Online requisition system for petty cash, transport and subsistence and salary advances for Centre for Sexual Health HIV and Aids Research (Zimbabwe)CeSHHAR

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Online requisition system for Petty cash, T&S and Salary advances

BY

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ABSTRACT

The primary purpose of this study was to document the problems of the current manual system and come up with a new online requisition system for petty cash, T&S and salary advances for CeSHHAR Zimbabwe.The system developer followed the steps outlined in the system development lifecycle which are, planning, analysis, design and implementation. In the introduction phase the developer introduced the organization and gave the aim and objectives of the research study. Feasibility studies were conducted to evaluate the technical, economic, social and operational feasibility of the system. The developer used interviews, questionnaires, observations and focus group discussions to gather information on the current system in the analysis phase. During the design stage, different design tools like UML diagrams were used to come up with the database structure of the system and interfaces were designed. Finally implementation was done in the final stage and the pseudo code was converted to source code using PHP and MySQL database. Although currently the system has been placed on a server there are plans to have in embedded on the CeSHHAR's website and also add more functions to the system.

DECLARATION

I **Sithembile Musemburi** do hereby declare that I am the sole author of this dissertation; I authorize the Midlands State University to lend this dissertation to other institutions or individuals for the purpose of scholarly research.

Signature…………………………. Date ……………………………..

APPROVAL

This dissertation entitled Online requisition system for Petty cash, T&S and Salary advances for CeSHHAR Zimbabwe by Sithembile Musemburi meets the regulations governing the award of the degree of Computer Science Honours of the Midlands State University, and was approved for its contribution to knowledge and literary presentation.

Supervisor……………………………. Date ……………………………………..

ACKNOWLEDGEMENTS

DEDICATION

I would like to dedicate this project to my husband Wellington Musemburi, my daughters Kupakwashe and Ngaakudzweishe, for bearing with me when I could not be there for them as a mother and a wife because I was attending lectures, and to my late mother Ms Patricia Zinyemba, I have finally done it and I know she would have been proud of me. I just wish she was were here to witness this.

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LIST OF ACRONYMS

AIDS..AQUIRED IMMUNO DEFICIENCY SYNDROME

CBA……………………………………………………………………..COST BENEFIT ANALYSIS

CₑSHHAR ....CENTRE FOR SEXUAL HEALTH HIV AND AIDS RESEARCH

HIV ....HUMAN IMMUNO DEFICIENCY SYNDROME

HTML……………………………………………………HYPER TEXT MARKUP LANGUAGE

NFRs…………………………………………………………….NON FUNCTIONAL REQUIREMENTS

NPV……………………………………………………………………….NET PRESENT VALUE

PHP…………………………………………………………….……HYPER TEXT PREPROCESSOR

ROI.…………………………………………………………………...RETURN ON INVESTMENT

T&S……………………………………………………………………TRANSPORT AND SUBSISTENCE

UML…………………………………………………………...UNIFIED MODELLING LANGUAGE

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CHAPTER 1
Introduction

1.0 INTRODUCTION

The online requisition system sought to automate the process of making requests and approving these requests thereby increasing efficiency and productivity within the Center for Sexual Health and HIV /AIDS Research Zimbabwe (CeSHHAR Zimbabwe). The system would handle requisitions for Travel and Subsistence allowances (T&S), salary advances and pretty cash.

This chapter gave the background of the organization for this project which is CeSHHAR Zimbabwe, its mission, vision, core values and show how the organization is structured. The chapter also sought to justify why there was need for the system and gave objectives that the system sought to achieve. Tools and methods that were used in developing the system were also highlighted in this chapter.

1.1 BACKGROUND

1.1.1 Background of Organisation

The Center for Sexual Health and HIV /AIDS Research Zimbabwe (CeSHHAR Zimbabwe) former Regai Dzive Shiri Project was registered as a trust in Zimbabwe in 2012.It has operated in Zimbabwe since 1999(https://www.sites.google.com).

The research organisation houses a number of HIV prevention and sexual reproductive health projects which has seen it grow and open a number of sites in different areas of Zimbabwe with its main office in Harare. The staff compliment of CeSHHAR Zimbabwe consists of epidemiologists, social scientist, public health specialist and a data team. Currently between the Sex Work project and Early Infant Male Circumcision projects, the organisation has about 8 static sites with 3 in Harare, and one in Bulawayo, Mutare, Masvingo, Gweru and Karoi and about 30 mobile sites.

1.1.2 Organizational Structure

CeSHHAR Zimbabwe Organogram
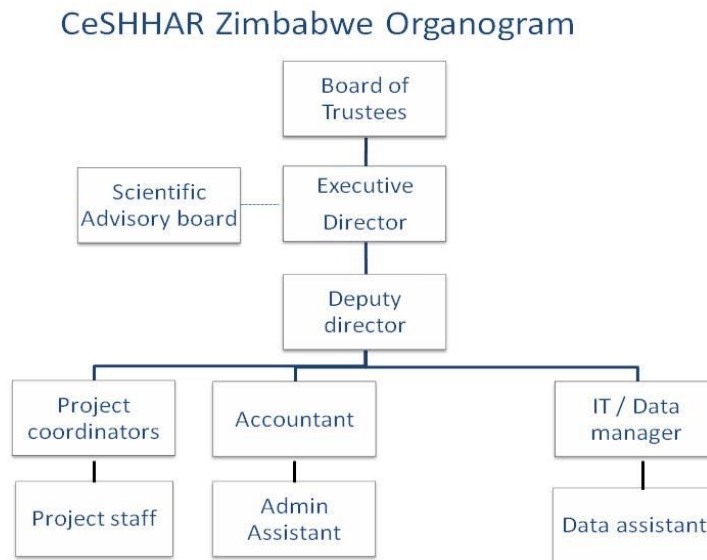
Fig 1.1 Organogram *Source: CeSHHAR Zimbabwe Strategic Plan 2012*

1.1.3 Vision

To be a center of excellence in research, education and capacity strengthening for sexual and reproductive health and HIV/AIDS

1.1.4 Mission Statement

To support development of evidence-based reproductive health and HIV programming and policy making in Zimbabwe through collaborative research, education, capacity building and community engagement.

1.1.5 Values and Principles

- Locally-appropriate, culturally relevant research informed by the public health needs of Zimbabwe
- Ethically sound research guided by local and international guidelines and regulations

- Striving for excellence and innovation in reproductive health and HIV programming and research
- Community engagement to ensure sustainability and ownership of programs
- Transparency in organizational processes and dissemination of information
- Cost effectiveness
- Inclusive of all regardless of gender, culture and economic status

1.2 PROBLEM DEFINITION

Although CeSHHAR Zimbabwe has managed to keep abreast with technology in most of its operations, there is need for a system which will provide employees with an interface where they can make requisitions for petty cash, travel and subsistence and salary advances.

Currently all these processes are centralised and done manually using paper based forms such that employees have to send in forms to the main office from the different sites either through mail delivery services or in person thus delaying the processing part. The employees would complete two copies of a requisition, send it to their supervisor for authorisation, then to the finance manager for approval before taking the forms to the accountant for checking who then hands the requests over to the accounts clerk for processing. At times offsite staff would have to ask a member of their project to complete requests on their behalf if they are offsite to speed up the process as compared to sending the forms but this also led to problems with auditing because at times the one whose name is on the request is not the one who used the money should there be any queries concerning the requisition.

The current challenges faced by CeSHHAR are that with paper forms, one has to be onsite to make their request or make sure the request has been signed by the responsible office and is being processed. This has led to great delays in decision making thus affecting operations of the various projects which would be dependent on the requests. With salary advances, there have been situations whereby employees have been allocated advance salaries twice within the same month as they had completed two forms because the first copy had been misplaced and both copies were then included in the batch for processing which is against the company policy. The use of paper forms has resulted on some offsite offices using old version forms to make requests and their requests being denied as a result of this. This is costing the organisation not only in terms of mailing costs but also cost of stationery as versions change make the printed forms to become absolute and a waste of money.

As CeSHHAR continues to grow and more projects are carried out the above situation is likely to worsen if not addressed. The management being aware of the challenges that the organisation is already facing then tasked the researcher to create a system for CeSHHAR Zimbabwe to automate these processes.

1.3 AIM

The aim of this research study is to create a system to automate the process of requesting for Travel and subsistence allowances, salary advances and petty cash at CeSHHAR Zimbabwe.

1.4 OBJECTIVES

1. To develop a system that will automate the process of petty cash requisition, travel and subsistence requisition and advance salary requisitions.
2. To promote use of the system by designing a system that has a user friendly interface and is easy to use
3. To create a system that will calculate T&S amounts to be allocated to staff upon entering details for the planned trips.
4. To design a system that will enable staff to send in petty cash, T&S and advance salary requisitions online
5. To have employees fully adopt the system within 6 months of implementation
6. To create a system that will enable users to track the status of their requisitions online

1.5 HYPOTHESIS

To solve the problems faced by CeSHHAR there is need to computerize the manual system. The computerized system would be able to process information quickly whilst maintaining data integrity. For this system the developer is going to use a range of Microsoft based software tools, which include:

- Joomla, which is a system that manages content and also enables users to build websites and online applications
- Mysql server database which is a scalable and robust relational database system

- Php which is a server side scripting language flexible enough to cater for my web needs.
- Fireworks and Photoshop for editing images
- Apache web server

The developer chose these packages because they compatible with most versions of windows operating systems from windows XP to the latest version, they are also open software packages that are easy to use and requires little technical skill.

1.6 JUSTIFICATION

As CeSHHAR has many employees in different sites, processing of requisitions at the main office is now difficult and is slowing progress of operations at these sites. This system will eliminate the risks associated with using paper based forms, which includes duplication of records, delayed processing of requisitions and also over stating travel and subsistence allowances. The system will use user's input to determine how much the staff should be able requesting for as T&S allowances and the funds are to be acquitted upon returning. The system will also enable employees to make requisitions for petty cash and salary advances from their respective sites of duty without having to go through the hustle of travelling to the head office in Harare or sending such confidential information through other individuals or postal services.

The use of hard copies of forms has led to situations where by staff have used old versions of forms either by mistake or because they were not informed of version changes, the new online system will mitigate against this risk. The use of postal services in sending confidential company forms poses a security risk of documents falling into the wrong hands and being used in fraudulent cases for example the company logo or letter head. At times documents get lost and don't reach the intended recipients which can disrupt operations and planning for example if the requisition forms do not reach the accounts office, a site might not get petty cash for their day to day running for the following month. The new system will improve efficiency and staff performance in their operations since the requisitions will be processed on time.

1.7 CONCLUSION

This chapter has brought to light the problems currently being ecountered by CeSHHAR as a result of the manual system in use for making requisitions and the potential benefits of the proposed system if it is a success.

CHAPTER 2

Planning phase

2.0 INTRODUCTION

This phase looks at how project resources are going to be used and enlists all the activities that will be carried out during the development of this system. A feasibility study is also carried out at this stage to see if it is viable to embark on this project considering different factors like cost benefit analysis before proceeding to develop the system. For the developer to be able to establish if the project can be successfully undertaken, the developer performs a feasibility and risk analysis, which is what this chapter is going to look at.

2.1 WHY BUILD THE SYSTEM

The proposed project entails automating the requisition system at CeSHHAR. The system seeks to address the following business needs at the organization:-

- Improved employee satisfaction due to increased efficiency in processing requests
- Reduced data redundancy
- Provide an audit trail of all requests and back up of the system
- Access control will assist in security of the system users as they will be assigned passwords and access levels
- Reduction of workload for workers involved in the processing of requisitions as the system will be handling some of the duties that were being done manually duties such as calculating the T& S amount to be applied for.

2.2 BUSINESS VALUE

At this stage the developer seeks to highlight the expected benefits that are going to be derived from implementing this proposed system.

These are:-

- Cost reduction in stationery (no more hard copy forms)
- Cost reduction in postal fees to send requisition forms

- Improvement of employee satisfaction as a result of increased efficiency in processing requisitions
- Improvement of corporate image of the organization to current and potential funders
- Improvement of the quality of data and data integrity pertaining to these requisitions.

The proposed system is expected to have the following functionalities:-

- Allow employees to make T&S, petty cash and salary advance requisitions online
- Calculate allowances to be given to staff for trips using departure and return data from the applicant
- Verify and validate input data
- Produce ad-hoc or periodic reports
- Notify applicants of the status of their requisition

2.2.1 Tangible benefits

- Reduction of day to day running costs as a result of reduced stationery requirements.
- Increased efficiency in making requisitions
- Improved data integrity and back up of all requisitions
- Reduced labour in applying for T&S as the system calculates automatically how much one should get

2.2.2 Intangible Benefits

- Efficiency as staff will be able to meet schedules for their different projects
- Improved morale as requisitions will be processed faster
- Quick processing of requests

2.3 **FEASIBILITY ANALYSIS**

"Feasibility is a measure of how beneficial or practical the development of an information system will be to an organization" (stcbok.editme.com). It is in this phase that an assessment of the specified requirements are made and a decision is made upon analysing the proposed solution to the requirement specification. "The aims of a feasibility study are to find out whether the system is worth implementing and if it can be implemented, given the existing budget and schedule" (Sommervale 2008). The feasibility assesses the merits of the proposed system and is a preliminary review of the facts in order to determine whether to proceed with the project or not before resources are expended (http://osarome.blogspot.com).

According to James (2009), there are several feasibility factors that affect the development of a system, the main ones being technological, economic, legal and operational feasibilities. For this project, the following factors were taken into consideration:-technical, economic, social and operational feasibility In this feasibility study, the analysts identified risks that were associated with the project to ascertain whether it is cost effective to go ahead with the system or not. Should the feasibility study indicate that the system is not feasible then the developer would have to abandon the project.

2.3.1 Technical Feasibility

Technical feasibility assesses the current resources and technology which are required to accomplish user requirements in the software within the allocated time and budget (Khurana 2009). This means that technical feasibility is mainly concerned with the technical requirements for the project which are hardware and software and even technical skills and capabilities for developing the software. It is this feasibility that will answer the question whether the system can be built given the available hardware and software versus the constraint of time and other resources.

At CeSHHAR Zimbabwe, this project is deemed technically feasible as most of the hardware and software proposed for use in the development of the new system are available within the organization. The company also has the capacity to handle the development of the system as they already have computers with internet access at most of their sites. The organization also has enough in-house expertise as the developer of the

system has some experience in system development and will also be guided by the data manager who has more experience in developing systems. Also most of the employees at CeSHHAR are computer literate thus using the system will not much if a challenge. Currently most of the computers have the following specifications:

- Windows 7 /8 professional edition
- Office 2007/2013
- 1GB RAM
- 256 cache
- 200GB hard disk drive

2.3.2 Economic Feasibility

According to Agarwal et al (2008) economic feasibility "is concerned with whether cost savings and other types of benefits will exceed the cost of developing and operating the proposed system" In this feasibility, the developer tries to establish whether the proposed system would be successfully implemented taking into consideration the anticipated cost benefits, available funds and required funds for the development of the system. The developer is going to use various techniques to identify and weigh both the intangible and the tangible benefits against any likely threats and risks accompanying this project. If the cost of developing and operating the system outweighs the benefits then the project is not viable and should be abandoned.

The challenges of economic feasibility are :-

- Stakeholder's risk- Project was initially not included in the budget for the first quarter. There is need to seek alternative sponsors or source of finance for the project's success.

- Unreliable estimates- estimated costs of the project might be way below actual costs. An allowance should be made for unexpected increase in costs.

Year	2014	2015	2016	2017
	(USD$)	(USD$)	USD$)	USD$)
BENEFITS:				
Tangible Benefits				
Reduced Paperwork	400	550	650	750
Reduced Labour	500	500	600	700
Reduce postage costs	300	500	550	600
Total Benefits	**1200**	**1550**	**1800**	**2050**
COSTS				
Development Costs:				
Salary- System Analyst	750	0	0	0
Programmer	600	0	0	0
User Training	550	0	0	0
Total Development Costs	**1900**	**0**	**0**	**0**
Operating Costs:				
Stationery Costs	50	40	30	30
System Maintenance	0	50	60	75
Equipment Maintenance	100	75	100	200
Total Operational Costs	**150**	**165**	**190**	**305**
Total Costs	**2050**	**220**	**210**	**325**
Net Benefits	**-850**	**1385**	**1610**	**1745**

Table 2.1 Cost Benefit Analysis Table.

