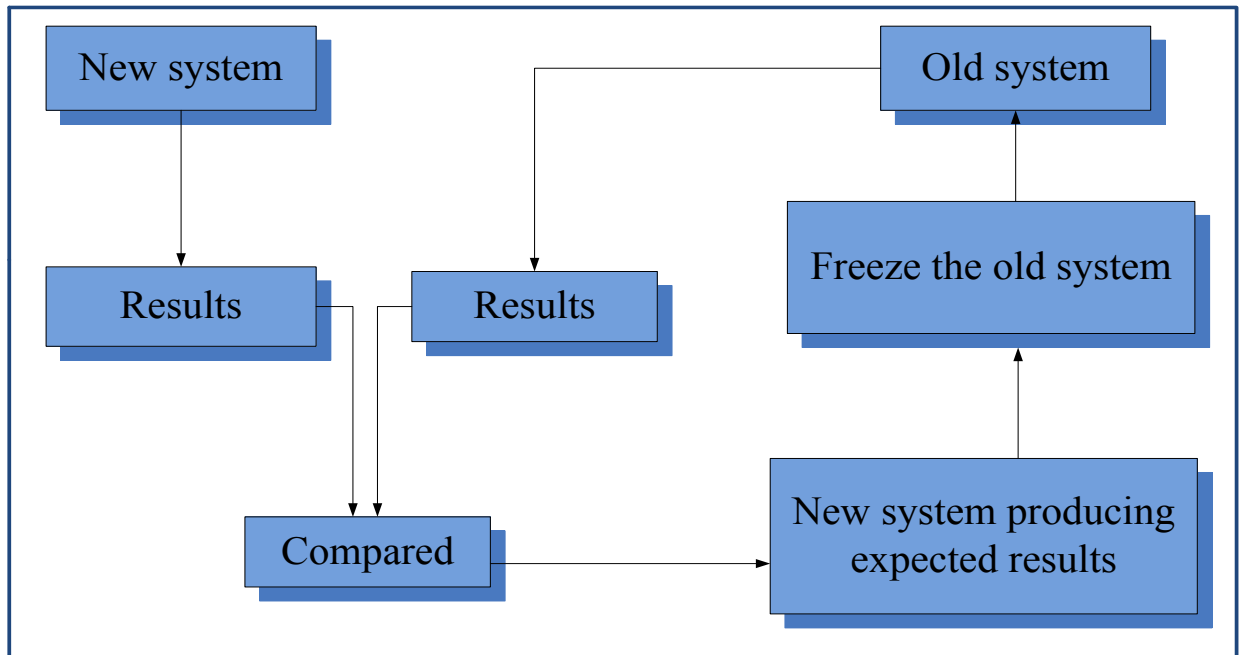


Figure 5.7 Parallel Conversion

Assessment of Parallel Conversion

The results that were expected were formed and the bugs and errors were corrected on each module of the system. Most errors came from users who were forgetting their tracking ID for their tickets and this was resolved by adding another module which allowed the users to recover their tracking ID through their emails.

The user requirements as proposed in the specifications were met by the system although some parameters, which were not within the scope of the system, were implemented in the system. The users accepted the system and its functionalities although the testing process is an on-going process. Overtime the old system will be thrown away and the new system will replace it after the users have fully adapted with the new system.

However on the other hand, parallel changeover is an expensive method since duplication of systems is involved. It is also difficult to test if the outputs of the two systems are incomparable and if the systems are different. It also requires extra effort and labor from the users of the systems over the changeover period.

5.4.4 Pilot changeover

Wiley et al (2010) defines this method as a process whereby the current system and new system are run concurrently but at a pilot site, the other part of the organization especially the naïve users will continue using the old system.

Advantages

- The costs are moderate since the chosen site will be running both the new system and old system simultaneously.
- There is little risk of failure since the new system will have been installed at the pilot site.
- The new system is tested in an actual site before it is used by the whole organization to check if it meets the objectives. The processes of the system are also checked to figure out if they execute tasks according to the requirements of the users.

The major disadvantage of pilot changeover is that part of the old system is possible for the use of variation of parallel and direct changeover only if it is treated as a distinct entity. The following diagram shows the procedures of pilot changeover showing the evaluation and analysis of the system inputs and the final outputs from both the new system and old system.

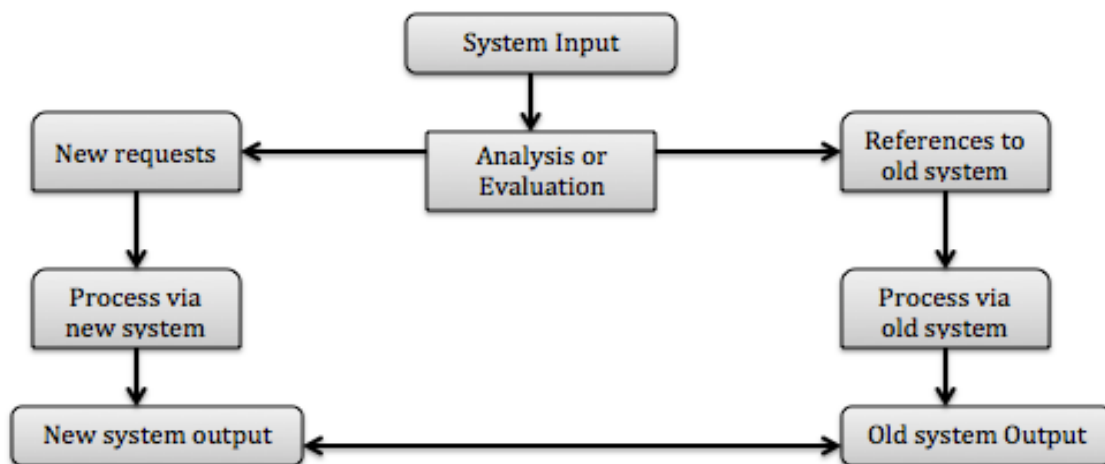


Figure 5.8 Pilot Changeover

Assessment of Pilot changeover

Pilot changeover would not work in this case for the ZESA I.T Ticket Management System because if the system fails, the data, which would have been collected in that period, is also lost. This will bring confusion in the organization since the users will not know which system will be now in use and also the one, which would have failed. This method will also increase the workload for the administrators of the system since they will be managing both the system in a same manner and will be a burden for

them. It will also risk full utilization of the new system since a small portion of users will use it and a small percentage of results will be produced.

5.4.5 Phased Conversion

Laplante (1999) defines phased conversion as a process, which involves breaking apart a new system into several parts or modules to ensure that the organization uses it step by step so that all the users get full knowledge of the modules at the same time. The problems that the users encounter during a particular module are fixed before implementing the next module.

Advantages

- There is little possibility that the whole system will go wrong after something happens, it will only affect that particular module.
- The users will have full knowledge of the system since they will be introduced to it step by step.

Disadvantages

- This method takes a long period of time to complete.
- Installation of other parts of the system will be held back if the users ask for changes in the new system.
- The integration of the old and the new system might be difficult.

The following diagram shows the stages that are involved in a phased conversion showing the steps that are taken when migrating from an old system to a new system.

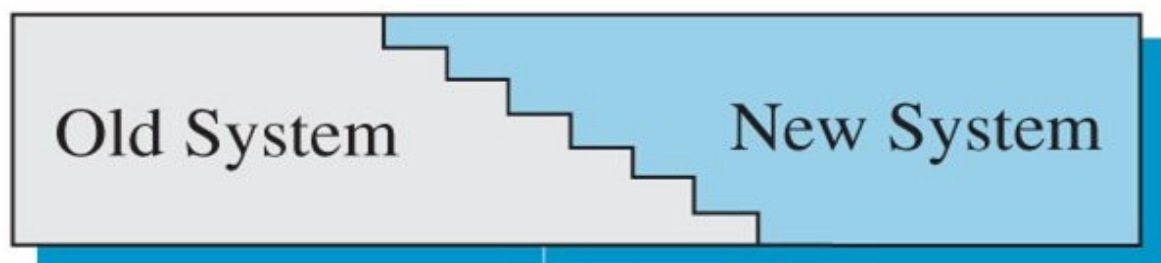


Figure 5.9 Phased conversion

Assessment of Phased Conversion

ZESA cannot use this method of installation since the time that is taken to complete the installation is long. This phase is an ongoing method that tries to equip the users with full knowledge of all the users but the ZESA I.T Ticket Management system has a few modules that will be easy for users. The costs that the organization will incur if they implement this method will be high and the managers will end up dropping the implementation of the system.

5.4.6 Direct Conversion

Shelly (2005) defines direct conversion as the process whereby the organization ceases to use the old system immediately and switches to the new system there and then. This is the most risky method so the administrators should be certain that the new system would be successful before choosing this method.

Advantages

- The new system will be rolled out in the organization immediately to the users after development.
- It is the cheap.
- There is no need to keep duplicate data.

Disadvantages

- It is the most risky method because if anything goes wrong in the new system, there is no system to use until the problem is rectified.
- All the data has to be transferred to the new system before the old one is thrown away.
- There will be a time whereby no system will be working since the old one will not be working whilst the new system is being rolled out.
- The users will have a period whereby they will be learning to use the system whilst their important work will be on stand still.

The following diagram shows a description of how direct conversion takes places during installation.



Figure 5.10 Direct Conversion1

ZC`

Assessment of Direct Conversion

Even though this method is cheap and the system will be immediately introduced in the organization, ZESA should not use this method because there are some ignorant users who won't be able to use the new system. The biggest fear of implementing this method is losing the data that will be migrated from the old system to the new system. Therefore the recommended alternative would be parallel conversion. ckkkkkke

5.5 Maintenance

Sommerville (2007) states that maintenance is a procedure that ensures that the new system meets the objectives that it was developed for and it is done frequently. Reviewing the system periodically and also monitoring the system will be done by the developers and also the users of the system to make sure that it will be functioning properly and to make sure that the objectives of the organization are being met.

5.5.1 Types of maintenance

Corrective maintenance: Sommerville (2007) defines corrective maintenance as maintenance to repair software faults. Design errors are usually more expensive than coding errors since they involve rewriting of numerous components of the program. If the errors are from requirements, they are usually the most expensive since a complete extensive program redesign might need to be done to fix the error. The corrections that are done to the system should be documented for future reference.