2.3.2.1 Tangible costs

These are costs that have a monetary value attached on them (*www.mgt.ncu.edu)*. These can be measured, for example in the development of this system, CeSHHAR will incur the following tangible costs:

- Hardware costs

- Salaries for the development team

- User training costs.

2.3.2.2 Intangible costs

These are costs that cannot have a monetary value attached. These include:

- Costs of operations incurred during training and implementation of the new system.
- Double work load during change over to the new system when parallel change strategy is used.

2.3.3 Operational Feasibility

Operational feasibility assesses the extent to which the required software performs a series of steps to solve business problems and user requirements (Khurana 2009). According to ISRD group (2006), operational feasibility is also dependent on a number of factors like how willing and able are the management, employees, clients and suppliers to operate and use the proposed system. To ascertain how operationally feasible this project is, a comparison will have to be done between the existing manual system and proposed system. Operational feasibility is also dependant on performance which is how efficient and accurate the system will be and how the proposed system will integrate with the organisation's activities (ISRD 2006).

To ensure that the project is operationally feasible, the developer is going to make sure that the system has the qualities of a good software which are maintainability, dependability, efficiency and usability (Jawadekar 2004). Not only is the system going to be easy to use and user friendly but users are also going to be trained on the use of the system for easy

adoptability. The system must also be flexible in that it allows for future adjustment and development as user requirements evolve with time.

2.3.4   Social Feasibility

"Social feasibility addresses the influences that a proposed system may have on the social system in the project environment." (stcbok.editme.com).There might be fear in the introduction of a new system that some employees might become redundant and lose their jobs as a result, with this system, it will just automate but will not eliminate the need for human effort as they still get to have the final say in processing the requests.

Under ethical concerns the users will have passwords that they are not supposed to share with anyone so that their credentials are not abused and requests are made on their behalf without their knowledge. This will actually help solve in of the problems in the current system that has seen some employees having made requests on behalf of colleagues and not being able to explain how the money was used as they were not the ones who actually used the money.

2.3.5 Cost benefit analysis:

According to MacManus (2004) CBA is a "systematic, quantitative method of assessing the life cycle costs, benefits and risks of competing alternative approaches". It is mostly used in the selection of a software project or in deciding whether to source from outside, buy off the shelf or do in-house development of the software. For this project, the following methods were used to evaluate and weigh the project on the basis of its cash flow projections:-net profit, return on investment and net present value.

a) Net Profit:

Net Profit is the difference between the total cost and total income over the life of a project (MacManus 2004).

The net profit of this particular project is calculated below

Net Profit $=$ **Total Benefits – Total Costs.**

$=$ (1200+ 1550+ 1800+2050) - 2805

$=$ **$3795**

The net profit of this project is $**3795 USD**

b) Return on Investment (ROI)

ROI refers to the amount of money that you can earn above the principal you apply to the investment" (Rico 2004). Also known as the Accounting Rate of Return (ARR), it can be used to compare the net profit against the investment required. ROI is used to calculate the viability of the project. It is the most widely used cost benefit analysis technique and is calculated using the percentage of profitability (Botcharev A., Andru P.2011).

ROI is expressed as a percentage and is calculated as follows:

ROI $=$ **(Average Annual Profit / Total Investment) * 100**

Where; Average Annual Profit = NP / # of years.

Assuming we want to make an analysis of 3 years for this particular project;

Average Annual Profit $= 3795 /3 = \underline{1265}$

ROI $= (1265/ 2805) * 100$ $= \underline{45.09\%}$

The return on investment is positive. Ratio of income generated to investment is sufficient and favorable.

c) NPV

Net present value can be defined as "the value of today's money in the future less inflation" (Rico 2004) .Using this method, the risk(s) associated with the development of the project can be calculated. The higher the perceived risk, the higher the discount rate applied .This means that in order to achieve a positive NPV, there is need for high revenue.

The formula for calculating NPV is:

$$A=P\ (1+R)^N$$

Where A= future value of capital invested

   P= present capital invested

   R= discount rate

   N= Number of years for which the capital is invested

Using the data from cost benefit analysis table for this project, the NPV for this project using a discount rate of 10% per year will be calculated as follows:

Year	Value in year	Discount rate	
0	-850	1	-850
1	1385	0.9091	1259.10
2	1610	0.8264	1330.50
3	1745	0.6830	1191.84
NPV			2931.44

Table 2.2 Net Present Value for 3 years

Basing on the above techniques of evaluating economic feasibility, it can be safely concluded that the proposed system is economically viable since the benefits outweigh the costs in the

first 3 years of implementing the system therefore the developer can proceed with developing the system.

2.4 **RISK ANALYSIS**

Every project has a level of risk associated with it , that may affect the outcome. Therefore it is crucial when working on a project to identify the risks, monitor the risks and develop contingent plans to either reduce the risk or mitigate against the risk. This reduces the effect that these threatened risk will have on the project thus saving costs of rectifying the situation when it occurs.

2.4.1 Risk Management

Risk management is where by risks have been anticipated, identified and contingency plans prepared to contain the effects of the risks on the development of the project. The main purpose of risk management is to reduce the impact that a risk can have on the project that might derail the progress or even the success of the project (J Bart N.D).

2.4.2   Identified Risks

- The system may fail to meet expectations of the users in terms of the user interface

- The users may have difficulty maintaining the system or restoring should the system malfunction or crash. There might be need to back up data daily to reduce the risks of data loss. After implementation, support for the system and maintenance of the proposed system needs to be offered until users are confident with the new system and are able to operate it on their own

- Power cuts- unscheduled power cuts are bound to affect the performance of the proposed system so there is need for a generator as a backup power source
- User requirements may change-to mitigate against this update and briefing meetings will be held key stakeholders during the development of the system, so that risks can be identified early and incorporated during the early stages of development.
- Virus attacks- Antivirus software need to be installed and updated frequently.

2.4.3 Mitigations of some of the identified risks

This stage involves coming up with contingency plans to mitigate against risks that can hinder the smooth completion of the project as a whole:-

- Changes in Requirements: System requirements may change along project development.
    - Countermeasure: Frequent meetings between stakeholder and the developer before and after each project development stage so that changes to requirements are identified early and incorporated into the system.
- Input errors – errors that will be done by the system users. Such a threat is very likely to occur and this tends to affect data integrity.
    - Countermeasure: the system will validate every data inputted to the system so as to reduce the rate of unwanted input errors. The system will also be validate inputted data to reduce data inconsistence and also be trained on how to use the system.
- Virus – viruses are programs that perform unwanted processes. Since the system is uploaded on networked computers it will be prone to virus attacks.
    - Countermeasure: Antivirus software will be installed so as to detect and quarantine the affected files.
- Unauthorized users – these pause a great threat to the system as they can cause harm to the organization should they have access to confidential information.
    - Countermeasure: Use of strong passwords to access the system and access levels will determine what kind of information a user is allowed to access
- Power cuts – high occurrence of unscheduled power cuts may affect the computer hardware and might cause the machines to malfunction.
    - Countermeasure: An Uninterrupted Power Supply is already in place so that if electricity is down machines will not be affected. Also CeSHHAR has a generator that automatically switches on in case of power cuts ensuring that system is always on.

2.5 DEVELOP WORK PLAN

This involves identification of tasks to be developed, the selection of a software development system to be adopted and allocation of resources to task. For the development of this system, the developer has chosen to use the waterfall model. The waterfall model is an approach to software development that emphasizes completing a phase of the development before proceeding to the next phase (http://www.stsc.hill.af.mil).

This makes the development process more visible and easy to track the progress of the system as a level indicates that the preceding stages have been completed unlike other models like prototyping. The developer also chose the waterfall model because it has adequate documentation at each stage that will make it easier for future reference in maintaining the system.

Feasibility study

Requirements Analysis and
 specification

Design

Coding and unit testing

Integration & system testing

Maintenance
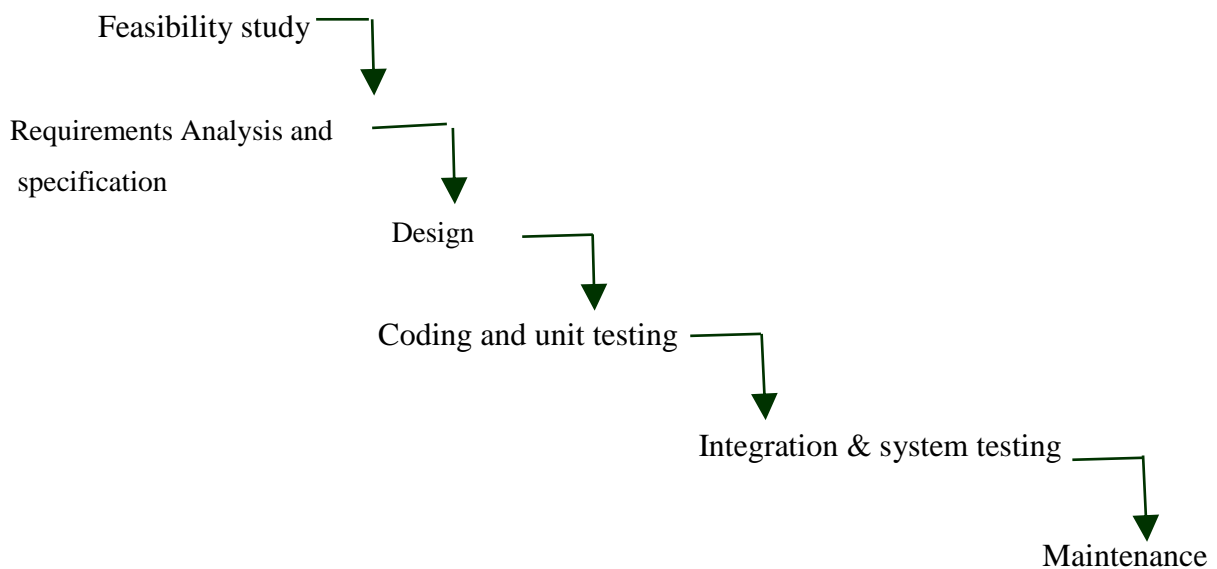
Fig 2.1: Classical waterfall model *Source: Mall (2004)*

The proposed system must be developed within the available scheduled time frame. The time has been allocated as illustrated below:

Phase	Start	End	Duration
Proposal writing	01/12/13	31/12/13	1month
Feasibility study	01/01/14	30/01/14	1month
Planning	01/02/14	18/02/14	2-3 weeks
Design	19/02/14	25/03/14	1 month
Implementation	26/03/14	10/04/14	2 weeks
Review	10/04/14	24/04/14	2 weeks
Maintenance	10/04/14	Ongoing	Ongoing

Table 2.3: Project Work Plan

The information in the work breakdown structure can be presented on the Gantt chart which is a technique that is popular and easy for task scheduling and reflects the time estimates for completing such a phase (http://www.gantt.com). It shows the estimated time taken to carry out the activities that are grouped into different phase. It is also an essential tool for a managing the schedule of a project.

	ACTIVITY	01-31 Dec	1- 30 Jan 14	1 - 28 Feb 14	01-30 Mar	April
1	Proposal writing					
2	Feasibility study					
3	Planning					
4	Design					
5	Implementation					
6	Review					
7	Maintenance(ongoing)					

Fig 2.2: Gantt chart

2.6 **CONCLUSION**

Based on the feasibility carried out above, it proves beyond doubt that the system is viable since the benefits outweigh the total costs and also the return on investment is above 50 %, this will enable the organization to continue with its operation. Against this break ground, the project can move to the next stage. The next phase entails analysis of the current system, where and how information will be gathered to find how the current system operates and its challenges.

CHAPTER 3
Analysis phase

3.0 INTRODUCTION

The analysis phase begins with information gained from the feasibility phase (Whitman and Mattord 2009). At this phase the existing current system is thoroughly scrutinized in order to understand what it is all about before designing the new system. This entails the development of the existing system's data flow diagrams and context diagrams. It explains fully all the information on who is currently using the system, identifies the input, processing and outputs of the existing system. The main objective of this phase is so that the analyst understands the importance, complexity and scope of the problem and ensure that the proposed system will support business requirements. It is also meant to help the analyst to be able to build a solid foundation for system development (psut.edu.jo) .

3.1 INFORMATION GATHERING METHODOLOGIES

The aim of this activity is to acquire detailed information from the current system users. This will in cooperate their views and ideas into the design phase. There are various methods of gathering information which include interviews, observation, document review and questionnaires (http://nptel.ac.in). For this project, the developer used the following methodologies:

- Interviews
- Document review
- Questionnaires
- Focus group discussions

The above mentioned methods were used to cater for the different users of the system to be able to gather their attitudes and thoughts on the existing system. These methods also assist the analyst in getting a clear picture of the current system's problems and possible solutions. Each of these methods has its own strength and a weakness as far as data gathering methodologies are concerned.

3.1.1 Interviews

An interview is where-by information is collected from users face to face either through structured or unstructured interview questions (http://home.kku.ac).

10 employees who are involved in making requisitions for petty cash, T&S, and salary advances were asked questions pertaining to the efficiency of the system, its effectiveness and areas of concern which users felt needed improvement. Also 2 staff members from the finance and administration department were also interviewed on their take on the current system and what they felt could be done to improve efficiency.

In conducting the interview, the analyst first selected interviewees, designed the interview questions and then conducted the interviews. The interviews were conducted at CeSHHAR Zimbabwe offices in Harare from 24-28 February 2014 between 8am and 4pm according to the staff member's availability. The selection criteria for interviewees were those who would be able to provide the information that is required to understand how the current system operates, that is those who use the system frequently. The interview questions were designed in a way that would allow one to get as much information as possible from the interviewee (open ended questions). Probing questions were asked to get some of the processed involved in making requisitions.

3.1.1.1 Advantages of interviews

- Allow direct communication with the users of the system thus the analyst got firsthand information about how the current system works and the existing problems which made it possible to correct misconceptions about the current system
- Feedback was provided quickly
- The setup and environment of the interview was effective as it enabled the analyst to obtain the required information since it was a one on one dialogue which promoted openness

3.1.1.2 Disadvantages of interviews

- It was costly and time consuming since it involved travelling to meet the selected personnel
- Some interviewees felt threatened by my presence as they consider me part of the management thus the information provided was sieved
- Some interviewees were reluctant to divulge a lot of information as they were afraid that their requests might be sabotaged in future for saying their views
- Interviewing was not possible in some cases due to the geographical location of the interviewees.

3.1.2   Document review

Documents review involves the examination of existing documentation in the problem domain (Patel 2005). For this project the analyst had an opportunity to assess the documents that are currently used in the system and the algorithm or sequence that they had to go through before being processed. The following source documents are being used in the current system requisition forms for petty cash, T&S and salary advances. These documents had to be completed by 4 people for them to be processed, these being the requester, the supervisor who approves, then the administrator who authorizes before the accountant checks and processes the requisition.

3.1.2.1 Advantages of document review

- Took less time than other methods as the documents were already in place
- Less costly as there were no communication, travel or stationery costs
- Method relied mostly on existing data

3.1.2.2 Disadvantages of document review

- Data might be outdated
- Scope of data collected was limited to what was available on the documents
- Data did not capture the feelings, attitudes and opinions of the users

3.1.3 Questionnaires

Questionnaires are a technique that can be used for fact finding in the development of systems. Unlike interviews, they are used to gather structured information, and because specific questions are used, clear data set is received from respondents and is easier to analyze. According to Patel (2005) questionnaires are said to provide an efficient means for reaching many people, which is not possible when compared to interviews or observations. With questionnaires, the developer was able to get the opinions of a larger number of people as compared to the interviews.

A number of questionnaires were distributed to employees who are involved in making requisitions for petty cash, T&S, and salary advances with questions pertaining to the efficiency of the system, its effectiveness and areas of concern which users felt needed improvement. Also some staff from the finance and administration department were also given the questionnaires so as to get their take on the current system and what they felt could be done to improve efficiency.

The questionnaires were designed in simple and clear way that would allow one to get as much information as possible from the respondents and not confuse them.

3.1.3.1 Advantages

- Allowed for anonymous input from respondents should not want to be identified
- Convenient for respondents as they could complete the questionnaires at their own time
- Allowed the gathering of information from a larger group of people
- The probability of getting true and genuine opinions was high because of the guaranteed confidentiality and anonymity

3.1.3.2 Disadvantages

- Some questions were left blank if respondents did not understand the questions or did not feel like answering them.

- Some of the answers were vague
- There was no opportunity to clarify questions that respondents did not understand
- Some respondents did not submit the questionnaires for review

3.1.4 Focus group discussions

"A focus group can be considered a group interview" (www.ournonprofitalliance.org). This means that like an interviewer information is collected face to face only that with focus group discussions there is a moderator who asks questions to a group of people. A focus group normally consists of between 8 -10 people who provide information during an interactive group discussion(http://www.aapcho.org). For this project, the developer selected a group of 10 users of the system and a focus group discussion was held on the 28th of February at CeSHHAR Harare offices.

3.1.4.1 Advantages of focus group discussions
- the interviewer selected her own group members for the discussion
- data was gathered more quicker and less costly than it was with individual interviews
- the interviewer was able to interact directly with the respondents and observe nonverbal cues during the discussion

3.1.4.2 Disadvantages of focus group discussions
- Respondents views were not independent from each other, there was a tendency to influence responses as a group
- The interviewer's nonverbal cues could also have influenced the response from the group members
- Progress was slow as it was hard to moderate and control the group

3.2 ANALYSIS OF EXISTING SYSTEM

Currently all these processes are centralized and done manually using paper based forms such that employees have to send in forms to the main office either through mail delivery services or in person thus delaying the processing part.

Currently all these processes are centralised and done manually using paper based forms such that employees have to send in forms to the main office from the different sites either through mail delivery services or in person thus delaying the processing part. The employees would complete two copies of a requisition, send it to their supervisor for authorisation, then to the finance manager for approval before taking the forms to the accountant for checking who then hands the requests over to the accounts clerk for processing. At times offsite staff would have to ask a member of their project to complete requests on their behalf if they are offsite to speed up the process as compared to sending the forms but this also led to problems with auditing because at times the one whose name is on the request is not the one who used the money should there be any queries concerning the requisition.

System performs the following:
- Approves requests
- Authorizes the requests
- Checks the request
- Processes the requests
- Dispenses the processed requests

All these procedures are done manually by certain individuals

Input
- Petty cash requisition form
- T&S form
- Salary Advance form

Process
Capturing details that is:
- Name of the requester
- Project
- Amount being requested

- Purpose for the request
- Name of authorizer, their designation and date
- Name of approver , their designation and date
- Name of checker , their designation and date

Output

- The requested funds
- Acknowledgement of receipt if given as cash

3.3 PROCESS ANALYSIS

The use of activity diagrams help in clearly showing the order in which the activities take place in the system.

Complete request form

Authorise request

authorised — NO →

YES

Approve request

approved — NO →

YES

check request

checked — NO →

YES

process request

disburse funds

[online diagramming & design] creately.com

KEY

initial/start of
activity

Activity

Decision   Flow end   Activity end
[online diagramming & design] creately.com
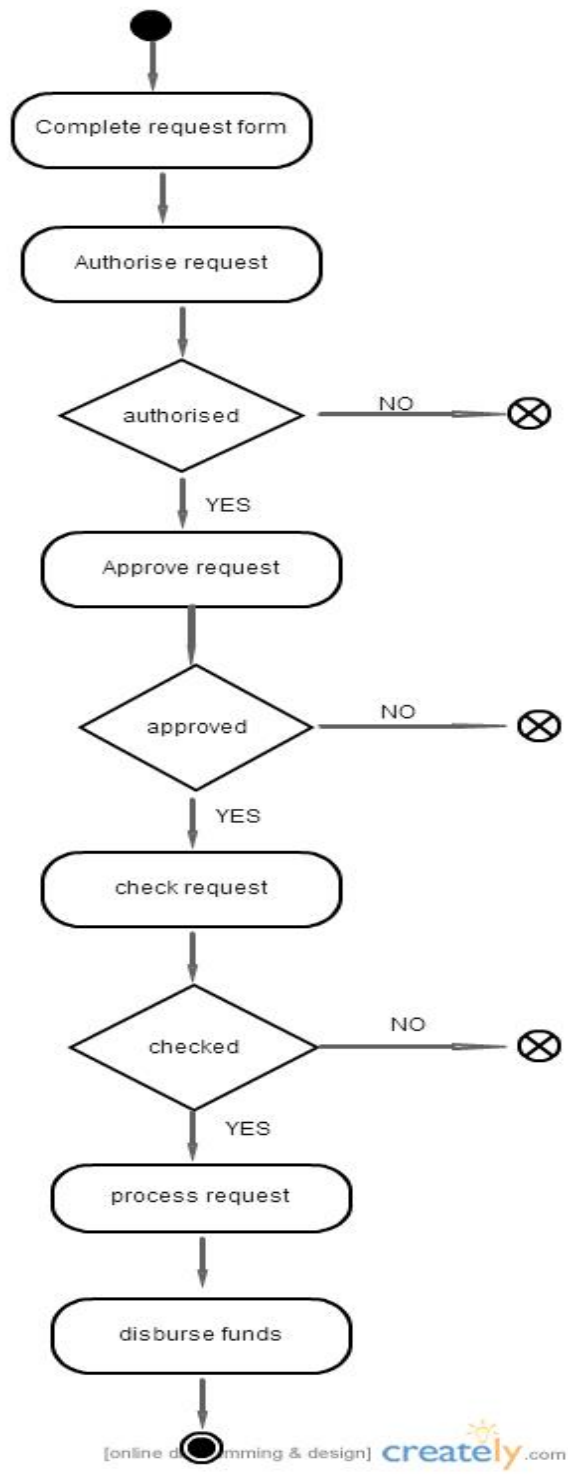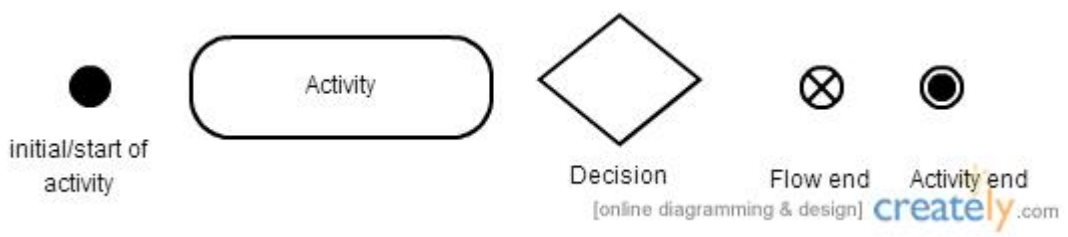
Fig 3.1 Activity diagram of the current system

3.4 DATA ANALYSIS

According to Modell (2007), data analysis has been defined as a set of processes and activities where the user's requirements are identified and the data elements needed to satisfy those requirements are also identified, defined, specified and then organized. This is done to show the activities that take place in the system.

3.4.1 Process modelling

According to Dittman (2004), a model is a picture that represents reality. From this statement it can be alluded that models help us understand the activities that occur in a system. The advantages of Process Modeling are:

- Little technical knowledge is needed, so that the flow chart can be used as a communication medium between users and analysts.
- Easier to understand and assimilate
- They assist the analyst to fully understand processes and sequence of operations

Staff e.g outreach worker

Withdraws the money
and either deposit into
an account or gives it
as cash

Accounts
clerk

Receives
the T&S

Requests for
example
T&S

CeSHHAR
Zimbabwe
Request
system

Checks if request is
justified

Checks if request has gone
through all the stages before
processing

Study
coordinator/
supervisor

Authorises request

Checks if request has been
authorised and approved

Accountant

Confirms the
request and sends
for processing

Approves the
request

Checks if the
request is
supported by
the budget and
if funds are
available

Finance and administration
manager

KEY

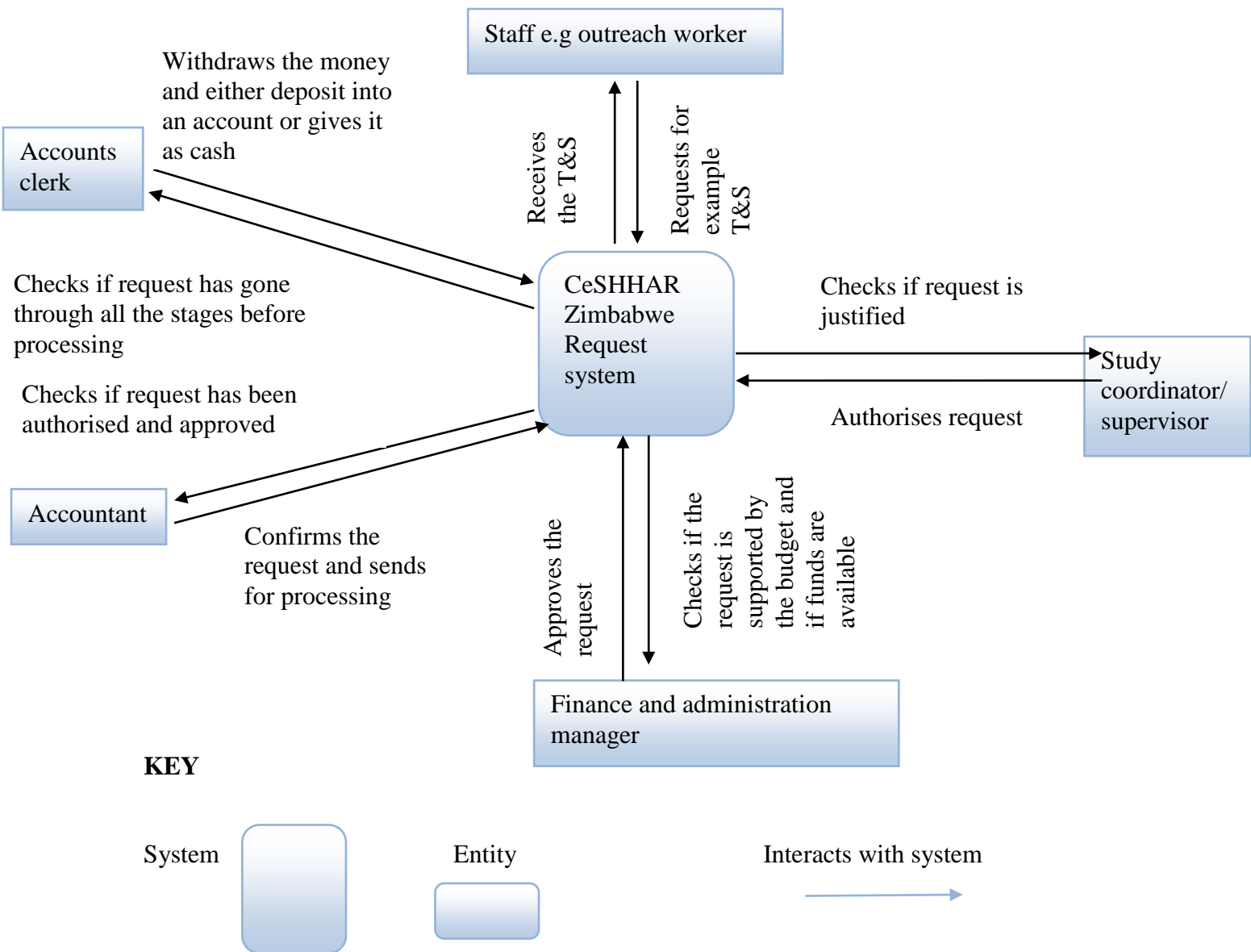System

Entity

Interacts with system

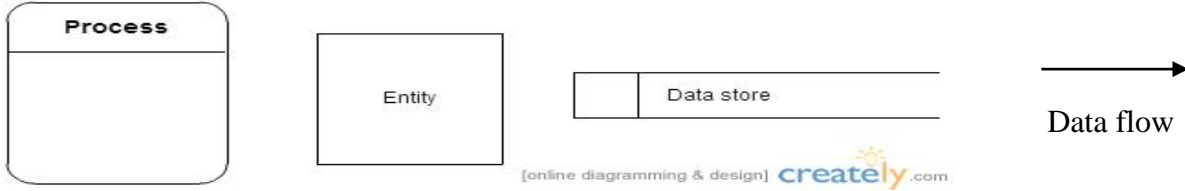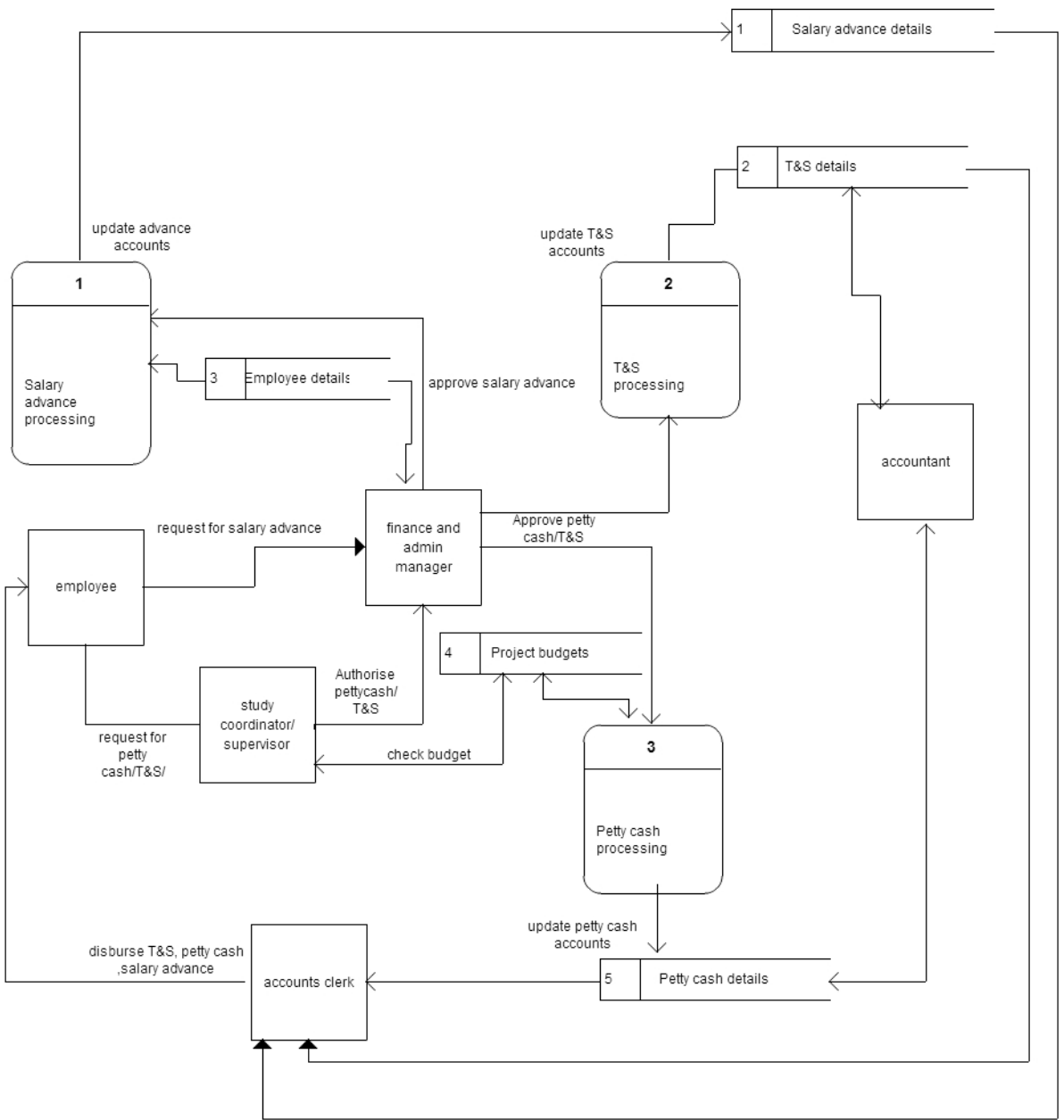**Fig 3.2 Context diagram of the current system**

Fig 3.3 DFD of the current system

3.5 WEAKNESSES OF CURRENT SYSTEM

- Most processes are centred on the presence of the finance manager as he has to physically place his signature to approve the request before it can be processed.
- Poor system security, everybody can access the information and other staff are able to request in behalf of others
- No audit trail is available.
- The process of preparation of reports by the accounts is cumbersome, labor intensive and monotonous. This is mainly caused by different storage files which are not integrated.
- Data duplication and too much paper circulating leading to reports which are not necessary and take time to be compiled
- Requests are sometimes misplaced along the way resulting in delays in processing of request and users having too complete another requisition form
- It is difficult to track the status of the request as users have to depend on the words of the accounts people
- delayed processing of requisitions
- over stating travel and subsistence allowances
- too many people involved in processing a request

3.5.1 Advantages

- The system is quite cheap and easy to maintain
- Manual system is flexible that is changes are easily accommodated when company needs change.
- Users are familiar with this manual system and no extra costs are incurred in hardware and   software   as compared to the proposed system, which has increased costs.