Adaptive maintenance: It is mainly done to make sure that the system will work on different software environments (Sommerville 2007). This is done to make sure that the system will be usable even if the operating system or the hardware changes in the system's environment. The system must be modified for it to be able to cope with different hardware and software setups that it might encounter. In this case, the system was tested on different common web browsers like Safari, Opera, Google Chrome, Mozilla Firefox and Internet Explorer. The system ran smoothly on the different web browsers that it was tested on and the system seemed to adapt on any web browser.

Perfective maintenance: Krugger (2005) defines perfective maintenance as the process of trying to make a better version of the system that is already there as well as

adding more functionality to it. He believes that every system that is out there has more room to be a better system only that there are constraints such as ignorance and lack of resources that limit developers from perfecting their systems. Even if the system is error free and free from bugs, it does not necessarily mean that users are satisfied, there are others who will be feeling like more could be done to the system. The users usually initiate this type of maintenance and if any modification is needed as a suggestion from a user, perfective maintenance is then implemented.

5.5.2 Overview of maintenance

After carrying out an analysis of the maintenance methods that can be used in maintaining the system, it was discovered that the perfective maintenance outweighed the other maintenance methods. Perfective maintenance was seen as the technique that is most effective especially if the system is being developed in house.

5.5.3 Recommendation

Basing on the current situation, the ZESA I.T Ticket Management System would be recommended to use the adaptive maintenance technique since there is a rapid change of technology. Using this method of maintenance will give room for the administrators and developers to upgrade and do back ups for later use.

5.6 System security

In a scenario whereby an unauthorized user gains access to the physical security measures, the following software measures will be implemented in the new system.

- Measures that are operating system based: The database of the new system will be working on a Linux server which will be comprised of passwords that are hard to crack to prevent illegitimate users from accessing the system.
- Access control that are program based: The ZESA I.T Ticket Management System will make use of usernames and passwords for different users and also permission levels will be set for different users of the system.
- Making use of anti-virus programs, frequently backing up the system on an external storage, having uninterrupted power supply on the server to counter threats such as viruses, power cuts and natural disasters will make sure that the system is secure.

5.7 Conclusion

This chapter marked the end of the documentation of the ZESA I.T Support Ticket Management system and proper verification and validation was done so as to make sure that the data of the system has integrity. Information about the maintenance of the system was also indicated and the installation procedures. The system objectives that were indicated in the first chapter were met and the system is now ready to be implemented into the organization.

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APPENDICES SECTION

APPENDIX A: User manual

Zimbabwe Electricity Supply Authority I.T Support Ticket Management System.

Introduction

The system will use the following technology:

- Any modern browser for the running of the system.
- My sql for the database management system
- MAMP Server

Getting started

Setting up environment

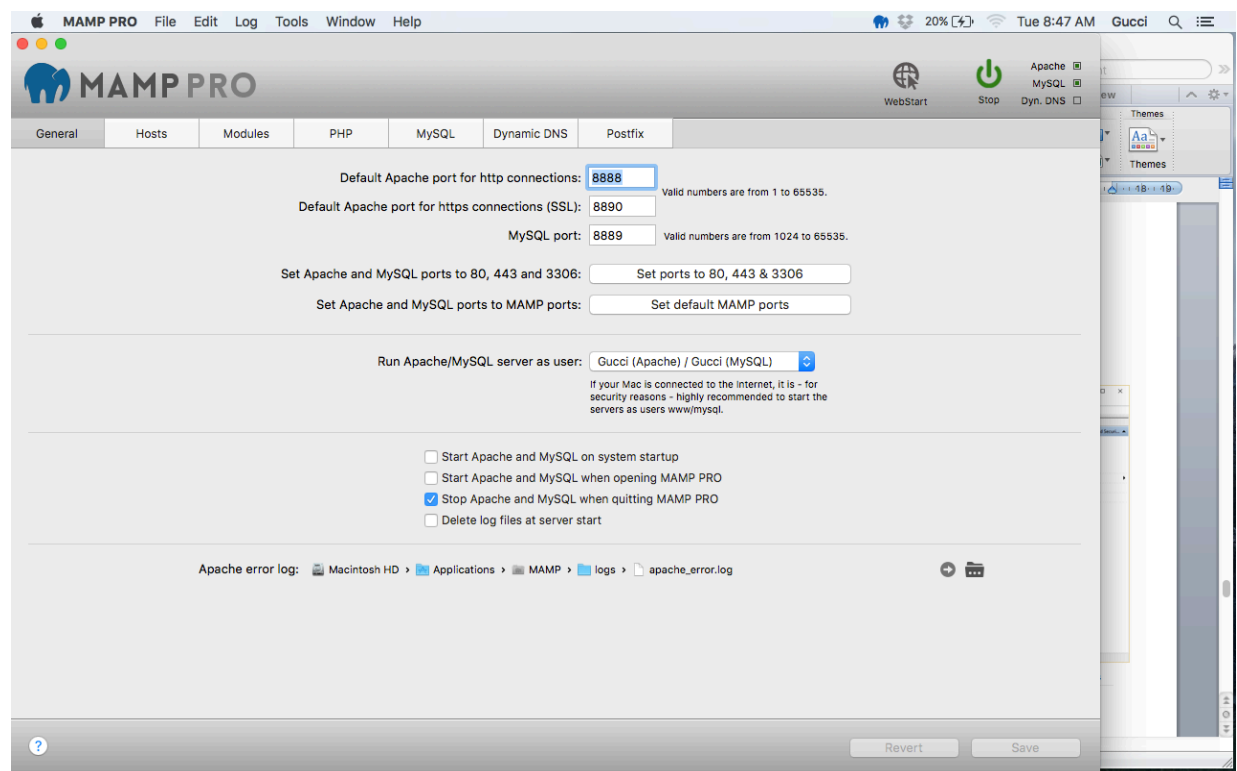
Firstly, before the system is installed the following has to be done on the server

- i. **Configure MAMP Server ports to allow incoming and outgoing connections to the database**

Figure A1 PORTS configuration

This is done via Applications->MAMP and General Tab->MySQL port

From here all inbound and outbound rules are set to allow communication via the MySQL port 8889



- ii. **Configuring the host that the system will run on**

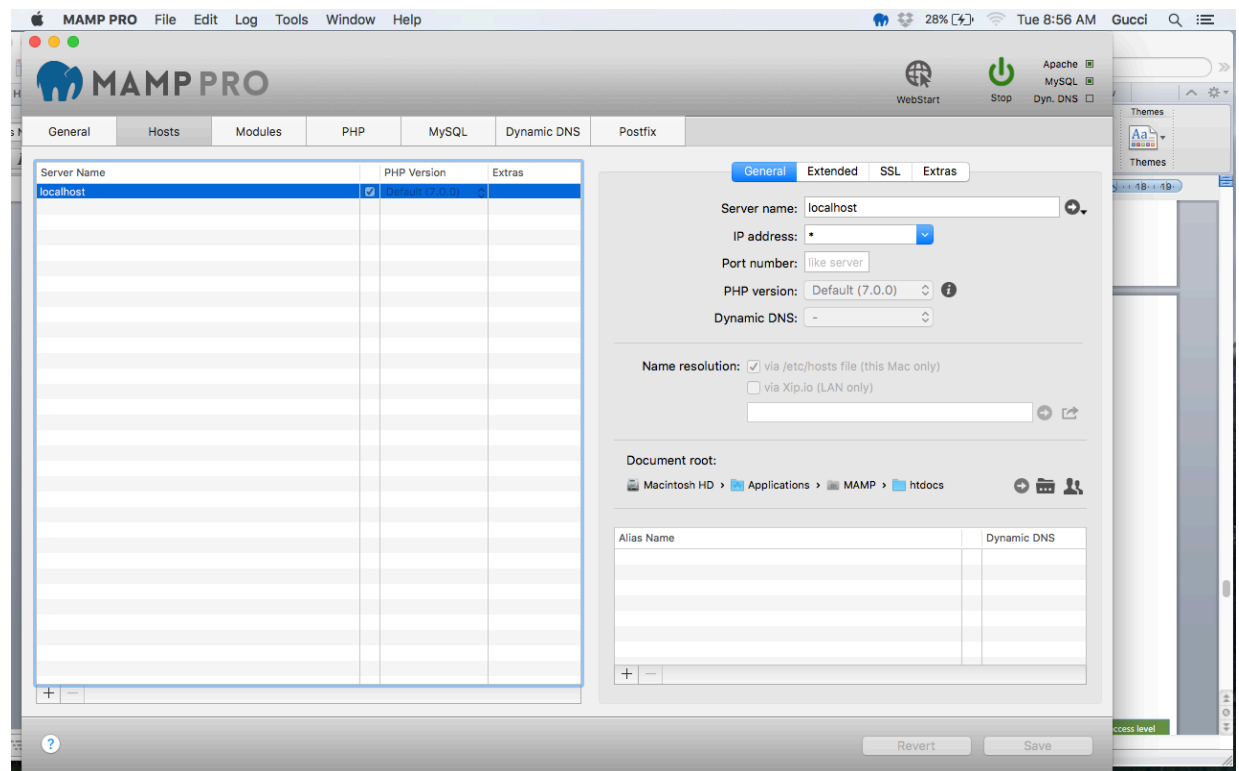
This is done via Applications->MAMP->Hosts -> Server name

For testing purposes the system will run on the localhost server and on a local area network the I.P address of the host machine will be used to access the system including the PORT number.

Figure A2 Server name configuration

How to access the system

The system is accessed by typing in the web address of the system into the web browser and in this case, the web address of the system will be <http://localhost:8888/ZESAitticket/> that will direct the user to the homepage of the



system. The homepage is for submitting tickets, viewing existing tickets and also has a calendar tab where users can view upcoming events.