3.6 EVALUATE ALTERNATIVES

The major options or alternatives that exist in acquiring IT applications are buy, lease, develop in-house, or outsourcing a system from any other companies (Rahardjo 2006). In order to come up with the best possible solution for the proposed system , the developer weighed these various system alternatives that are available for the development and acquisition of the system. Research on their pros and cons was done and critically looked at.

3.6.1   Outsource

Outsourcing is said to be the use of outside resources to perform activities traditionally handled by internal staff and resources (Griffith 2001). This alternative is this scenario was no appropriate since the user requirements were not complete and precise. The other findings from outsourcing were that there was a high probability that some important functions of the system were not going to be included in the specification by the experts. Outsourcing option was discarded for the following reasons:

- Training cost will be increased as there will be constant reference to the developers for training and this might cause problems with the sponsors as they require that every cost should be as stated in the annual work plan budget.
- There will be need for external support of hardware and software.
- May be more expensive.
- Integration of the new system with existing manual system may prove to be difficult
- Less managerial control - It may be harder to manage the outsourcing service provider as compared to managing your own employees.
- Should the service provide go bankrupt or out of business, the company will have to look to a new service provider or take the process back in-house.

3.6.2   Improvement

Improvements or bespoke as they are sometimes called involves buying an already developed software package from software vendors and customizing or improving it so as to meet the user requirement of the organization(http://www.bcs.org).

Although this option has some advantages over outsourcing, however for this particular project is was not chosen because:-

- The product may not meet user expectations since organizations have different needs

- A purchased system rarely reflects the ideal solution that the business might achieve with an in-house developed system that could be customized to the precise expectations of management and the users.

- There are increased training costs as there will be constant reference to the developer for training and maintenance.

- Maintenance of the system will be difficult since it is not in house developed and upgrading it will also be difficult when need arises

- The software might have specific hardware and software needs

- The company will have to rely on the supplier for support

3.6.3 Development

This involves developing the system internally. This alternative was selected as the best in this scenarios as it did not involve making a huge adjustment on the budget as the costs involved are minimal as compared to the other alternatives. Outsourcing also has the following benefits:

- Most likely to meet user requirements compared to the other alternatives

- The organisation has total control over the software in terms of updates or improving it

- Increased accuracy, as the developer is part of the organisation understands user requirements

- The organisation has an opportunity to come up with a unique package that will differentiate it from the competition.

3.6.4 Conclusion of alternatives

Buying an off- the-shelf software package could not be chosen because of the high cost and the rigidity of the package. It is also costly to outsource the development of the system to an outsider because the training costs will be increased as there will be constant reference to the developer. Outsourcing the design of the system to outsiders is also costly in terms of user training, maintenance costs and technical support. The developer therefore concluded that it

was more advantageous to have a developer who had the knowledge of how the current system was working and also having the knowledge of how the new system required to ensure success of the project at a minimal cost.

3.7 REQUIREMENTS ANALYSIS

3.7.1 Functional Requirements

Functional requirements are "statements of services that the system should provide, how the system should react to particular inputs and how the system should behave in particular situations." (http://www.inf.ed.ac.uk).In essence these are the capabilities or the function that the system is expected to perform based on the user requirements. For this project these include:

- Use of a central database to enable real-time data capturing and manipulation to facilitate requisition of petty cash, salary advances and T & S allowances
- Use of passwords and usernames to access and modify data
- Use of report generating modules to produce correct and timely reports
- Status tracking of requests

The system shall:

- Capture travel details for T&S , salary advances and petty cash
- Calculate T&S due to user
- Notify the user when their request has been processed
- Validate data entry
- The system will be able to generate reports based on user desire and criteria.
- With the use of password the confidential information will be safe and the   system will make sure that the information does not fall in the hands of wrong people
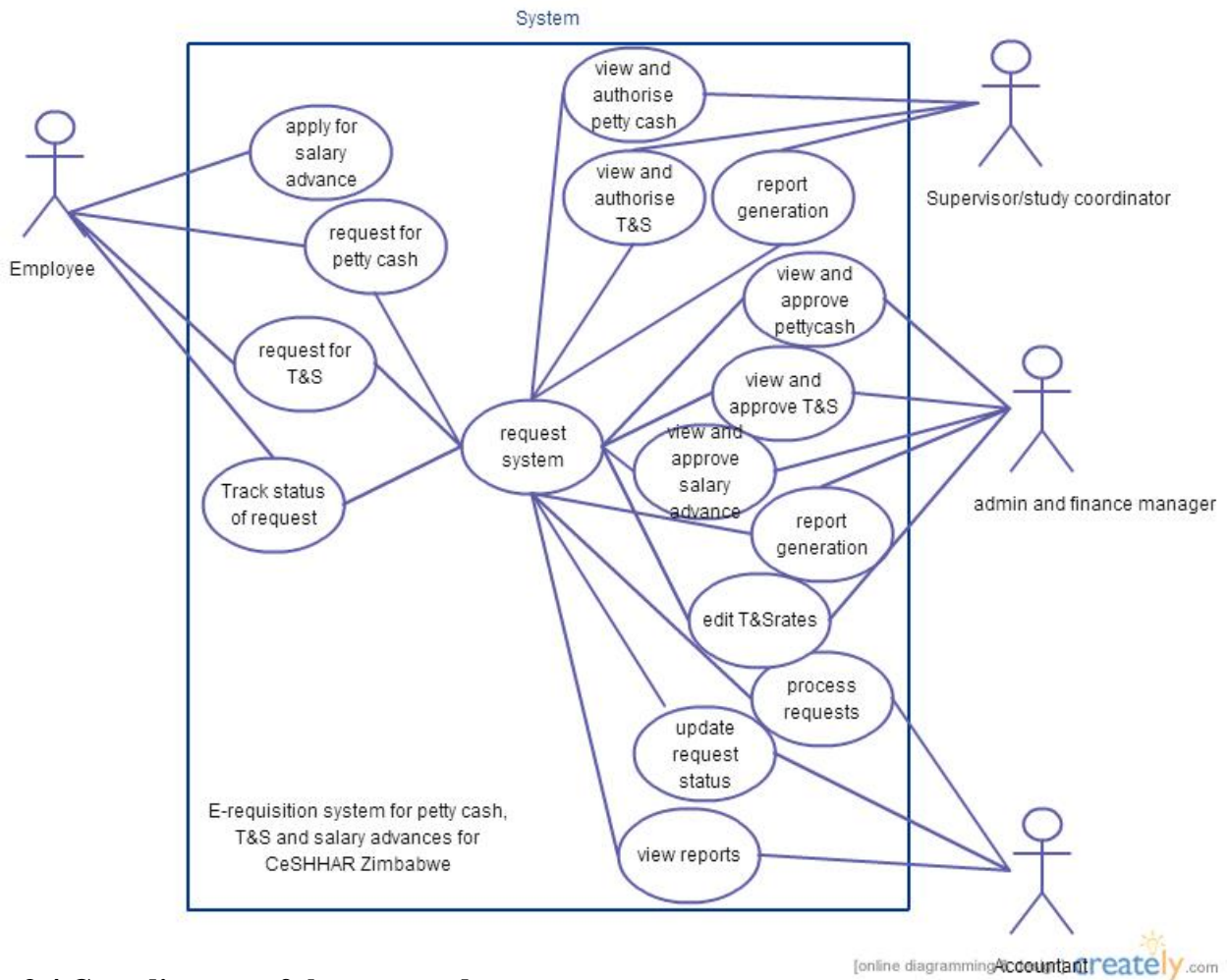- Be user friendly

Fig 3.4 Case diagram of the proposed system

3.7.2   Non-Functional requirements

Glinz (2007), defines non-functional requirements (NFRs) as those that define the non-behavioral aspects and constraints of a system. Every system has its boundaries which set limits to its operations, and the limits make up these constraints. The following are common NFRs:-

Performance

- The system must provide reliable performance in terms of throughput, response time.
- Must produce timely reports.
- Information- must be pertinent to user in terms of content, timeliness and accuracy format.
- Be able to run queries
- Be able to update the database on each and every transaction made.

Usability Requirements

- The system should have a user interface with self-explanatory menus that make it easy for the user to understand the functionality depicted by menu items.

Security Requirements

- Logon screen should be used to prevent unauthorized access to the system
- Users should be categorized by their privileges, and access to particular areas of the system should be determined by those privileges

Operating environment

The system should be running on Windows platforms. All this information obtained during analysis will be used for designing the new system.

3.7.3   Constraints

Technical constraints

In the development of the system the following maybe encountered during the different stages of development

- Not enough manpower to concentrate on different modules of the system
- The system developer has limited knowledge in developing systems of this scope.

Time constraints

More time is needed to complete the project as it encompasses the amalgamation of all modules that will be used within the system

3.8 CONCLUSION

From the alternatives presented above, it was unanimously agreed that in-house development of the system was the most apt alternative. Powered by this requirements specification, the designer can now proceed to the next chapter of designing the proposed system, thus the following chapter is dedicated to complete the design process of the system.

Chapter 4
Design phase

4.0 INTRODUCTION

According to Wang and Wang (2012), it is this phase that determines how the new system will be created. The requirements identified in the analysis stage provide an outline of how the new system should be designed. This phase focuses on how the new system will operate in terms of the logical and physical design of the system and also how software and hardware will relate.

4.1 SYSTEM DESIGN

System design according to Laplante (2004) can be defined as a process that converts the blueprint of the analysis phase into models or physical architecture of the solution that are needed for implementation. It is during system design that decisions are made on different aspects of the system for example the system's architecture, layering and modularization. The main focus of this stage is the detailed implementation of the system that was proposed in the previous phases of the system development life cycle (ISRD 2006).

The areas that need to be considered during this phase are:-
* Outputs-what output will be produced in what format
* Inputs-what data will be entered, how often, where it comes from and how it will be entered into the system
* File design-how many are needed and what will their structure be like
* Hardware- types of computers, printers and other hardware devices suitable for the system, details of the network if necessary
* Software- software packages that are going to be used for example access (http://doit.ort.org).

How the system will work

The system shall:
* Capture travel details for T&S , salary advances and petty cash
* Calculate T&S due to user

- Notify the user when their request has been processed

- Validate data entry

- The system will be able to generate reports based on user desire and criteria.

- With the use of password the confidential information will be safe and the system will make sure that the information does not fall in the hands of wrong people

- Be user friendly

- Shall provide project management at system level

- Users will be able to track the status of their requisitions

Operational Advantages

- Reduction of operational costs because of reduced stationery requirements.

- Increased efficiency in making requisitions

- Improved data integrity and back up of all requisitions

- Reduced labour in applying for T&S as the system calculates automatically how much one should get

- limited human intervention.

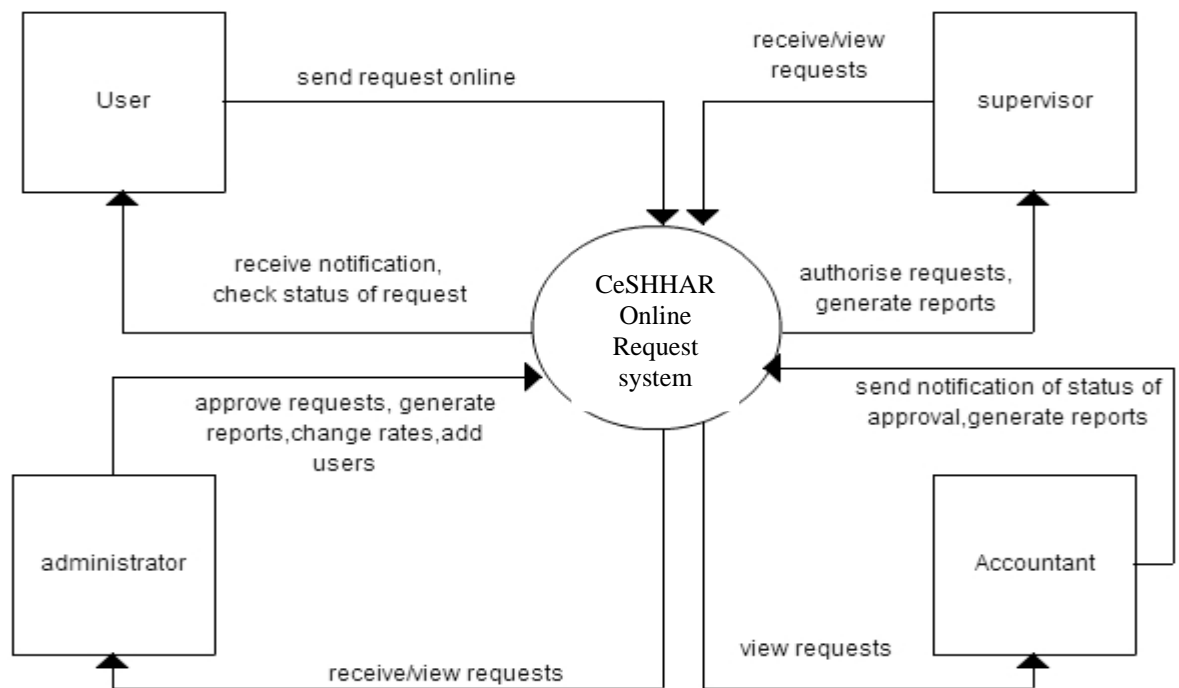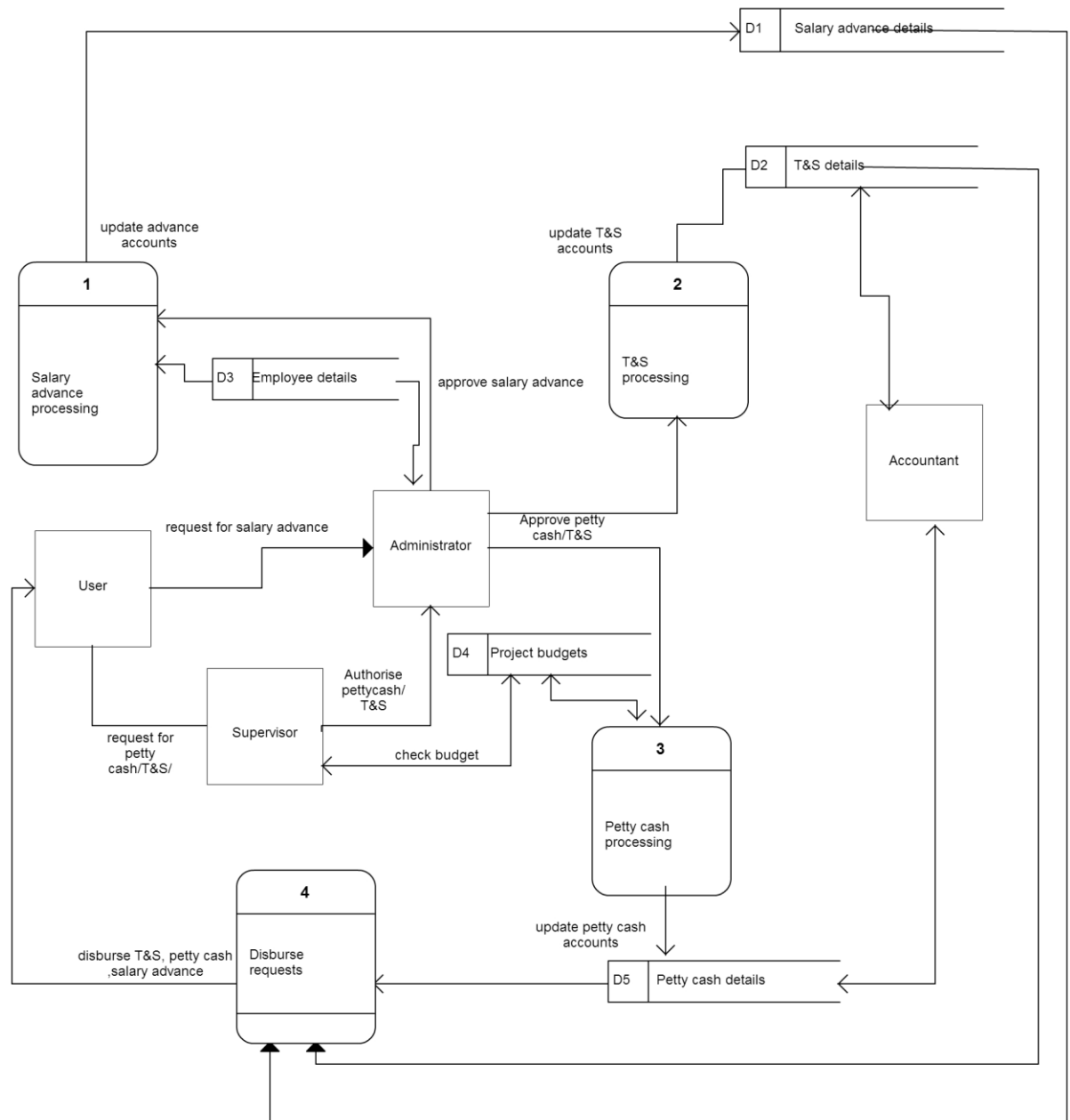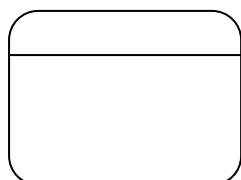**4.1.1 CONTEXT DIAGRAM -PROPOSED SYSTEM**

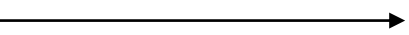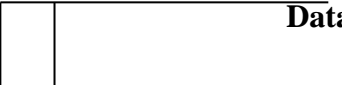**Fig 4.1 Context diagram for the proposed system**

KEY

Process

Entity

Data flow

Data store

Fig 4.2 DFD for the proposed system

4.2 ARCHITECTURAL DESIGN

According to Golden (n.d), this is a standard order of how to handle objects in systems in a manner that aids reasoning concerning the essential properties of these objects. Architectural design refers to the way in which data is arranged in a database. This design has 3 layers namely, physical, application and conceptual layer. The objective of architecture design is to ensure that there are no holdups caused by either hardware, architectural or software issues (http://docs.oracle.com). For the system to be efficient and effective, it needs to run on a hardware platform that is reliable and has an adequate back up system done regularly should the system get corrupted. Other measures which the analyst considered that also be put in place to reduce the negative effects of power cuts on the system are the installation of UPS system and a standby generator.

Client one   **Client two** ...... **Client n**

Internet

Web server   **Print server**   **Client server**
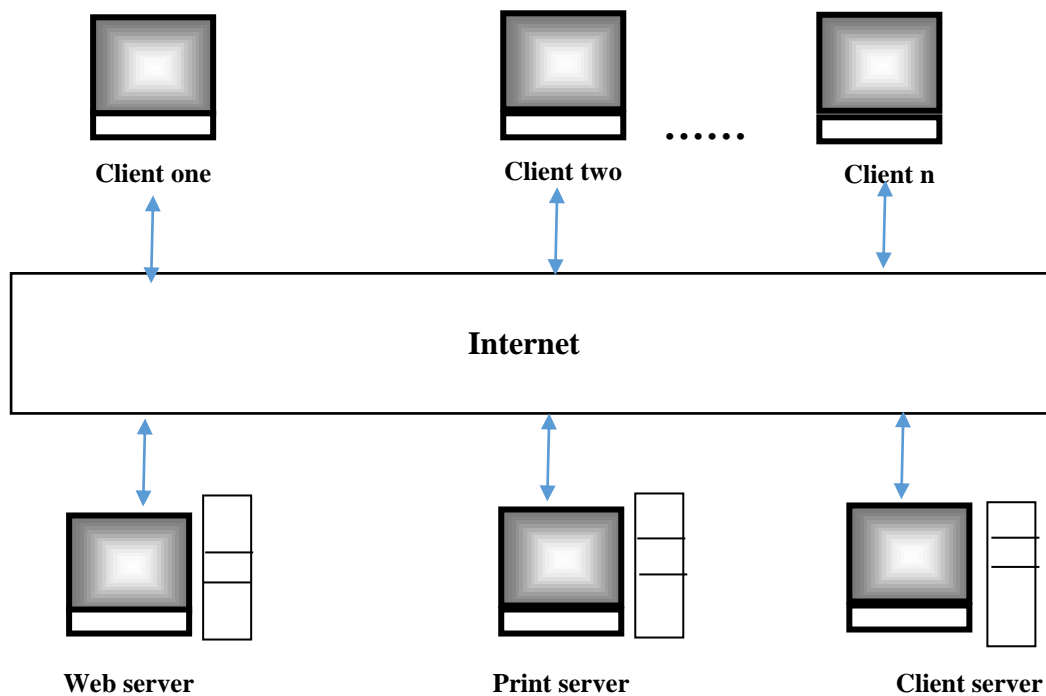
Fig 4.3 client server model *Source: Puntambekar (2008)*

The designer decided that the system be designed using the client-server architecture. The system will comprise the following:

- Web server is a computer which is meant for hosting websites or perform certain tasks for example-DNS translations (Jones 2006). This can be said to be where the graphic user interface web pages reside. They can be accessed through any the web browser. For this project an Apache web server is going to be used.

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- Database Server- is a networked computer that is committed to the storage and retrieval of the database. It holds the Database Management System and the databases allowing client machines to send requests to it and then it searches the database for the requested records before passing them back over the network (Thakur n.d).For this project a Mysql database server is going to be used.

4.2.1 Advantages of this architecture

According to Nazir(n.d) the following are advantages of using client server architecture:-

- It is flexible and scalable - if one server gets overloaded, another memory/ server is added and some of the applications and data are moved and stored to it as a result of this, it has the ability to provide service without affecting its performance as work load increases
- It saves money-costs of creating, maintaining and upgrading the server are minimal.
- It increases productivity-enables users to share and access files online
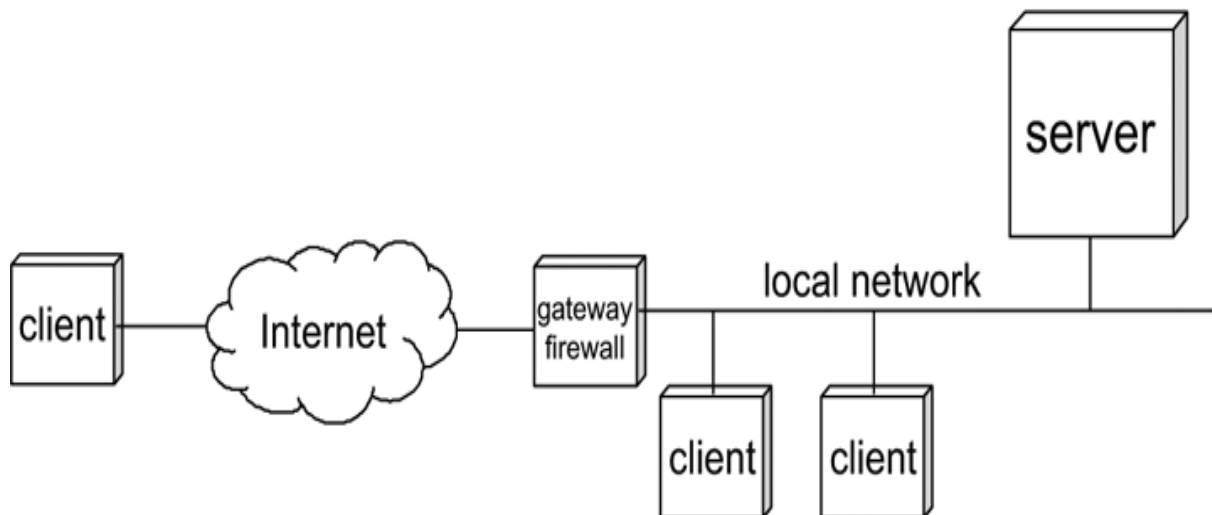- It enables centralized control of resources

Fig 4.4 The Network Architecture of the System

Source http://www.emeraldinsight.com/content_images/fig/2630280207002.png

4.3 PHYSICAL DESIGN

According to Shelly and Rosenblatt(2011), physical design is "the actual process of entering, verifying, and storing data; the physical layout of data files and storing data files and sorting procedures, the format of reports…"This can be said to be the transformation of the logical model into a practical or physical design. It encompasses the design of all software and hardware that this system will run on.

As the necessary hardware and software are already available for the system in this project, the machines using the system will be connected to the internet so as to access to the server

Hardware	Specifications
Desktop Computer	Intel Pentium V processor 3 GHZ 500GB Hard drive, 2GB memory
Printer	1005 HP Laser Jet printer, Drivers and interface cables

Table 4.1 Hardware Specifications

Software specifications

Software packages listed below will be required to support the running of the proposed system

Software Tool	Purpose
Kaspersky Antivirus	To protect the system from viruses which are a threat to the system
Windows xp and later versions	Operating system
Microsoft Office 2007 and later versions with email functionality	Email functions of the system.
Google chrome	For accessing the server via the internet.
Dreamweaver	Development of the system
Xampp	Server

Table 4.2 Software Specifications

Other network devices already available

- A hub
- Routers
- Switch

Back-up requirements
- server
- 500GB external hard drive
- UPS
- Drop box accounts

4.4 DATABASE DESIGN

Database design can either make a system to be a success or a failure. The success of a system mainly depends on how much the system is able to meet the specifications and requirements of the stakeholders and also the efficiency of the data store and processing. For this system to be successful, the database should warrant that the following characteristics of good data are maintained, integrity, consistency and reduction in data redundancy. There is also need for efficiency in the processing of the data thus the need for this stage in the design phase. For this system, a database management system has been chosen over a file based system and the following are stated as the main reason for using database management system,

(http://www.teach-ict.com):
- File integration to reduce and eliminate data redundancy.
- Use of passwords to protect the system from unauthorized users
- Database management system to incorporate data into one database
- Backup and recovery system for the proposed system
- Simultaneous database access
- Validation of all data inputs to improve data consistency

Physical database design

Mainly focuses on the architectural design of the database whose main emphasis is on the tables within the system and giving a detailed description of these tables. The schema describes the structure of the database specified during database design.

The database design phase is divided into 3 steps, which are, the conceptual, logical and physical database design (http://www2.amk.fi).

Diagrammatically this is represented as follows:-
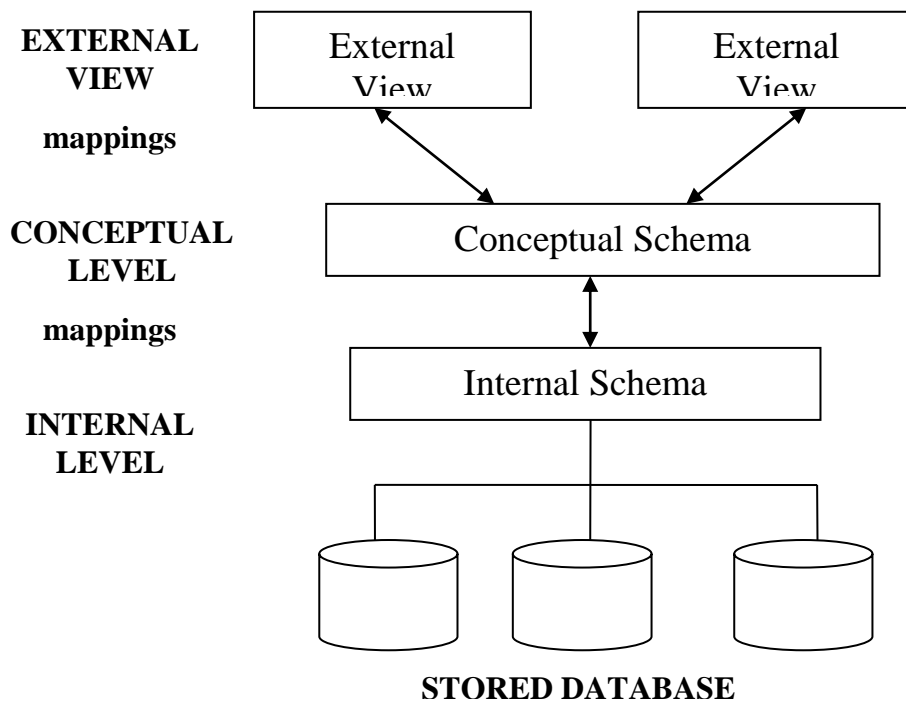
Fig 4.5 Database Abstraction Levels
Source: www.ctp.bilkent.edu.tr/~russell/ctp225/Chapter2Notes.doc

Internal Level: This is the lowest level and defines the physical structure of the data .According to Rob and Coronel (2007), the internal level represents how the database is perceived by the database management system. It is in this level that base relations, indexes, integrity constraints, security, are defined using the SQL language and the characteristics of the conceptual model are matched with the constraints of the implementation model.

Conceptual Level: This level describes the structure of the database for a community of users and also the relationships that exist amongst the data which is independent of any

physical considerations. It is mostly based on requirements specifications of the system and describes how different entities relate to each other showing the attributes of the different entities and results in entity relationship diagrams of the database (http://www2.amk.fi).

External View: This was described by Coronel et.al as the way the end user view the database (Coronel et.al 2014).It shows the highest level of abstraction and describes part of the database that is particular to a certain group of individuals making interaction and data manipulation easy for the specified group. Tables in the database can have the following relationships: -

- One to many
- Many to many

Logical database design: tables

Databases are the store houses of data used in the software system (http://www.ntchosting.com). A table is a collection of rows and columns, commonly known as tuples and attributes respectively. The table is designed has an impact on the efficiency of the software thus need for careful planning when coming up with these tables.

Database technology

The database will be designed using MySQL, which extends the performance, reliability quality and ease of use in database design. When using the database, one works mainly with the logical components of the database which include views, procedures tables, and users (http://technet.microsoft.com).The physical implementation of files should be transparent.