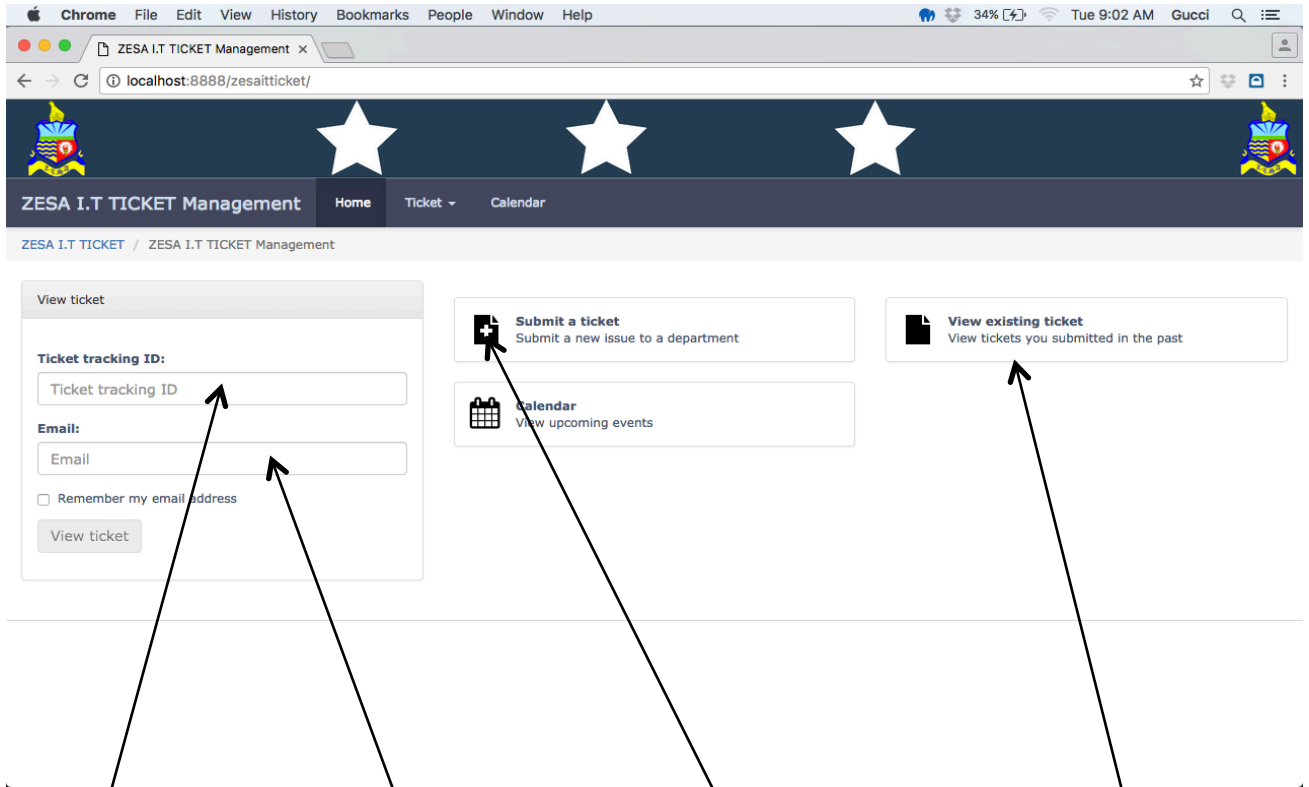
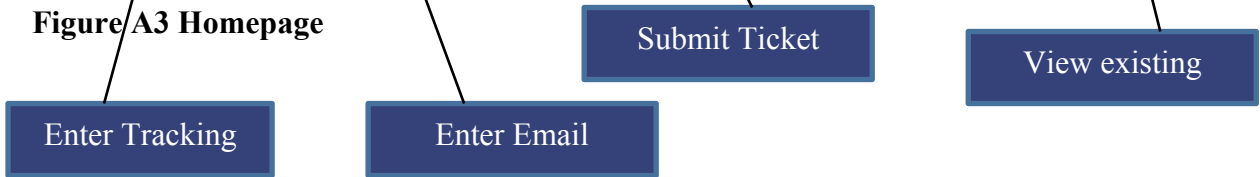


Figure A3 Homepage



How to submit a ticket

When a user clicks on the submit ticket button, they will be directed to a page where they will enter their details, the department they want their issues to be directed to and the issue subject and message. The required fields will be indicated by an asteriks and the user will not be able to submit their ticket if the required fields are not filled out. After filling in the necessary details, the user clicks on the submit ticket button and the ticket will be submitted to the designated department and assigned to a support officer and both the user and the support officer will receive an email notification of the ticket status.

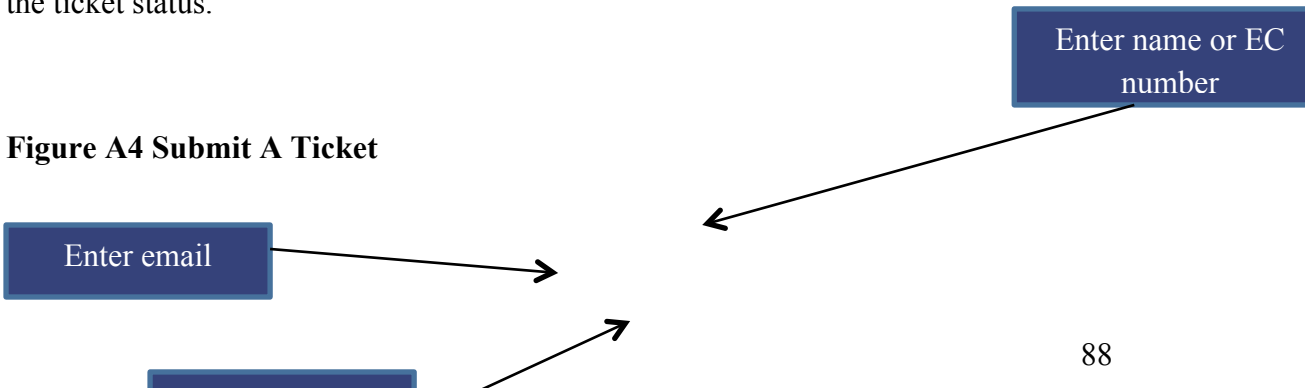


Figure A4 Submit A Ticket

ZESA I.T TICKET Management Home Ticket - Calendar
ZESA I.T TICKET / ZESA I.T TICKET Management / Submit a ticket

Quick Help
Please fill out the form on the right to submit a ticket. Required fields are marked with a *.

Submit a ticket

If you are reporting a problem, please remember to provide as much information that is relevant to the issue as possible.

General Information

Name: *
Please enter your name

Email: *

Department: *

Your Message

Subject: *

Message: *

Attachments:

Drag files here or click the 'Add File' button below to select files to upload.

File upload limits

Attach file/screenshot

Successfully submitted ticket

If a ticket has been successfully submitted, a message is generated showing the tracking ID of the ticket

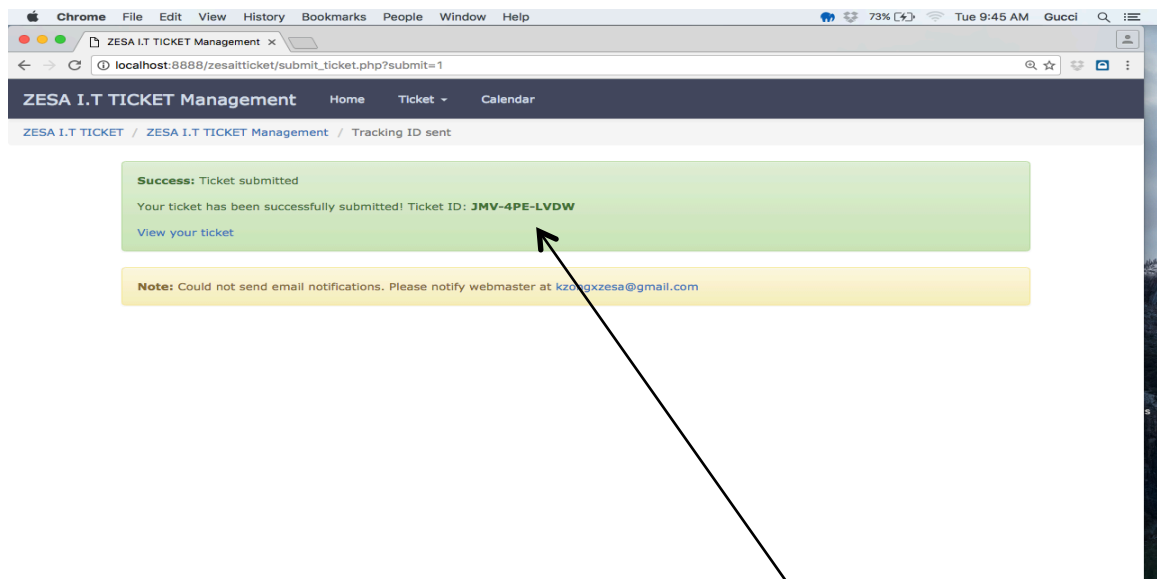


Figure A5 Successful ticket

Tracking ID

View existing tickets

To view existing tickets, a user can navigate to the submit ticket page and enter the Ticket Tracking ID and email and the ticket will be shown. In a scenario where the user forgets their tracking ID, they can click on the forgot Track ID link just beneath the view ticket button to retrieve their tracking ID. The user also has an option to view open or all tickets when they forget their tracking ID. The link to their tickets will be sent to the email of the user.

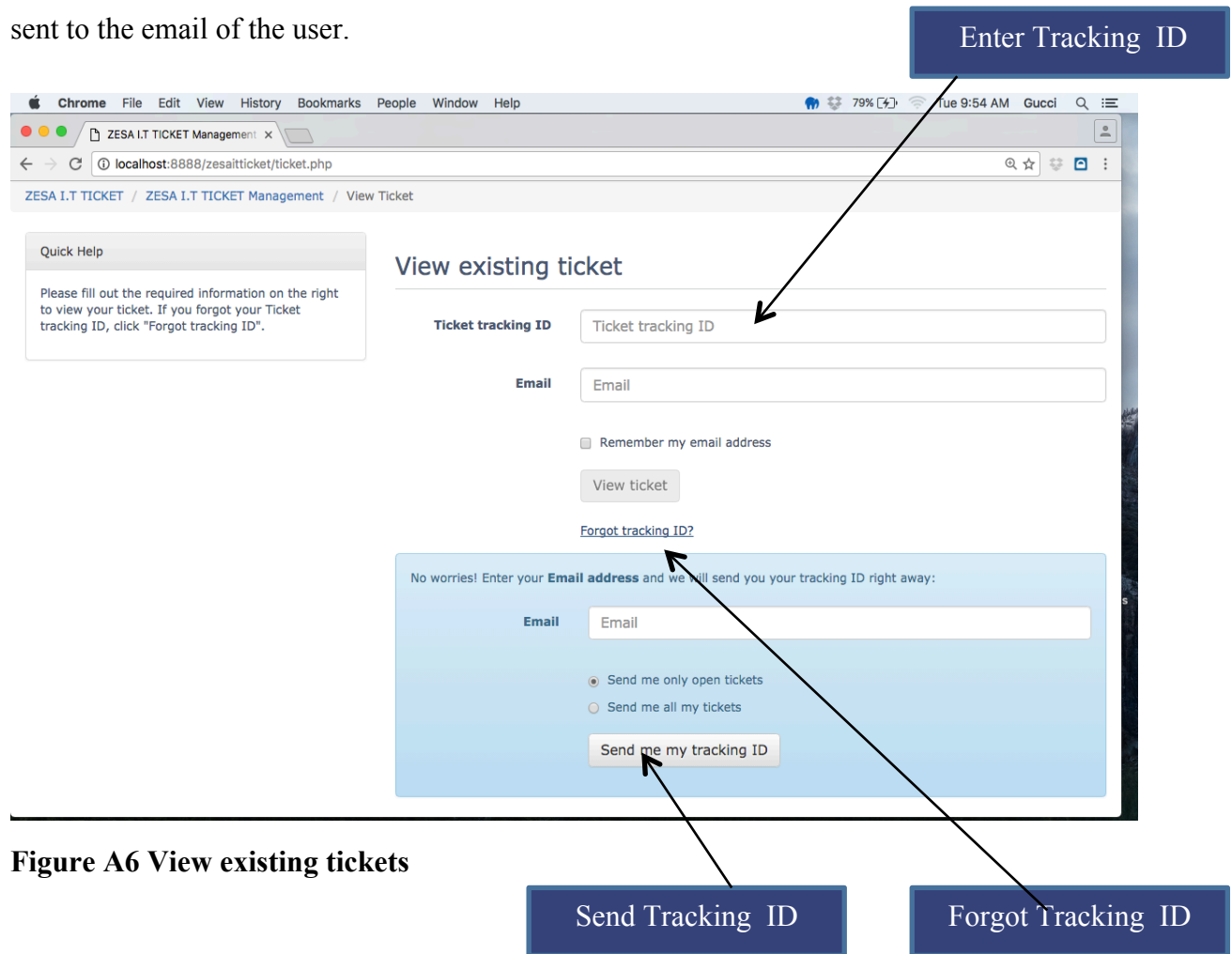


Figure A6 View existing tickets

How to access the administration panel

The administration panel is for the administrators and the support officers who are responsible for replying tickets that are submitted by the users.

The administration panel was made invisible from the users and this link <http://localhost:8888/ZESAitticket/admin/> has to be entered by the admins to go on to the administration panel.

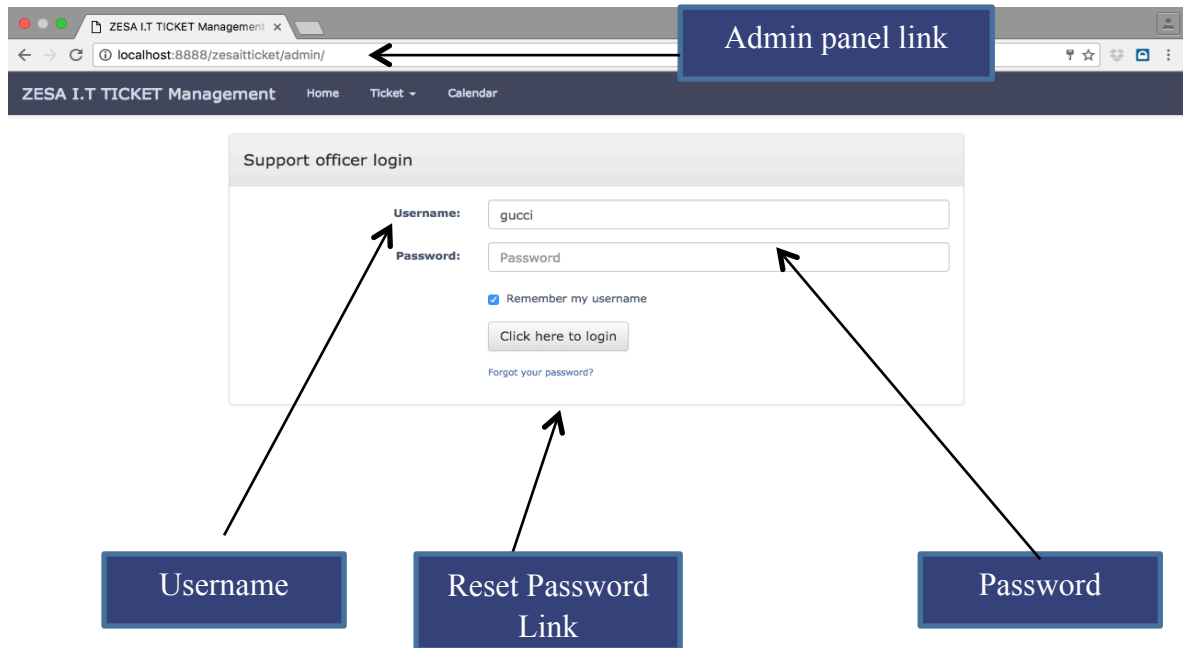


Figure A7 Administration Panel

Administration Home Page

After a support officer or an administrator logs in, they are directed to the administration dashboard showing a list of all tickets they have replied to and open tickets. They can also set the priority of a ticket and they can also open a new ticket within their dashboard. Tickets can also be filtered according to their priority or status when searching.

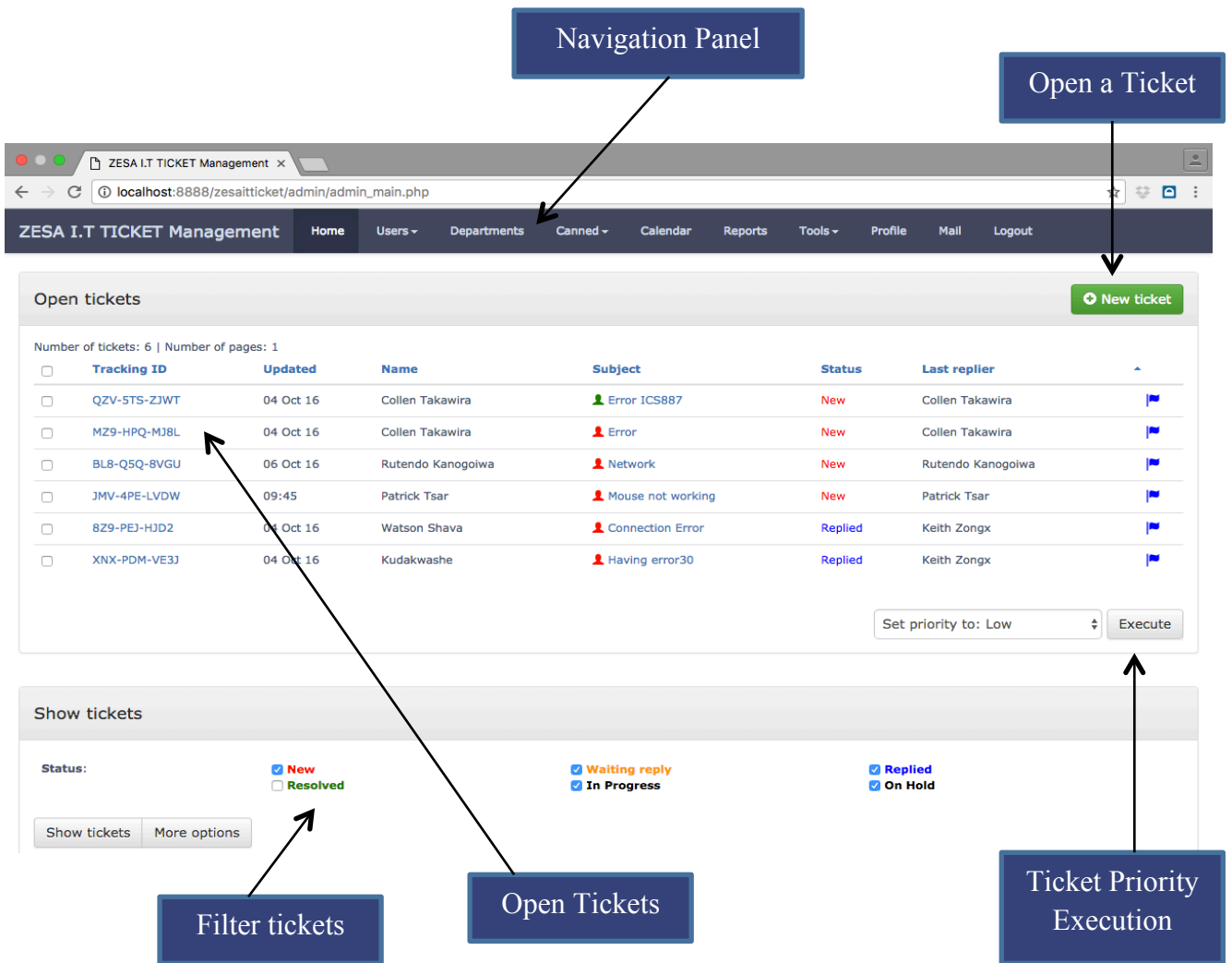


Figure A8 Administration Dashboard

How to manage users

The administrator or a support officer with the the certain rights can manage and add users into the system. To manage the users, the administrator should click on the User link on the navigation bar and a drop down menu will appear and click on the manage users link. The manage users page has a list of support officers and administrators on top and also their online status which is indicated by a green icon when online and a grey icon when offline. Beneath the list of users is the add user panel where details of the users are entered with navigation panels which are Profile information, Permissions, Signature, Preferences and notifications.