Fig 4.6 Entity relationship diagram

staffname surname password usergroup empid

USERS

d

SUPERVISOR ACCOUNTANT ADMIN EMPLOYEES

authorises/rejects processes approves/rejects

amount

Submit

Requisition

Type

request

Status

Has project assigned to

pojectname funder

Key

Entity Attribute Relationshi
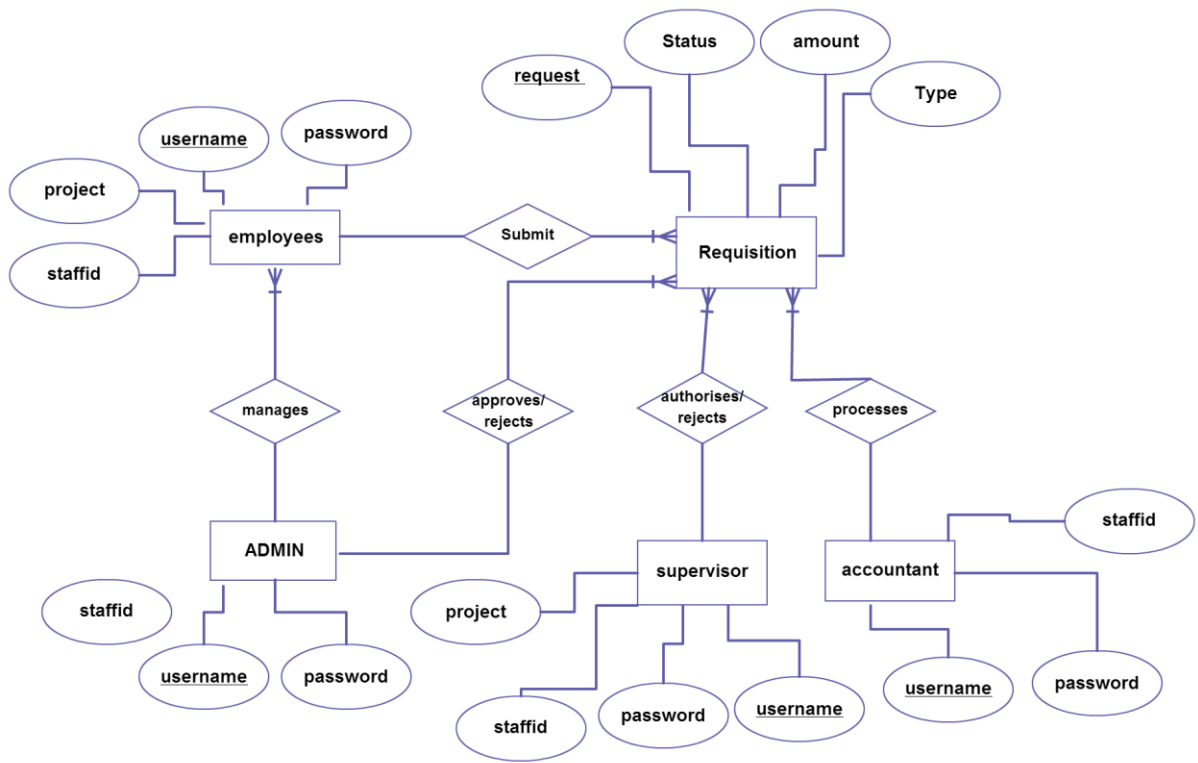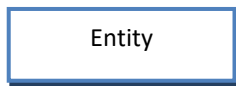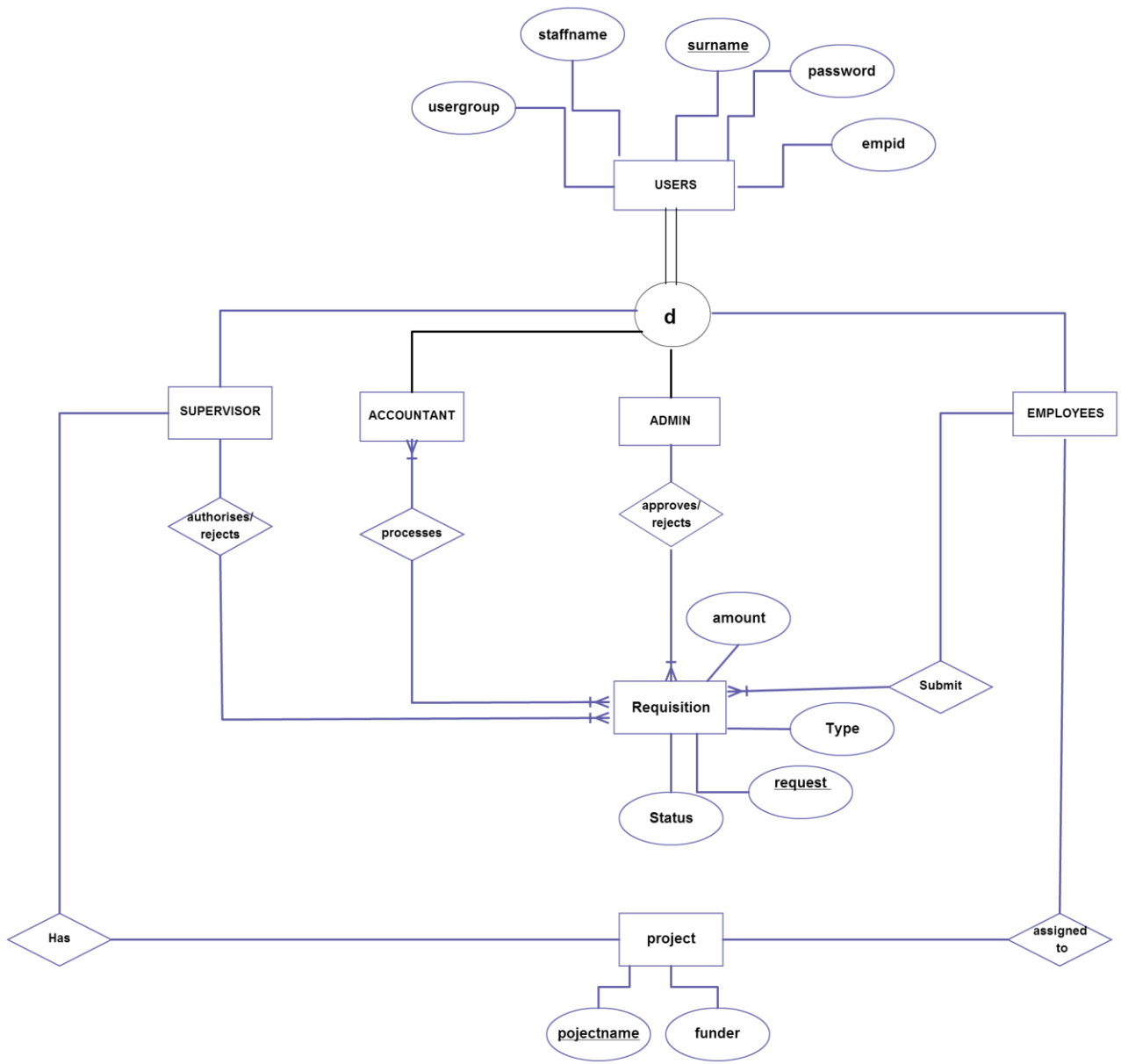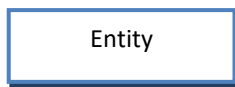
Fig 4.7 Enhanced Entity relationship diagram

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4.5 PROGRAM DESIGN

This phase of software development involves the identification of hardware and software resources necessary for the system being designed and the logic flows that the system is going to use. This phase entails the use of many levels of abstraction to break down the program into manageable modules, identify classes, interfaces, and determine relationships among the stated elements (http://cs.nyu.edu). Modules from this phase must compliment what was produced previous stages. This phase can be illustrated using UML diagrams like class, package and sequence diagrams.

4.5.1   Class diagram

Class diagram is a structured diagram that describes the structure of a system by showing the entities, attributes and the relationships between the classes. They consists of super classes and sub classes which have a relationship of either association or inheritance.

Project

projectnumber:int
projectname:varchar
funder:varchar

save()

1   M
has

User

username:varchar
password:varchar
user group:int

M   M
access

Requesition

type:varchar
project:varchar
amount:int
status:int

save()

(disjoint,complete)

Study coordinator/supervisor

username:varchar
password:varchar
user group:int

AuthoriseRequest()

Administrator

username:varchar
password:varchar
user group:int

ApproveRequest()

Accountant

username:varchar
password:varchar
user group:int

ProcessRequest()

Employee

username:varchar
password:varchar
user group:int

SubmitRequest()

Key

<<StereoType>>
Class Name

+ Attribute 1 : Type
+ Attribute 2 : Type
- Attribute 3 : Type
- Attribute 4 : Type

+ Operation 1 (arg list) : return
+ Operation 2 (arg list) : return
+ Operation 3 (arg list) : return
+ Operation 4 (arg list) : return

Fig 4.8 Class diagram for the proposed system

4.5.2 Sequence diagram

This is a collection of objects which shows the interaction of a task and the steps that it follows from initiation to termination. This diagram demonstrates how objects interact as observed over time. It shows how objects and classes involved in the sequence relate and how messages are exchanged between the objects to carry out their functionality (http://www.cs.iit.edu).

Fig 4.9 Sequence diagram

4.5.3 Package diagram

It is also a UML diagram which groups the elements of a system into related groups. Package diagrams show the dependencies between the packages that form a system.

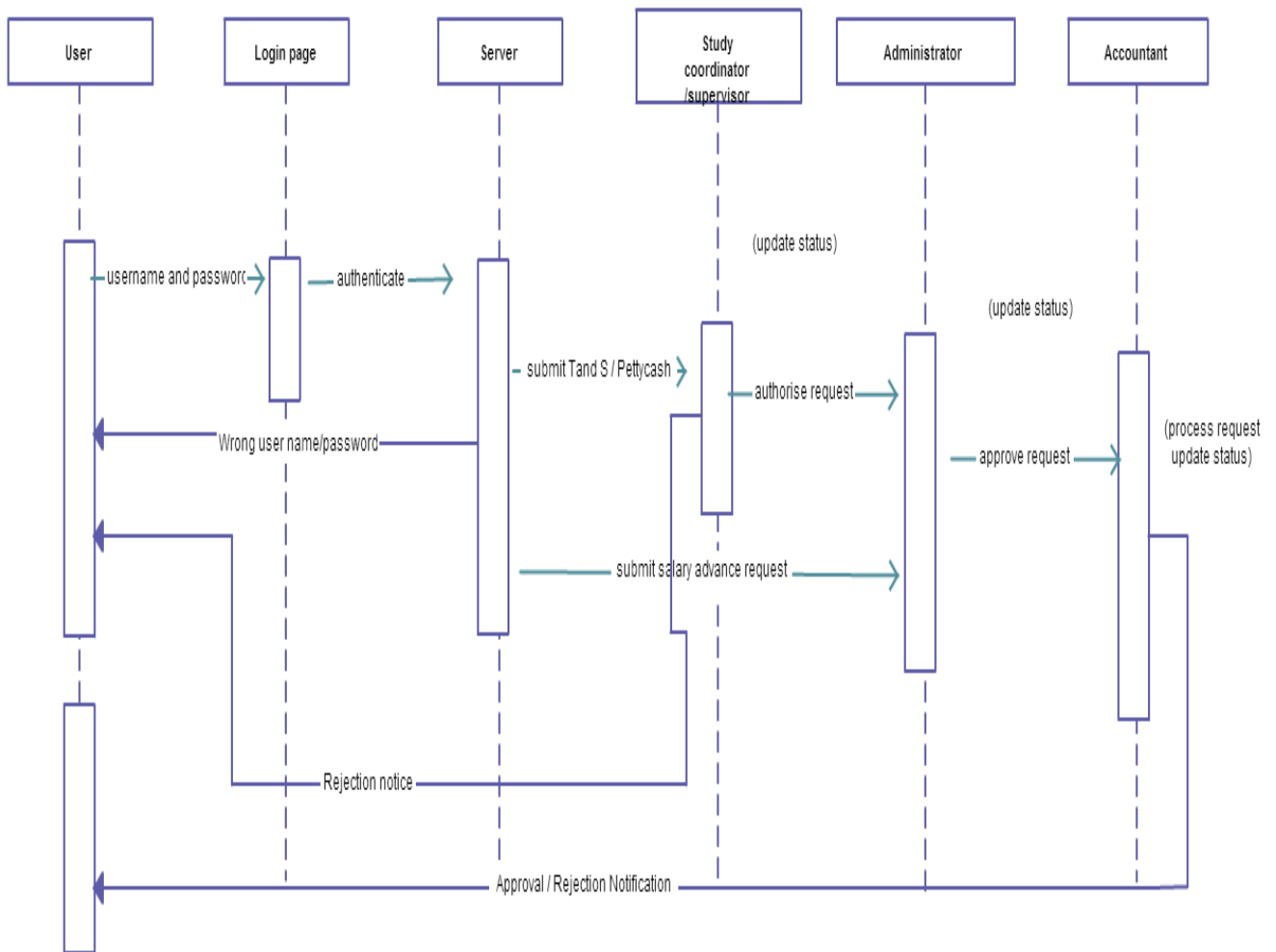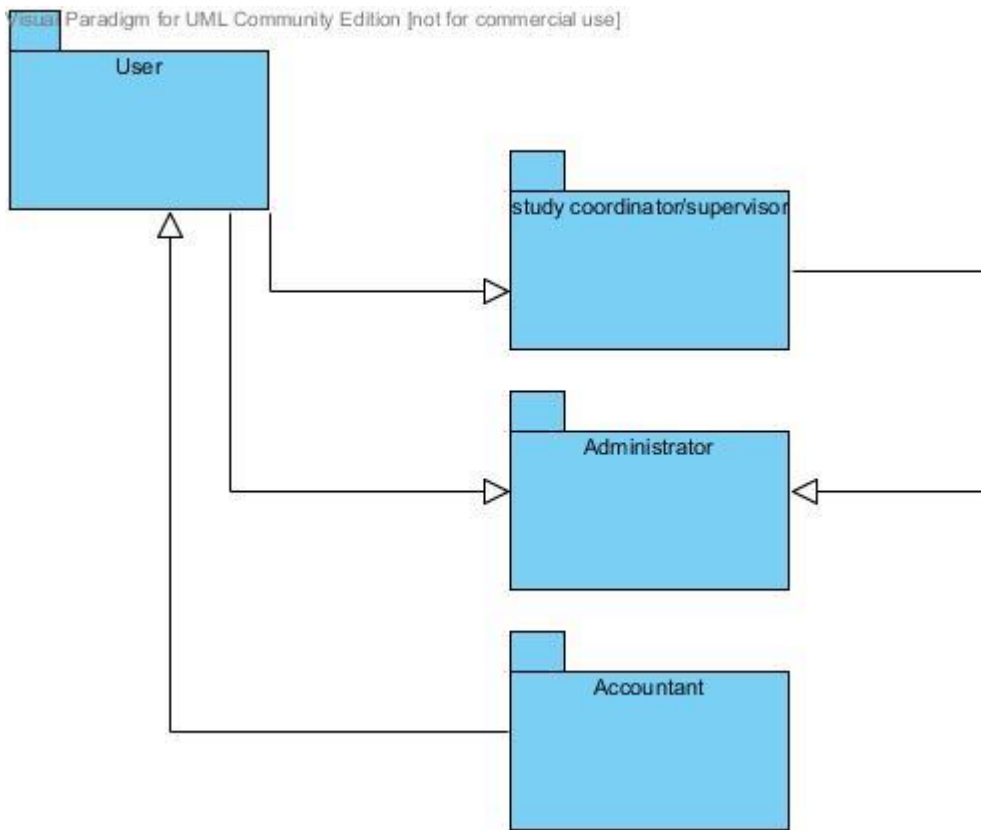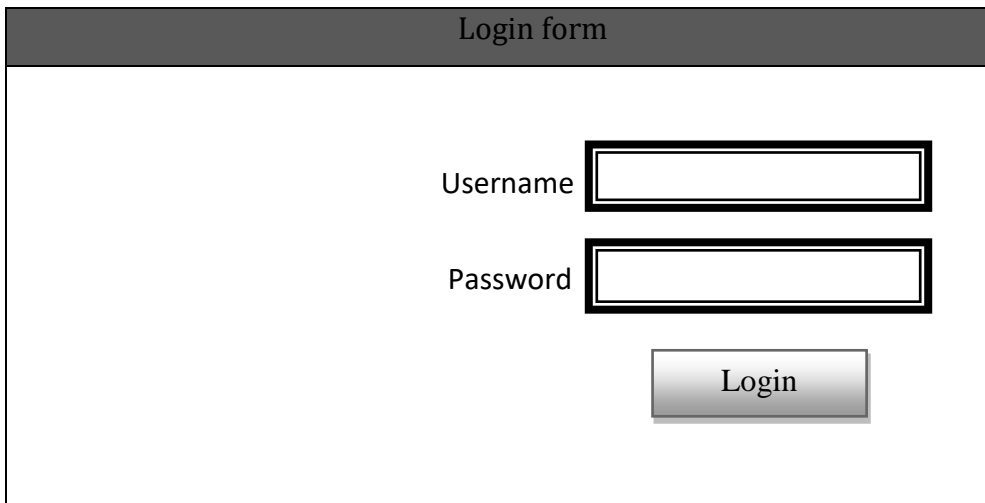**Fig 4.10 Package diagram**

4.6 INTERFACE DESIGN

The interface is an integral part of a computer system which enables the user to interact with the system to achieve his or her goal (http://booksite.elsevier.com). This also incorporates the input like forms, output for example report generation and other functionalities such as help menus. .