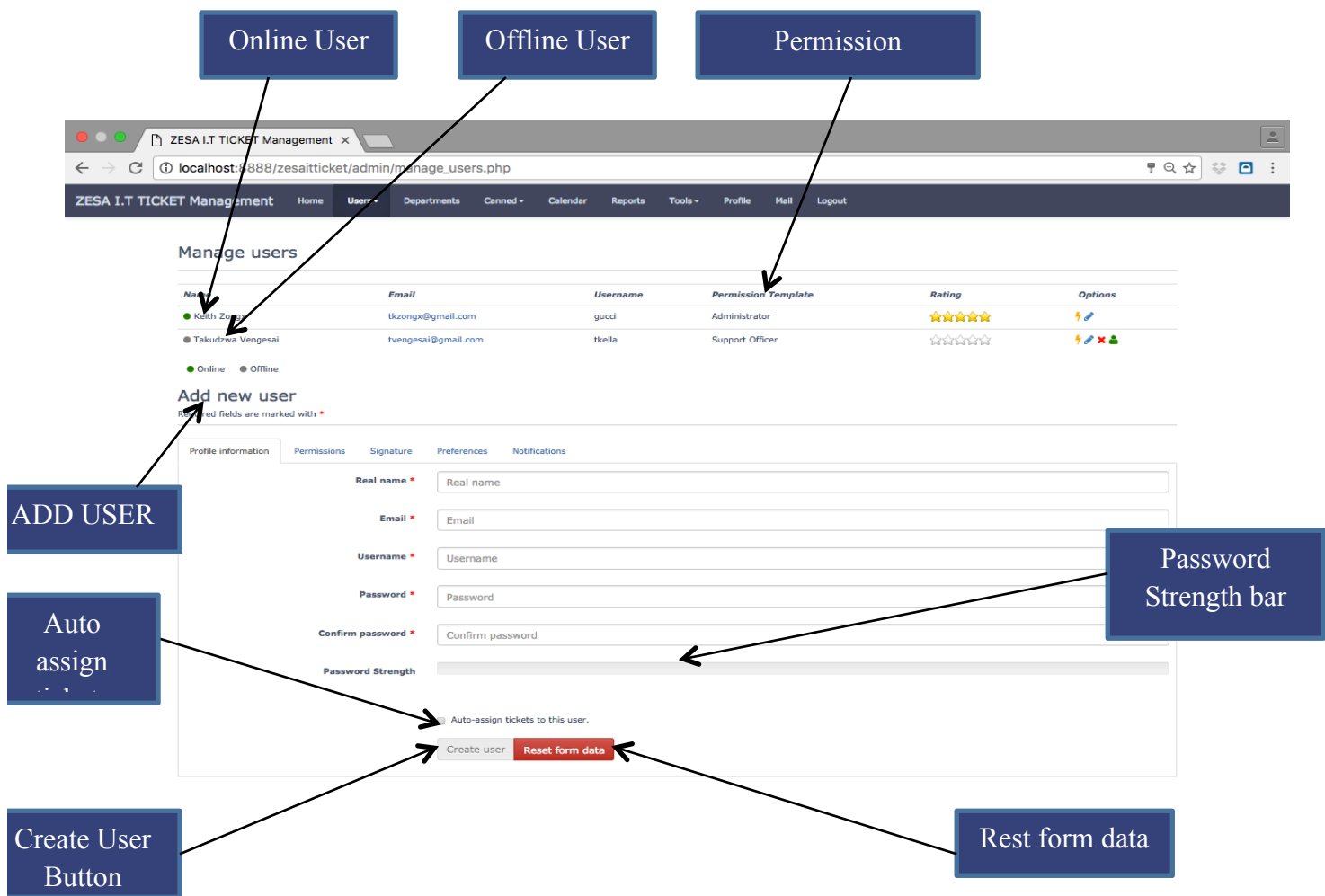


Figure A9 User profile information

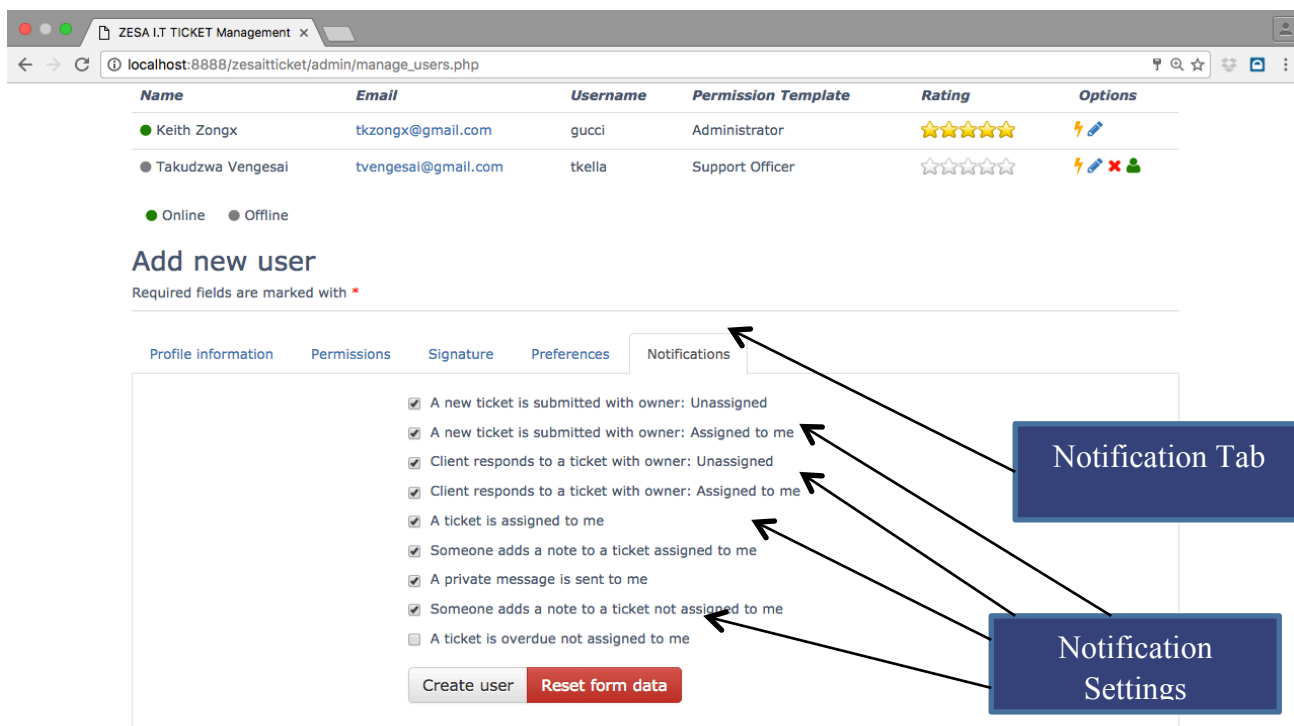


Figure A10 Notification Settings

How to reply to a ticket

To reply to a ticket, a support officer has to click on the ticket and as soon they click the timer starts, which shows the amount of time it takes to work on a ticket for reporting purposes. On top of the ticket thread is the lock ticket, tag ticket, print option and delete ticket option. Only support officers with the right to delete tickets can delete a ticket and for those who do not have the permission, the option is disabled in their menu. The IP address of the ticket submitter is also shown in the thread and information about the ticket is shown on the sidebar of the thread. Ticket information that is shown on the sidebar includes, Tracking ID, Owner of the ticket, Date created and time worked.

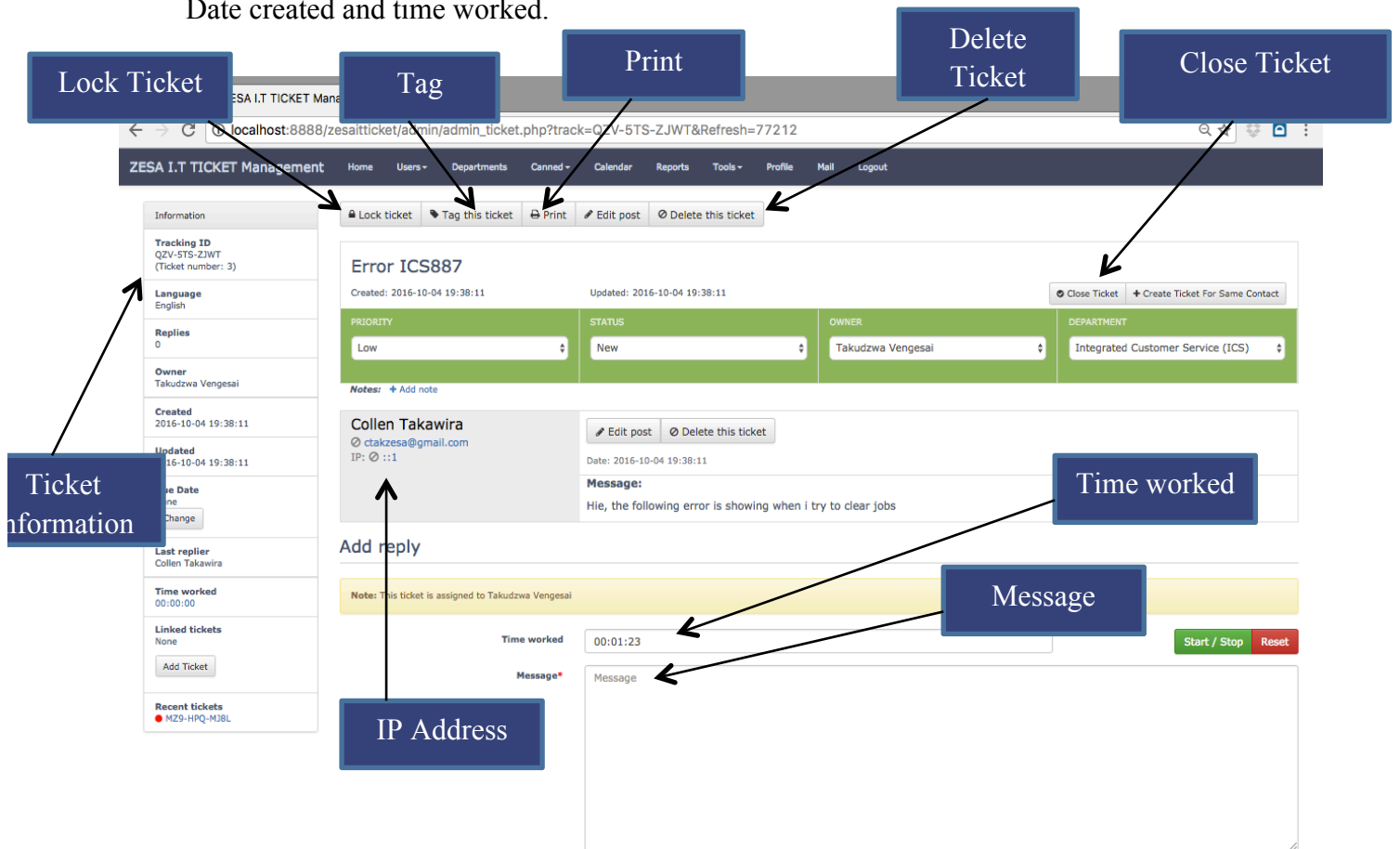


Figure A11 Reply to a ticket

How to add a Department

A department can be added or viewed by simply navigating to the Departments on the navigation panel and clicking on the Departments link. In this module, a department can be added from the sidebar of the page and other settings like department priority and usage can be configured whilst creating one. Departments can also be managed after they have been created and graphs which show tickets that have been worked on by a department are also shown in this section.

The screenshot displays the ZESA I.T. TICKET Management interface. The navigation bar includes 'Home', 'Users', 'Departments', 'Canned', 'Calendar', 'Reports', 'Tools', 'Profile', 'Mail', and 'Logout'. The 'Departments' menu is active.

On the left, the 'Add new department' form contains the following fields and options:

- Department name (max 40 chars): Department name
- Department priority: Low
- Color: Color
- Usage: Tickets and events
- Options:
 - Auto-assign tickets in this department.
 - Make this department private (only support officers can select it).
- Create department button

On the right, the 'Manage departments' table lists existing departments:

Department name	Priority	Tickets	Graph	Usage	Chief Systems Analyst	Options
Integrated Customer Service (ICS)	Low	1	<div style="width: 25%;"></div>		No chief systems analyst	
Eclipse Enterprise Edition (3E)	Low	0	<div style="width: 0%;"></div>		No chief systems analyst	
System Application Program (SAP)	Low	1	<div style="width: 25%;"></div>		No chief systems analyst	
Citrix	Low	2	<div style="width: 50%;"></div>		No chief systems analyst	
Hardware Systems Support	Low	1	<div style="width: 25%;"></div>		No chief systems analyst	
Database Management	Low	1	<div style="width: 25%;"></div>		No chief systems analyst	
Software Systems Support	Low	1	<div style="width: 25%;"></div>		No chief systems analyst	

Figure A12 Create department

How to manage canned responses

Here you can add and manage canned responses. These are commonly used replies which are more or less the same for every user. Support officers should use canned responses to avoid typing the same reply to different users numerous times. They can be managed or added by navigating to the Canned link on the navigation bar and a dropdown menu will appear showing a manage canned responses link.

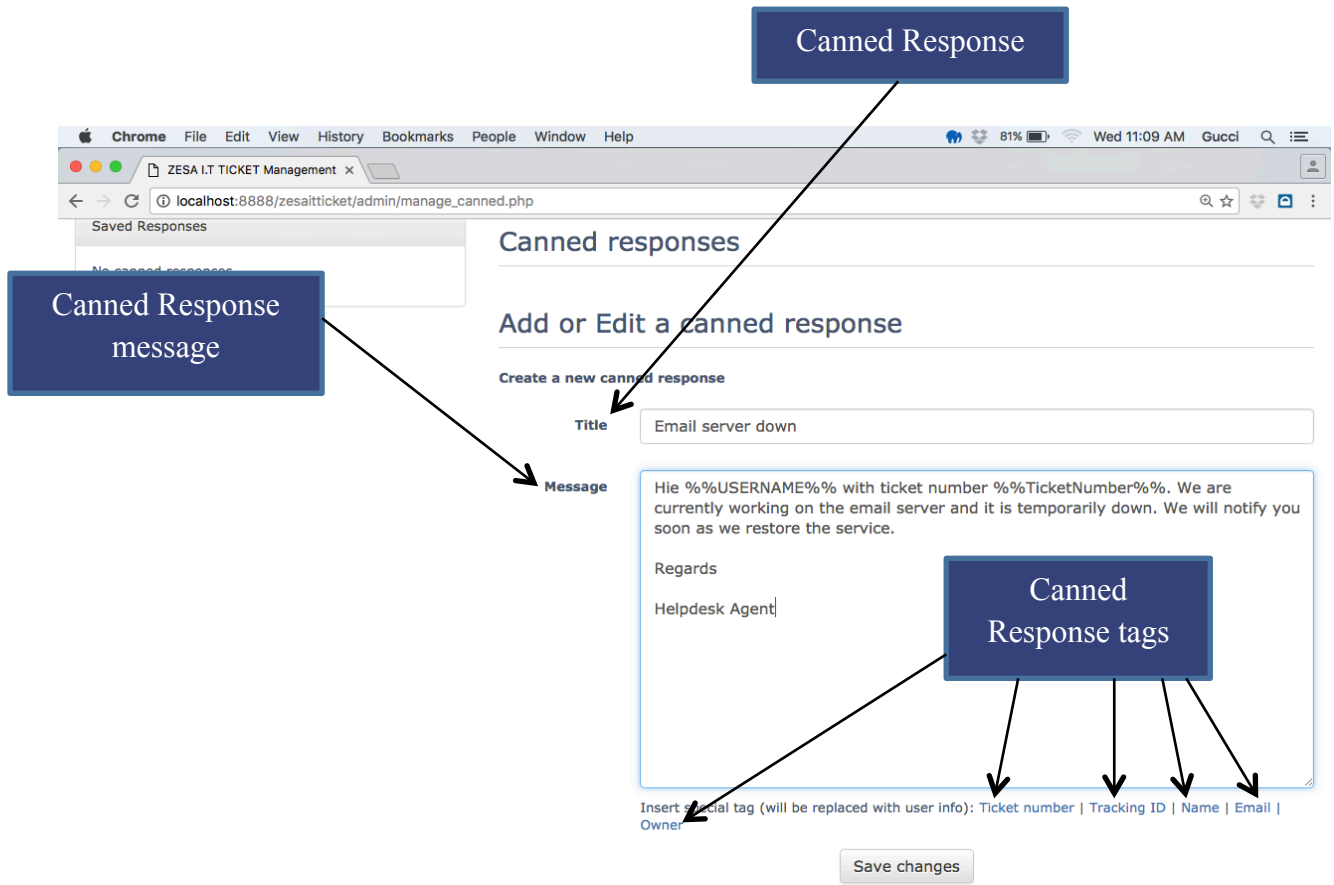


Figure A13 Canned responses

How to access reports

The users who have access to reports are the chief systems analyst, support officers and the administrators. To access the reports, they will click the report link on the navigation panel and they will be directed to the reports page. Reports can be run by date range or by report type. The type of reports that can be run are tickets per day, tickets per month, tickets per user and tickets per department. Only users who have the permission to run reports can run the reports, some support officers may not be given the permission to run reports in the system.

Department	Tickets	Open	Closed	Replies (All)	Replies (Support officer)	Time worked
Integrated Customer Service (ICS)	1	0	1	0	0	
Eclipse Enterprise Edition (3E)	0	0	0	0	0	
System Application Program (SAP)	1	1	0	1	1	00:00:22
Citrix	2	2	0	2	2	00:01:30
Hardware Systems Support	1	1	0	0	0	
Database Management	0	0	0	0	0	
Software Systems Support	1	1	0	0	0	
Totals	6	5	1	3	3	00:01:52

Figure A14 Reports

How to manage tools

Administrators have a big range of tools that they can manage to keep the system secure. The administrators can ban suspicious emails, ip addresses that are sent from from unkown sources. The administrators can also manage ticket statuses and edit email templates that are sent to the users in the tools section.

Banned Emails

Email address to ban:

Examples:

john@email.com
@domain.com

Permanent email bans:
No emails are being banned.

Figure A15 Manage tools

How to send private mails

Support officers and system administrators can send each other private mails from within the system. This is helpful when support officers from different departments want to communicate about a certain issues that will be going on in the system.

The screenshot displays the 'Private messages' section of the ZESA I.T TICKET Management system. The interface includes a navigation sidebar with 'INBOX', 'OUTBOX', and 'NEW MESSAGE' options. A table lists existing messages with columns for 'Subject', 'From', and 'Date'. Below the table is a 'Mark selected messages as read' dropdown and an 'Execute' button. The 'New private message' form is visible, with three blue boxes and arrows pointing to its fields: 'Send email to' points to the 'To:' dropdown, 'Email subjects' points to the 'Subject:' text input, and 'Email message' points to the 'Message:' text area.

<input type="checkbox"/>	Subject:	From:	Date
<input type="checkbox"/>	NDEIP	Takudzwa Vengesai	October 1, 2016
<input type="checkbox"/>	Hie	Takudzwa Vengesai	September 27, 2016

Mark selected messages as read

New private message

To:

Subject:

Message:

Figure A16 Service messages

APPENDIX B: Questionnaires

ADMIN/MANAGEMENT

1. How do you rate the existing system in terms of security?

Excellent Good Fair Poor

2. How do you rate the existing system in terms of generation of helpdesk reports?

Excellent Good Fair Poor

3. Do you vote for computerisation if it is considered a candidate for transferring from the current system of reporting issues to the I.T department?

Yes No

If **No**, what could be the reason?