4.6.1 The user interface
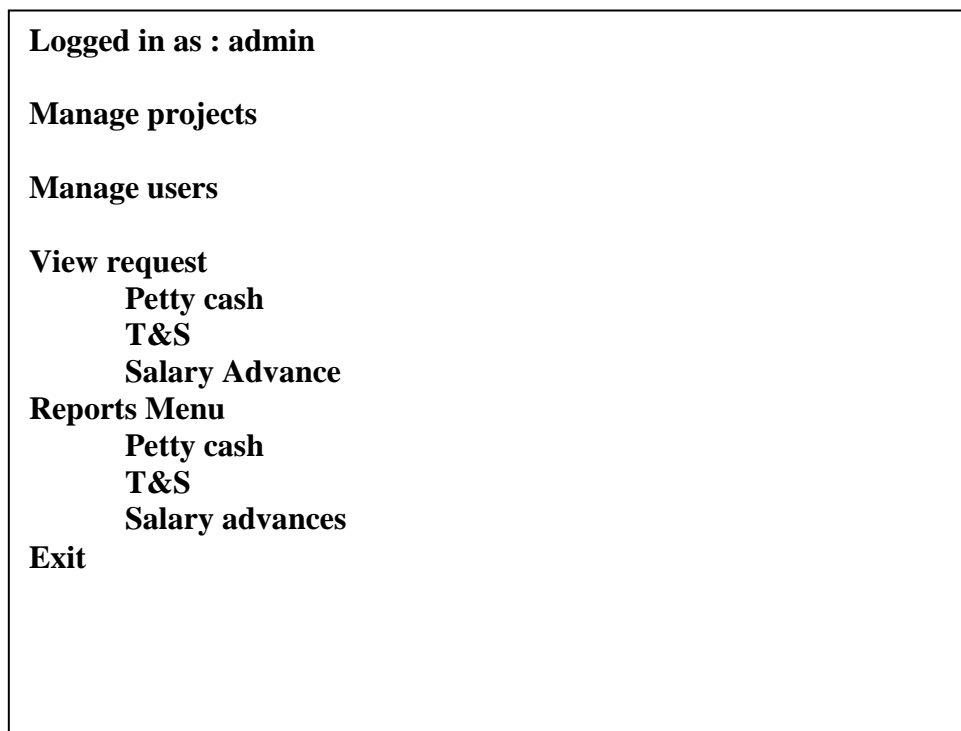
The user interface for the proposed system will be designed in a way that is user friendly even for users who are not familiar with computers so as to increase acceptability and adoption of the system. Below is a sample of how the forms will look like

Login form
Username   [ ]
Password   [ ]
[Login]

Fig 4.11 Log in form

The following form will appear if a user enters admin user name and password

Logged in as : admin

Manage projects

Manage users

View request
      Petty cash
      T&S
      Salary Advance
Reports Menu
      Petty cash
      T&S
      Salary advances
Exit

Fig 4. 12 Admin interface:

Logged in as : admin

Manage users

Full name and surname	
Employee number	
Project name	
Email-add	
Usertype	

Add

User type	Name	Emp #	Project name	Email address	
1	Sithembile	106	Sex work	sithembile@ceshhar.co.zw	edit/remove
3	Norman	100	admin	norman@ceshhar.co.zw	edit/remove
2	Gugu	95	admin	gugu@ceshhar.co.zw	edit/remove

Back to main menu

Fig 4.13 Manage user interface

Logged in as : admin

Manage projects

Project name	
Funder	
Lead person	
Email-add	

Add

Name	Funded by	Lead person	Email address	
Sex work Pro	UNFPA	Sibongile	sibo@ceshhar.co.zw	edit/remove
EIMC	PSI	Webster	webster@ceshhar.co.zw	edit/remove
SRH	PSI	Euphemia	euphemia@ceshhar.co.zw	edit/remove

Fig 4. 14 Manage project interface

Logged in as : admin

Petty cash requests

Emp #	Amount	Project name	Email address	status	
106	500	Sex work	sithembile@ceshhar.co.zw	Pending	Approve/reject
100	100	Admin	norman@ceshhar.co.zw	Approved	
95	200	Admin	gugu@ceshhar.co.zw	Rejected	

Back to main menu

Exit

Fig 4. 15 Petty cash requests

Logged in as : admin

Petty cash report

Project Admin

Emp #	Amount	status
106	500	Pending
100	100	Approved
95	200	Rejected

Back to main menu

Exit

Fig 4. 16 Petty cash reports

Logged in as : Sithembile

Petty cash request form

Project name: [⬇]

Amount: [   ]

[Submit]

Back to main menu

Exit

 Fig 4. 17 Petty cash request from

4.6.2   Interface design tools

The interface is going to be implemented using Dreamweaver, PHP, HTML which are used to design web pages. This will provide good interaction with the user in the form of simple and easy to understand form design. The user interface is designed in such a way that it puts much emphasis on supporting the interactions between the users and the computer based applications.

4.7 CONCLUSION

This phase assisted the developer to come up with how the system is supposed to designed both physically and logically before proceeding to the next phase of system development which is the implementation stage.

Chapter 5

Implementation phase

5.0 INTRODUCTION

"Implementation is the stage of a project during which theory is turned into practice" (http://oer.nios.ac.in). This phase entails the conversion of the system designed on paper into a computer based system through the use of a programming language. It is in this phase that the actual system is coded, tested, through validation and verification, installed and the users trained before system conversion occurs. The main purpose of the implementation phase is to put the built system to test and check if it meets the objectives of the users as stated in the user requirements specification.

The implementation involves the following steps:-

- Testing
- Installation
- User training
- System conversion
- System operation

5.1 CODING (PSEUDO CODE)

"This is also called the programming phase in which the programmer converts the program specifications into computer instructions" (http://oer.nios.ac.in). This involves converting the logical program into programming commands to be performed by the computer. For this project the developer recommended the use of PHP and Mysql database. This is a very important stage that directs the data movement and flow of logic and also control the system processes as a whole. The code was done in modular form for fast development and easy maintenance should the system require changes in future (http://pnagila.blogspot.com).

```
  Pseudo Code for the Module

  Outlined below are pseudo codes in the system.

  Log in

  Check for database connection

        Connect

                Validate username and passwords

        If correct then

        Open admin menu

                Else

                Display message "invalid username or password"

        And

                Loop

Petty cash request

Check for connectivity

Check for required fields

        If correct then

Submit request and send email

        Else

                Show error message and abandon

                End
```
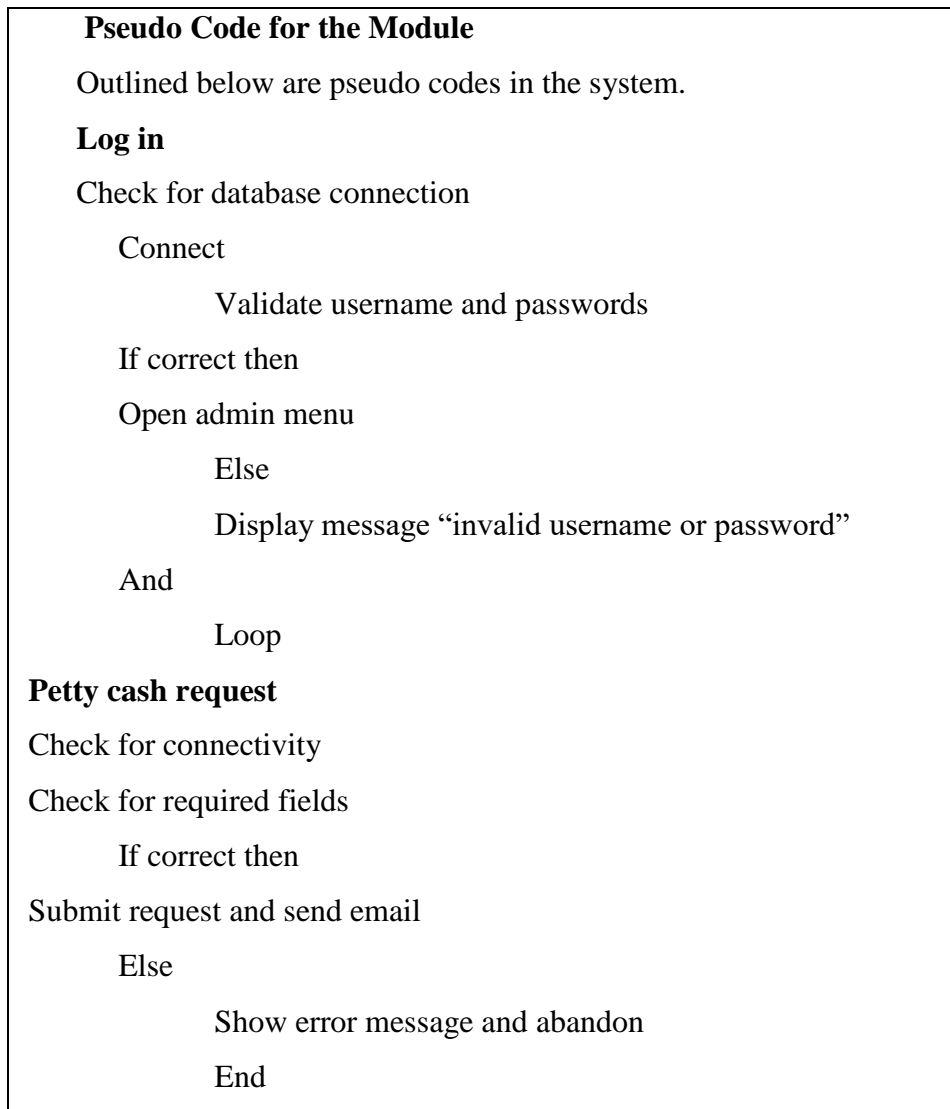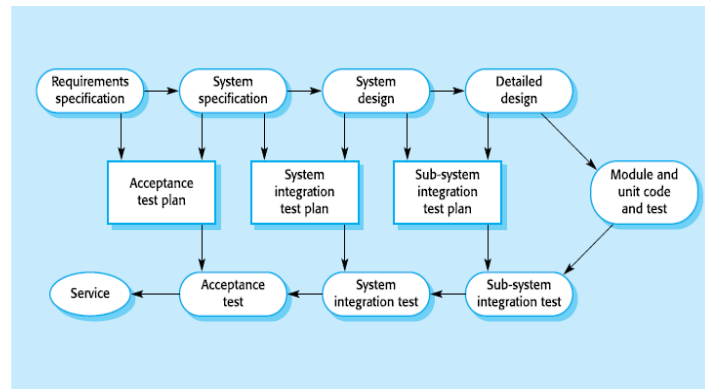
   Fig 5.1 Pseudo code

5.2 TESTING

"Testing is the process of checking that all the functions of the program work as they should and give correct results" (Lawson 2004:146). This stage of implementation is necessary as it ensures that the system being built meets the user requirements. That is, is it the right system and is it built right.

Testing along software development

Software Engineering, 2006   Software testing   20

Fig 5.2: Diagram showing Testing along software development *Source: www.cs.bgu.ac*

There are two test strategies used:

- Validation
- Verification

5.2.1 Validation

This is done to check if the right product is being built (Lawson et al 2004).This is test that checks if the system accepts only data that is valid or is in the acceptable format and does not accept invalid data. This test is usually done through inputting invalid and valid data values and checking the results. The system will be checked to see if it meets user requirements. The users have commented that the interface is user friendly and meeting the user requirements.

5.2.2 Verification

Although this term us sometimes confused with validation in checking data input, it is different as it is about checking if the product is being built right (Lawson et al 2004). Verification is about ensuring that the system meets all the requirement specifications. The data captured is verified to see if the computations made by the system on the inputted data us correct and also the output produced is as expected.
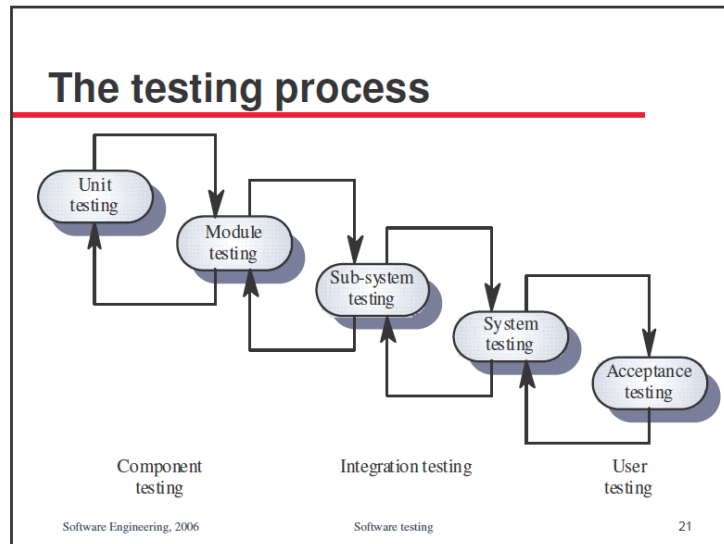
The testing process

Unit testing

Module testing

Sub-system testing

System testing

Acceptance testing

Component testing   Integration testing   User testing

Software Engineering, 2006   Software testing   21

Fig 5.3: Diagram showing the Testing Process *Source www.cs.bgu.ac*

5.2.1   UNIT TESTING

This is testing each program to see if its running as it should. In this phase, individual components of the system are tested independently without other system components (Stair and Reynolds 2014). For example the code for logging into the system is tested to find if it is running as desired without considering other codes like sending a request for petty cash or T & S. Units of the system were tested individually as per test specification. There are 2 variation to unit testing and these are:-

5.2.1.1 White box tests

This test focuses on the internal performance of the system which checks of the code is functioning as it should. White box testing is also used to check if code is running as planned during the design stage. In short white box testing tests the intended and unintended behavior of the software.

5.2.1.2 Black Box tests

This is a "testing methodology where only the inputs and outputs are considered" (Laplante 2004:447). With this kind of test, the developer uses some data inputs and notes the outputs but is not able to see how the output has come about. With this testing strategy, the developer does not have to know the code or design of the system. It is mainly concerned with the system meeting the user requirements and the efficiency of the system.

5.2.2   MODULE TESTING

Module testing involves testing the module in isolation first then integrating the modules to a subsystem and retesting if there are any errors after integration (http://pnagila.blogspot.com). All the codes in the individual modules of the system is going to be tested to see if it is executing its functions as expected. This type of testing makes debugging easier as the codes will be shorter and developer can easily identify where the error is and debug it (http://pnagila.blogspot.com).

5.2.3   SUBSYSTEM TESTING

Subsystem testing involves the testing of modules after they have been integrated into a subsystem to check for compatibility and to verify if it's still working after the integration. With this testing modules are combined into sub-systems and then tested, and the testing mainly focuses on the interface (www.cs.bgu.ac).

5.2.4   SYSTEM TESTING

System testing is when subsystems are integrated to form a system and then testing of the system as a whole is carried out. It mainly encompasses the testing of emergent properties and finding errors that result from the interface (www.cs.bgu.ac).