4. How often do you experience very busy days and huge workloads during your operations?

Very Often Sometimes All the
time

5. Have some of the employees complained about the current system's performance?

Yes No

If **YES** what were the complaints?-----

6. What problems are you facing with the current system?

USERS

1. Are you satisfied with the current manual system?

Yes

Sometimes

No

If **YES**, give the reason

2. How do you rate the current system?

Excellent

Good

Fair

Poor

3. Are you pleased with the response speed of the current manual system?

Yes

No

If No what are your suggestions?

4. What do you think should be done to the current system?

APPENDIX C: Interview Questions

MANAGEMENT/ADMINISTRATION

1. How does the current system work and what are the processes involved in reporting issues to the support officers
2. What kind of data do you capture and or retrieve from the system and how often?
3. Are there any problems that you face in the existing system? If YES identify them and point out what you think should be done to deal with them?
4. How do you rate the performance of current system?
5. Are there any measures in place to safeguard your information against unauthorized access?
6. How do you generate reports and who can access them and when?
7. What are your views or opinions about changing the current system to a fully computerised system?

USERS

1. What are your major tasks when you report issues to the helpdesk?
2. Do you enjoy working with the current manual system and if so what are its strengths?
3. What are your views or opinions about changing from the existing system to a fully computerised system?
4. What are the things you would expect to see if a computerised system was to be introduced?

APPENDIX D: Observation Score sheet

Observation guide schedule

Schematic of observation recording sheet

Date/...../2016

Time

Area under Observation

Observations

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

Recommendations

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

Conclusion

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

APPENDIX E: Code snippet

Database connection

```
<?php
mysql_connect("localhost","root","") or die(mysql_error());
mysql_select_db("ais");
?>
```

Login code

```
<?php
session_start();
include "db/tdb.php";
include("l_functions.php");
$query=mysql_query("SELECT * FROM users WHERE
username='$_POST[username]' and password='$_POST[password]'" or
die(mysql_error());

$count= mysql_num_rows($query);
/* if($count==0){
message("Username does not exist!");
}*/
while($fetch=mysql_fetch_array($query)){
if($fetch['level']=='Administrator'){
$username=$fetch["username"];
$_SESSION['username']=$username;
$_SESSION['id']=$fetch["id"];
$_SESSION['logged']=true;
redirectto("Adminhome.php");
}
if($fetch['level']=='User' && $fetch['department']=='ais'){
```

```

$username=$fetch["username"];
$_SESSION['username']=$username;
$_SESSION['id']=$fetch["id"];
$_SESSION['logged']=true;
redirectto("home.php");
}
if($fetch['department']=='department'){
$username=$fetch["username"];
$_SESSION['username']=$username;
$_SESSION['id']=$fetch["id"];
$_SESSION['logged']=true;
redirectto("Accountshome.php");
}
if($fetch['department']=='ZESA'){
$username=$fetch["username"];
$_SESSION['username']=$username;
$_SESSION['id']=$fetch["id"];
$_SESSION['logged']=true;
redirectto("ZESAhome.php")
}
if($fetch["username"]!=$_POST[username] ||
$fetch["password"]!=$_POST[password]){
$rs1= mysql_query("SELECT * FROM users WHERE
username='$_POST[username]'");
$row1=mysql_fetch_array($rs1);
lockout($row1["id"]);
message_redrct("Wrong Username or Password!");
}??>

```

Add user

```
<?php
include ("db/tdb.php");
if(isset($_POST["submit"])){
$firstname = $_POST["firstname"];
$lastname = $_POST["lastname"];
$dpt = $_POST["department"];
$lvl = $_POST["level"];
$n_a="";
$status="Deactivated";

mysql_query("INSERT INTO users
VALUES(NULL,'$firstname','$lastname','$n_a','$n_a','$n_a','$n_a','$n_a','$status','$d
pt','$lvl')") or die(mysql_error());
?>

<script language="javascript">
alert("User Added successfully");
window.location="users.php";
</script>

<?php
exit();
}
?>
```


Reply Ticket

```
<?php
```

```
define('IN_SCRIPT', 1);
```

```
define('ZESA_PATH', './');
```

```
/* Get all the required files and functions */
```

```
require(ZESA_PATH . 'ZESA_settings.inc.php');
```

```
require(ZESA_PATH . 'inc/common.inc.php');
```

```
require(ZESA_PATH . 'inc/admin_functions.inc.php');
```

```
ZESA_load_database_functions();
```

```
require(ZESA_PATH . 'inc/email_functions.inc.php');
```

```
require(ZESA_PATH . 'inc/posting_functions.inc.php');
```

```
require(ZESA_PATH . 'inc/htmlawed.php');
```

```
// We only allow POST requests from the ZESA form to this file
```

```
if ($_SERVER['REQUEST_METHOD'] != 'POST') {
```

```
    header('Location: admin_main.php');
```

```
    exit();
```

```
}
```

```
// Check for POST requests larger than what the server can handle
```

```
if (empty($_POST) && !empty($_SERVER['CONTENT_LENGTH'])) {
```

```
    ZESA_error($ZESAlang['maxpost']);
```

```
}
```

```
ZESA_session_start();
```

```

ZESA_dbConnect();

ZESA_isLoggedIn();

if (!isset($_REQUEST['isManager']) || !$_REQUEST['isManager']) {
    ZESA_checkPermission('can_reply_tickets');
}

# ZESA_token_check('POST');

$replyto = intval(ZESA_POST('orig_id', 0)) or die($ZESAlang['int_error']);

$result = ZESA_dbQuery("SELECT * FROM `".
ZESA_dbEscape($ZESA_settings['db_pfix']). "tickets` WHERE `id`='{$_replyto}'
LIMIT 1");

if (ZESA_dbNumRows($result) != 1) {
    ZESA_error($ZESAlang['ticket_not_found']);
}

$ticket = ZESA_dbFetchAssoc($result);

$trackingID = $ticket['trackid'];

$ZESA_error_buffer = array();

// Get the message
$message = ZESA_input(ZESA_POST('message'));

$submit_as_customer = isset($_POST['submit_as_customer']) ? true : false;

$modsForZESA_settings = mfh_getSettings();

```

```

if (strlen($message)) {
if (isset($_POST['save_reply'])) {

ZESA_dbQuery("DELETE FROM `` . ZESA_dbEscape($ZESA_settings['db_pfix']) .
'reply_drafts` WHERE `owner`=" . intval($_SESSION['id']) . " AND `ticket`=" .
intval($ticket['id']) . " LIMIT 1");

ZESA_dbQuery("INSERT INTO `` . ZESA_dbEscape($ZESA_settings['db_pfix']) .
'reply_drafts` (`owner`, `ticket`, `message`) VALUES (" . intval($_SESSION['id']) .
", " . intval($ticket['id']) . ", " . ZESA_dbEscape($message) . ")");

$_SESSION['ZESA_SUCCESS'] = TRUE;

$_SESSION['ZESA_MESSAGE'] = $ZESAlang['reply_saved'];
if ($_SESSION['afterreply'] == 1) {
header('Location: admin_main.php');
} elseif ($_SESSION['afterreply'] == 2) {
/* Get the next open ticket that needs a reply */
$res = ZESA_dbQuery("SELECT * FROM `` .
ZESA_dbEscape($ZESA_settings['db_pfix']) . 'tickets` WHERE `owner` IN ('0,'" .
intval($_SESSION['id']) . "')
AND " . ZESA_myCategories() . " AND `status` IN (SELECT `ID`
FROM `` . ZESA_dbEscape($ZESA_settings['db_pfix']) . 'statuses`
WHERE `IsNewTicketStatus` = 1 OR `IsCustomerReplyStatus` = 1
OR `IsStaffReopenedStatus` = 1)
ORDER BY `owner` DESC, `priority` ASC LIMIT 1");

if (ZESA_dbNumRows($res) == 1) {
$row = ZESA_dbFetchAssoc($res);
$_SESSION['ZESA_MESSAGE'] .= '<br /><br />' . $ZESAlang['rssn'];
header('Location: admin_ticket.php?track=' . $row['trackid'] . '&Refresh=' .
rand(10000, 99999));
}
}
}

```

```

    } else {
        header('Location: admin_main.php');
    }
} else {
    header('Location: admin_ticket.php?track=' . $ticket['trackid'] . '&Refresh=' .
rand(10000, 99999));
}
exit();
}

if (!$submit_as_customer && !empty($_POST['signature'])) {
    if ($modsForZESA_settings['rich_text_for_tickets']) {
        $signature = nl2br($_SESSION['signature']);
        $signature = ZESA_htmlespecialchars($signature);
        $message .= "<br><br>" . $signature . "<br>";
    } else {
        $message .= "\n\n" . addslashes($_SESSION['signature']) . "\n";
    }
}

if (!$modsForZESA_settings['rich_text_for_tickets']) {
    // Make links clickable

    $message = ZESA_makeURL($message);
$message = nl2br($message);
}
} else {
    $ZESA_error_buffer[] = $ZESA_lang['enter_message'];
}

```

```

}

/* Attachments */

if ($ZESA_settings['attachments']['use']) {
    require(ZESA_PATH . 'inc/attachments.inc.php');
    $attachments = array();

    $use_legacy_attachments = ZESA_POST('use-legacy-attachments', 0);

    if ($use_legacy_attachments) {
        for ($i = 1; $i <= $ZESA_settings['attachments']['max_number']; $i++) {
            $att = ZESA_uploadFile($i);
            if ($att !== false && !empty($att)) {
                $attachments[$i] = $att;
            }
        }
    } else {
        // The user used the new drag-and-drop system.
        $temp_attachment_ids = ZESA_POST_array('attachment-ids');
        foreach ($temp_attachment_ids as $temp_attachment_id) {
            // Simply get the temp info and move it to the attachments table
            $temp_attachment = mfh_getTemporaryAttachment($temp_attachment_id);
            $attachments[] = $temp_attachment;
            mfh_deleteTemporaryAttachment($temp_attachment_id);
        }
    }
}