5.2.5   ACCEPTANCE TESTING

Acceptance testing is "the system testing performed by the customer himself after the product delivery to determine whether to accept the delivered product or reject it" (Mall 2009:39). This is considered as the last stage of the process of system testing after modules have been integrated. In acceptance testing, users test the system using real data rather than simulated data which is the case with the other testing methods dome previously. This testing phase is iterative as this is where errors and omissions are discovered by the users and the system is referred back and forth between the developer and the users until they both agree that the system is acceptable. Acceptance testing is made of two types these being beta and alpha testing.

5.2.5.1 Beta testing

In beta testing, the system is tested using actual data from CeSHHAR's archived manual system data files. Errors and omissions will be discovered and corrected. This process continues until the organization accepts that the delivered system is ready for usage.

5.2.5.2 Alpha testing

With alpha testing, the system is delivered to the organization and the project stakeholders will have a feel of the system and report any errors and defects which they discovered during the testing. The system is then returned to the development team where the identified errors and defects are then addressed.

5.2.6   DATA INPUT

The system was tested for validation to check if the input that it accepts is realistic and acceptable. Also the test data had to be realistic in that it represented the actual data that the system will be required to capture.

5.2.7   DATA OUTPUT TESTING

Data output was also tested to verify that the system is producing the expected results. This is done through the following:-

Reports: these must show what the system has captured and processed.

Transactions: must be the transactions that took place when the system was in use.

The system has got input validation checks such as the ones included below.

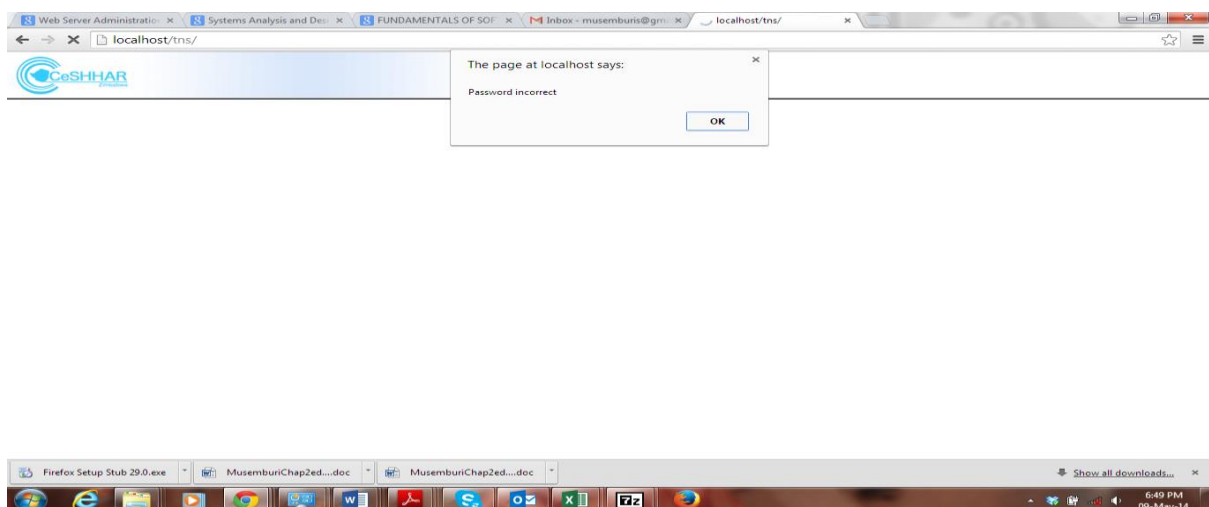The screen below shows validation against unauthorized entry into the system

Fig 5.4 validation for wrong password

The following screen illustrates a validation check where the system validates against input of petty cash that outside the allowable limit.
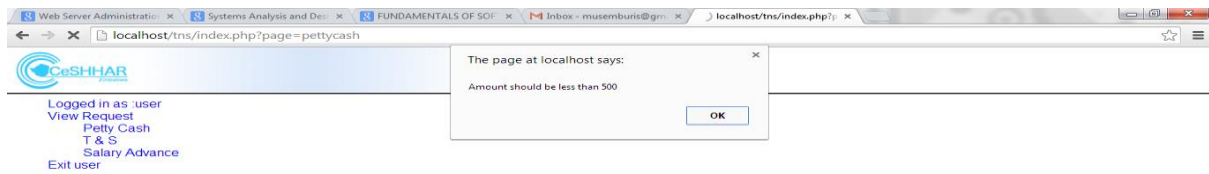

Fig 5.5 validation against petty cash amount out of range

The screen below is an illustration of a validation check which ensures that the salary advance is within the pre-defined ranges
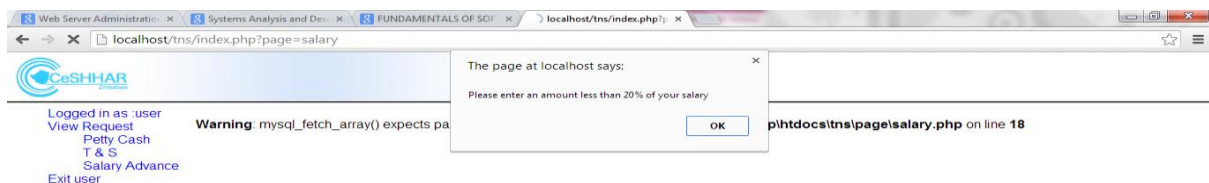
Fig 5.6 validation against salary advance amount out of range

5.3 INSTALLATION

It is putting the developed system in use. Users are changing from using the old system to using the new system. In this phase the required software is installed on the appropriate hardware converting from the manual system to the proposed system. A number of activities such as training, file conversion, system changeover methodologies such as direct

changeover, parallel running and pilot operation are carried out during this stage. Installation is rendered incomplete if it is not complemented with sufficient user training.

The installation will started with the hardware and then software. Hardware installation involved printer setup to test reports, setup and configuration of the server and client machines. This did not take much time since most of the hardware was already available.

5.3.1 User training

Users of the system will be trained on how to use the system. The following groups are going to be tested:-

Administrator- training will cover the following topics

- Backing up the system
- Troubleshooting errors
- Report creation
- Managing projects and managing users

Employees- all employees are going to be trained as they would have to use the system be it for salary advances, travelling allowances or petty cash. This training will following;-

Security issues

Navigating the system

Querying

Report generation

Training Plan

Training will be done internally and Sithembile Musemburi will be the facilitator. There are going to be two sessions, one for the administrator and the other for all employees.

Training venue	CeSHHAR boardroom
Date	10 June 2014
Attendees	Administrator, coordinators and accounts
Requirements	Laptops and an overhead projector
Facilitator	Sithembile Musemburi

Table 5.1 -Session 1

Training venue	CeSHHAR boardroom
Date	9 June 2014
Training group	All employees
Requirements	Laptops, overhead projector
Facilitator	Sithembile Musemburi

Table 5.2 -Session 2

5.3.2 File Conversion and System Changeover

For implementation to occur, there is need to change over from the manual paper based system to the new electronic system. There are four strategies that can be used to implement this, these are pilot, direct, phased and parallel conversion
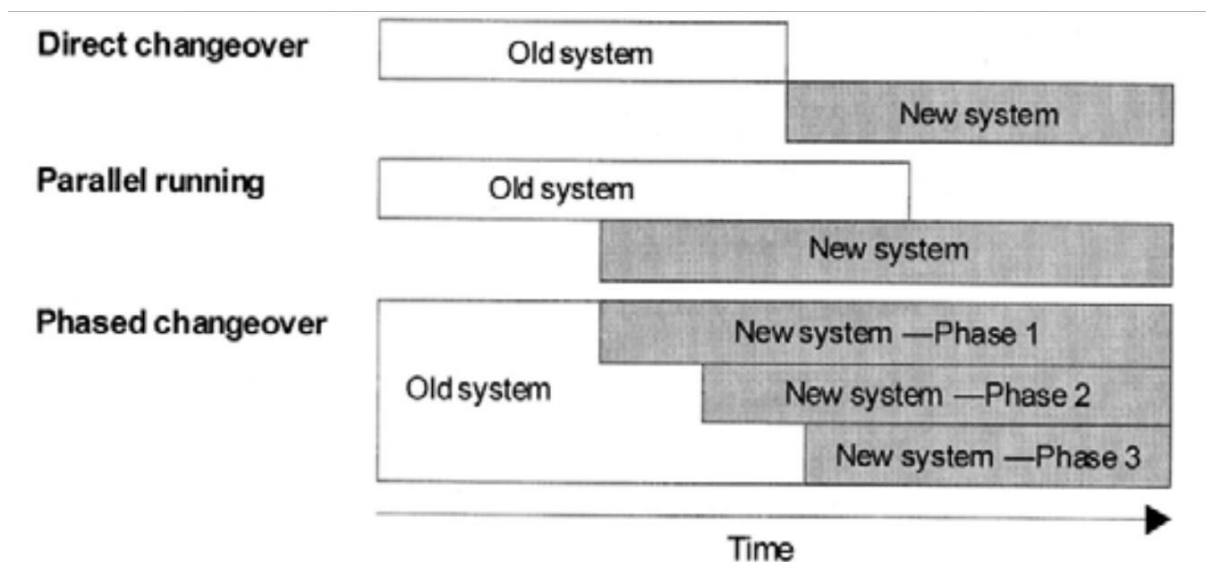

Fig 5.7 file conversion and system change over strategies *Source: http://www.peter-lo.com/Teaching/B2001/L18.pdf*

5.3.2.1 Pilot conversion

According to Duncan 2009 cited in http://cduncan92.edublogs.org, "this method involves the introduction of the whole system to a small part of an organisation, then eventually introduced to the whole organisation". This implies that system is tested or run on department within the organisation for evaluation purposes. Cost of this strategy is low since both systems are only being run in one department. This reduces the risk of failure as only that one

department will be affected should anything go wrong and there is also a backup as both systems are running concurrently.

5.3.2.2 Direct conversion

According to Duncan 2009 cited in http://cduncan92.edublogs.org, direct conversion "involves the complete replacement of the old system with the new system at a single point in time". With this method, the new system totally replaces and directly takes over from the old system at once. The old system is rendered obsolete and all the departments that were using it will now start carrying out their daily activities under the new system. The cost of implementing this strategy is also lower as only one system is operational as compared to phased or parallel conversion, however risk is higher as this method has no backup should the system fail.

5.3.2.3 Phased conversion

With phased conversion, "the new one gradually overtime replaces the old system" (Lo 2007 cited in   http://www.peter-lo.com.) The new system is installed in phases allowing the users to familiarize with new system whilst phasing out the old system.

5.3.2.4 Parallel conversion

"This method involves introducing the new system so that it operates side-by-side with the old system for a time" (Duncan 2009 cited in http://cduncan92.edublogs.org). This involves running the old and the new systems simultaneously before converting to the new system. This method offers a backup should the new system is not fail to meet user expectations. The cost of implementing this is high compared to the other methods as it entails running both systems simultaneously during this changeover period. However the risk involved in this method is low as we have a full back up in case of the new system being a failure.

After weighing the merits and demerits of the available conversion methods, a parallel conversion was selected by the developers to implement this system.

5.4 MAINTENANCE

There is need for maintenance after system implementation so as to ensure that the new system meets the user requirement and to future changes of these requirements should there be any. According to Saleh (2009), there are four types of maintenance that can be done to a

system and these are preventive, adaptive, corrective and perfective. Perfective and preventive are said to be scheduled maintenances as users are bound to have changes to the user requirements overtime whereas the corrective maintenance has been termed an emergency as is done as and when the need arises where there are system errors identified during use. This process of maintenance involves updating continuously to ensure that it continues to meet the ever changing user requirements.

5.4.1   Perfective:

New requirements may be put forward in order to make the system more efficient, change functionalities or enhance system performance according to customer demands (Mall 2009). Such possibilities were looked into and use of modular programming was used to make maintenance easier.

5.4.2   Corrective

The system may still have errors after testing should system users identify these bugs that were not identified during system testing, corrective maintenance will be required. This corrective maintenance is meant to rectify bugs which might be identified by users while the system is in use (Mall 2009). As such, a team has been put in place that will attend to any queries such as errors and problems being encountered and users have also been advised to report such new errors as soon as possible.

5.4.3   Adaptive

The software might need maintenance to adopt to changes in its operating environment for example new platform or operating system (Mall 2009). Measures have been put in place to accommodate any changes in the operating environment such as new hardware and operating system. The task of complementing the various measures of maintenance has been assigned to the IT department that has been tasked with monitoring the operations of the system and make adjustments where necessary.

5.4.4   Preventive

Preventive like perfective is a scheduled maintenance which is proactive and entails periodically reviewing and checking the system to identify and anticipate possible problems (Tinnirello, 2009). The system is going to be reviewed to check for any potential problems that could arise and find ways to mitigate against them before they affect the system

performance. This task has been left to the IT department who will be monitoring the performance of the system.

5.5 USER MANUAL

A user manual is provided within the system documentation that goes along with the application.

5.5.1   BACK UP PLAN

System back up is as follows:

- System application backup will be done daily onto the server and users have been assigned individually folders for their email and documents and department folder for all information that pertains the department. This will only work as back up if an individual's machine is the only one affected.
- Output Files Backup-printed reports and email receipts will also be filed as back up should anything happen to the system.

A secondary backup storage will also be implemented for this system and these are:-

- **Drop box back up-** this is a cloud back up system which enables user to save their data onto the cloud as a recovery plan should the system fail. all machines have been assigned to a drop box folder where the machine automatically synchronizes any changes to the folders onto the drop box folder
- **Google drive back up-** like drop box, this is also a cloud back up system and is an alternative back up for other machines as drop box offers limited storage**.**

Secondary backups helps to secure the companies data so that there is a recovery plan in the case of a disaster that results in data loss at the company site.

Type of back up	Time and frequency
File and application back up	Quarterly
Drop box and google drive data base back up	Automatically as changes are made to the system folders
File back up by individuals	weekly

Table 5.3-Backup plan

5.5.2 SECURITY

Both physical and software based security measures were implemented.

5.5.2.1 PHYSICAL AND SOFTWARE SECURITY

The following technical controls were implemented

- **Identification and authentication**

   The system will ensure that the users of the system are identified and their details are authenticated before they can be allowed to use the system. The system will exit after three failed login attempts.

- **Logical access**

   Each user who wishes to gain access to the system will go through a login account that will allow the user to get the username and access rights giving the user the ability to log into the system (Authentication).

5.5.3 SYSTEM EVALUATION

After the system has been operating successfully for a while, there is need to evaluate the system to see whether it meets the objectives of the system (http://latesttechnomanias.blogspot.com). This evaluation is done by the users, stakeholders and the developer. The following objectives were considered as written in the project proposal:-

- Automating the process of petty cash , T&S and salary advance requisitions
- Creating a system that has a user friendly interface that will promote use of the system
- Creation of a system that will calculate T&S amounts to be allocated to staff upon entering details for the planned trips.
- System that will enables staff to send in petty cash, T&S and advance salary requisitions online
- Adoption of the system by employees within 6 months of implementation
- Creation of a system that will enable users to track the status of their requisitions online
-

5.5.4 CONSTRAINTS

The following challenges were encountered during the development of this project which could have affected the outcome:-

- Economic challenges- lack of budget from the funders of the project to meet the financial needs for data collection, travelling expenses and stationery requirements.
- Lack of experience and technical expertise on the part of the system designer in system designing and development.
- Time limitation- the developer had to work under a tight schedule as this projected had to be completed within 3 months
- Busy schedules of the interviewees- data collection and information gathering took longer than planned as the respondents had tight work schedules

5.6 CONCLUSION

This stage marked the end of the system development life cycle although review and maintenance are continuous activities, the developer can safely conclude that this project was a success. However before such a conclusion can be made, there is need to get feedback from the users and stakeholders after they have used the system for a while. Also to increase acceptability, the developer is still going to carry out the training sessions and also provide user manual for the users.

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