```

```

$myattachments = "";

$time_worked = ZESA_getTime(ZESA_POST('time_worked'));

if (count($ZESA_error_buffer) != 0) {
    $_SESSION['ticket_message'] = ZESA_POST('message');
    $_SESSION['time_worked'] = $time_worked;

if ($ZESA_settings['attachments']['use']) {
    ZESA_removeAttachments($attachments);
}

$tmp = "";
foreach ($ZESA_error_buffer as $error) {
    $tmp .= "<li>$error</li>\n";
}
$ZESA_error_buffer = $tmp;

$ZESA_error_buffer = $ZESAlang['pcer'] . ' <br /><br /><ul>' .
$ZESA_error_buffer . '</ul>';

ZESA_process_messages($ZESA_error_buffer, 'admin_ticket.php?track=' .
Sticket['trackingID'] . '&Refresh=' . rand(10000, 99999));
}

if ($ZESA_settings['attachments']['use'] && !empty($attachments)) {
    foreach ($attachments as $myatt) {
        ZESA_dbQuery("INSERT INTO " .
ZESA_dbEscape($ZESA_settings['db_pfix']) . "attachments`
('ticket_id`,`saved_name`,`real_name`,`size`) VALUES (" .
ZESA_dbEscape($trackingID) . ",", " . ZESA_dbEscape($myatt['saved_name']) . ",", " .
ZESA_dbEscape($myatt['real_name']) . ",", " . intval($myatt['size']) . ")");
    }
}

```

```

    $myattachments .= ZESA_dbInsertID() . '#' . $myatt['real_name'] . '#' .
    $myatt['saved_name'] . ',';

    }

}

$html = $modsForZESA_settings['rich_text_for_tickets'];

if ($submit_as_customer) {

    ZESA_dbQuery("INSERT INTO `" . ZESA_dbEscape($ZESA_settings['db_pfix'])
    . "replies` (`replyto`,`name`,`message`,`dt`,`attachments`,`html`) VALUES ("
    . intval($replyto) . "," . ZESA_dbEscape(addslashes($ticket['name'])) . "," .
    ZESA_dbEscape($message) . " <br /><br /><i>{$ZESAlang['creb']}</i>
    {$_SESSION['name']}</i>)" . ",NOW()," . ZESA_dbEscape($myattachments) . "," .
    $html . ")");

} else {

    ZESA_dbQuery("INSERT INTO `" . ZESA_dbEscape($ZESA_settings['db_pfix'])
    . "replies` (`replyto`,`name`,`message`,`dt`,`attachments`,`staffid`,`html`) VALUES
    (" . intval($replyto) . "," . ZESA_dbEscape(addslashes($_SESSION['name'])) . "," .
    ZESA_dbEscape($message) . ",NOW()," . ZESA_dbEscape($myattachments) . "," .
    intval($_SESSION['id']) . "," . $html . ")");

}

$revision = "";

if (!empty($_POST['set_priority'])) {

    $priority = intval(ZESA_POST('priority'));

    if ($priority < 0 || $priority > 3) {

        ZESA_error($ZESAlang['select_priority']);

    }

}

$options = array(

    0 => '<span class="critical">' . $ZESAlang['critical'] . '</span>',

    1 => '<span class="important">' . $ZESAlang['high'] . '</span>',

    2 => '<span class="medium">' . $ZESAlang['medium'] . '</span>',

    3 => $ZESAlang['low']

```

```

);

$revision = sprintf($ZESAlang['thist8'], ZESA_date(), $options[$priority],
$_SESSION['name'] . ' (' . $_SESSION['user'] . ')');

$priority_sql = ", `priority`='\$priority', `history`=CONCAT('history',"
ZESA_dbEscape($revision) . ") ";

} else {

$priority_sql = "";

}

$defaultStatusReplyStatus = ZESA_dbFetchAssoc(ZESA_dbQuery("SELECT `ID`,
`IsClosed` FROM `` . ZESA_dbEscape($ZESA_settings['db_prefix']) . "statuses`
WHERE `IsDefaultStaffReplyStatus` = 1 LIMIT 1"));

$staffClosedCheckboxStatus = ZESA_dbFetchAssoc(ZESA_dbQuery("SELECT
`ID`, `IsClosed` FROM `` . ZESA_dbEscape($ZESA_settings['db_prefix']) . "statuses`
WHERE `IsStaffClosedOption` = 1 LIMIT 1"));

$lockedTicketStatus = ZESA_dbFetchAssoc(ZESA_dbQuery("SELECT `ID` FROM
`` . ZESA_dbEscape($ZESA_settings['db_prefix']) . "statuses` WHERE
`LockedTicketStatus` = 1 LIMIT 1"));

if (!empty($_POST['assign_self']) && (ZESA_checkPermission('can_assign_self', 0)
|| (isset($_REQUEST['isManager']) && $_REQUEST['isManager']))) {

$revision = sprintf($ZESAlang['thist2'], ZESA_date(), $_SESSION['name'] . ' ('
$_SESSION['user'] . ')', $_SESSION['name'] . ' (' . $_SESSION['user'] . ')');

$sql .= " , `owner`=" . intval($_SESSION['id']) . " , `history`=CONCAT('history',"
. ZESA_dbEscape($revision) . ") ";

}

$sql .= " $priority_sql ";

$sql .= " $sql_status ";

```



```

if (!$ticket['firstreplyby']) {
    $sql .= " , `firstreply`=NOW(), `firstreplyby`=" . intval($_SESSION['id']) . " ";
}

$sql .= " , `replies`=`replies`+1 ";

$sql .= $submit_as_customer ? " : " , `staffreplies`=`staffreplies`+1 ";

$sql .= " WHERE `id`='{ $replyto }' LIMIT 1";

ZESA_dbQuery($sql);

unset($sql);

ZESA_dbQuery("UPDATE `". ZESA_dbEscape($ZESA_settings['db_pfix']) .
"users` SET `replies`=`replies`+1 WHERE `id`='" . intval($_SESSION['id']) . "'
LIMIT 1");

$info = array(
    'email' => $ticket['email'],
    'category' => $ticket['category'],
    'priority' => $ticket['priority'],
    'owner' => $ticket['owner'],
    'trackid' => $ticket['trackid'],
    'status' => $new_status,
    'name' => $ticket['name'],
    'lastreplier' => ($submit_as_customer ? $ticket['name'] : $_SESSION['name']),
    'subject' => $ticket['subject'],
    'message' => stripslashes($message),
    'attachments' => $myattachments,
    'dt' => ZESA_date($ticket['dt'], true),
    'lastchange' => ZESA_date($ticket['lastchange'], true),

```

```
'id' => $ticket['id'],  
'language' => $ticket['language']  
);
```

Print reports

```
$sql_final = "SELECT  
`id`,  
`trackid`,  
`name`,  
`email`,  
`category`,  
`priority`,  
`subject`,  
LEFT(`message`, 400) AS `message`,  
`dt`,  
`lastchange`,  
`firstreply`,  
`closedat`,  
`status`,  
`openedby`,  
`firstreplyby`,  
`closedby`,  
`replies`,  
`staffreplies`,  
`owner`,  
`time_worked`,  
`lastreplier`,
```

```

`replierid`,
`archive`,
`locked`,
`merged`
";

foreach ($ZESA_settings['custom_fields'] as $k => $v) {
    if ($v['use']) {
        $sql_final .= ", `". $k . "`";
    }
}

$sql_count = "SELECT COUNT(*) FROM `".
ZESA_dbEscape($ZESA_settings['db_pfix']). "tickets` WHERE ";

// This is common SQL for both queries
$sql = "";

// Some default settings
$archive = array(1 => 0, 2 => 0);
$s_my = array(1 => 1, 2 => 1);
$s_ot = array(1 => 1, 2 => 1);
$s_un = array(1 => 1, 2 => 1);
$category = intval(ZESA_GET('category', 0));
if ($category && ZESA_okCategory($category, 0)) {
    $sql .= " `category`='{ $category}' ";
} // No category selected, show only allowed categories

```

```

else {
    $sql .= ZESA_myCategories();
}

if (!empty($_GET['archive'])) {
    $archive[1] = 1;
    $sql .= " AND `archive`='1' ";
}

// Ticket owner preferences
$fid = 1;
require(ZESAIT TICKET. 'inc/assignment_search.inc.php');

// --> TICKET STATUS
$statuses = mfh_getAllStatuses();
$totalStatuses = 0;
$possible_status = array();
foreach ($statuses as $row) {
    $possible_status[$row['ID']] = $row['ID'];
    $totalStatuses++;
}
$status = $possible_status;

// Process statuses unless overridden with "s_all" variable
if (!ZESA_GET('s_all')) {
    foreach ($status as $k => $v) {
        if (empty($_GET['s' . $v])) {
            unset($status[$k]);
        }
    }
}

```

```

    }
}
}
$tmp = count($status);
if ($tmp < $totalStatuses) {
if ($tmp == 0) {
    $status = $possible_status;
    foreach ($statuses as $row) {
        if ($row['IsClosed'] == 0) {
            continue;
        }

        unset($status[$row['ID']]);
    }
}

// Add to the SQL
$sql .= " AND `status` IN (" . implode(",", array_keys($status)) . ") ";
}

$possible_priority = array(
    0 => 'CRITICAL',
    1 => 'HIGH',
    2 => 'MEDIUM',
    3 => 'LOW',
);

$priority = $possible_priority;

```

```

foreach ($priority as $k => $v) {
    if (empty($_GET['p' . $k])) {
        unset($priority[$k]);
    }
}

$tmp = count($priority);
if ($tmp == 0 || $tmp == 4) {
    // Nothing or all selected, no need to modify the SQL code
    $priority = $possible_priority;
} else {
    // A custom selection of priorities
    $sql .= " AND `priority` IN (" . implode(",", array_keys($priority)) . ") ";
}

// That's all the SQL we need for count
$sql_count .= $sql;
$sql = $sql_final . $sql;

// Prepare variables used in search and forms
require(ZESAITTICKET_PATH . 'inc/prepare_ticket_search.inc.php');

// List tickets?
if (!isset($_SESSION['hide']['ticket_list'])) {
    $href = 'show_tickets.php';
    require(ZESAITTICKET_PATH . 'inc/ticket_list.inc.php');
}

```

