

**BDO ZIMBABWE AUDITORS SCHEDULING AND LEAVE
CONTROL SYSTEM**

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BDO Zimbabwe Auditors Scheduling and Leave Control System

BY

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DECLARATION

I, Brighton Muzhanje (R091350A) hereby declare that I am the sole author of this thesis. I do hereby authorize Midlands State University to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Signature.....

Date.....

APPROVAL

This thesis entitled BDO Zimbabwe Auditors Scheduling and Leave Control System by Brighton Muzhanje meets the regulation governing the award of the degree of Bachelor of Science Honors Degree in Information Systems of Midlands State University and is approved for its contribution to knowledge and literal presentation.

Supervisor's signature.....

Date.....

Abstract

BDO Zimbabwe Auditors Scheduling and Leave Control system is an intranet-based application which is ideal to be used in the auditing sector that aims to automate the company's scheduling and control leave activities to provide convenient services to clients. It allows employees to assign staff to clients based on the resources available, inform staff of client schedules through SMS (small message service), notifying management of leave applications that might have concerns over and generate ideal reports for staff. The primary purpose for writing this thesis is to present on the current problems of the existing system that compelled developing the auditors scheduling and leave control system solve the problems of the existing system. Amongst tools used were ASP.Net which is a server side scripting language which supports session handling, SQL server 2008 was used as a database management system, Ozki was used as an SMS gateway, outlook was used as an e-mail platform and the system development life cycle as the development methodology. This document consists of five main phases; Introduction, Planning, Analysis, Design and Implementation phase respectively. The first chapter will describe the background of BDO Zimbabwe, the problem definition, aim and objectives of the project as well as the hypothesis and justification of embarking on the project. Thus this phase will explore the problems identified and the objectives of the study. The second chapter will focuses on how the project development time will proceed, as well as the activities that will be undertaken. At this phase the business case of the project is analyzed and evaluated through various feasibility scenarios. In the third chapter analyses of the current system is done through various information gathering techniques such as interviews, questionnaires, observations and diagrammatically represented. The fourth chapter will describe and diagrammatically present how the new system is going to be developed through context and data flow diagrams, its architectural, physical, database, program and interface designs and finally the fifth chapter will focus on the system coding, testing, installation and maintenance. The implementation phase is the final stage of the system development process where a unique installation strategy is selected such as direct changeover, parallel changeover and phased changeover. A post implementation review is also important as a learning phase and for future project reference.

Acknowledgements

This project is the result of the collective effort of many individuals. BDO Zimbabwe employees and information systems students participated generously offering their talent, ideas and expertise. This team exhibited a spirit and selflessness that has become the hallmark of contributions to this project. Their participation and insight are truly appreciated.

A special thanks goes to Mrs Zhou, Chairperson of Department of Computer Science and Information Systems who served as the project supervisor.

Dedication

This project is dedicated to my sister and my role model Mahwinhei Muzhanje who was unable to witness my academic progress up to this level. I would also like to dedicate this project to my brothers, sisters and friends who have paved the way for me to successfully deliver this project.

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List of Acronyms

Co- Company

HR- Human Resources

IT- Information Technology

SMS- Short Message Service

APT- Audit Process Tool

NPV- Net Present Value

ROI- Return On Investment

FRD - Functional Requirements Document

DFD - Data Flow Diagram

LAN - Local Area Network

ID - Identification

EER - Extended Entity Relationship

DBMS - Database Management System

IEEE - Institute of Electrical and Electronics Engineers

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

The auditors scheduling and leave control system will enable management to coordinate human resources available during the audit period, control the issuance of leave days and enhance the means of communication with auditors. This chapter will describe the background of BDO Zimbabwe, the problem definition, aim and objectives of the project as well as the hypothesis and justification of embarking on the project.

1.2 Background

The company background seeks to identify the origin, mission and vision of the organization as well as its operational structure.

1.2.1 Background of the organization

BDO Zimbabwe is a member of BDO International that has over 1095 offices in 110 countries throughout the world .Formed in 1981 by local Chartered Accountants, BDO Zimbabwe (formerly BDO Kudenga & Co) provides financial solutions to a diversified clientele that includes medium sized and large listed companies. To date it is one of the biggest local firms of Chartered Accountants in Zimbabwe with offices in Harare and Mutare.

As the business climate has changed, it has grown and evolved to become a multi-disciplinary professional services firm, which can offer clients a wide range of specialist services and advice. In addition to audit services, it offers the following through BDO Tax & Advisory Services (Private) Limited (formerly BDO Kudenga & Co Management Consultants (Private) Limited):

- Business advisory services
- Economic and financial consulting services
- Computer risk management services
- Business consulting
- Information technology consulting
- Taxation services

BDO Zimbabwe is committed to a distinctive ethical culture and set principles, which emphasize on placing its clients first, integrity, and commitment to excellence, innovation and teamwork.

BDO Zimbabwe’s team of professionals and support staff are committed to giving quality services. Its services are enhanced through strategic partnerships built through years of experience brought in by the professional team.

1.2.2 Organizational structure

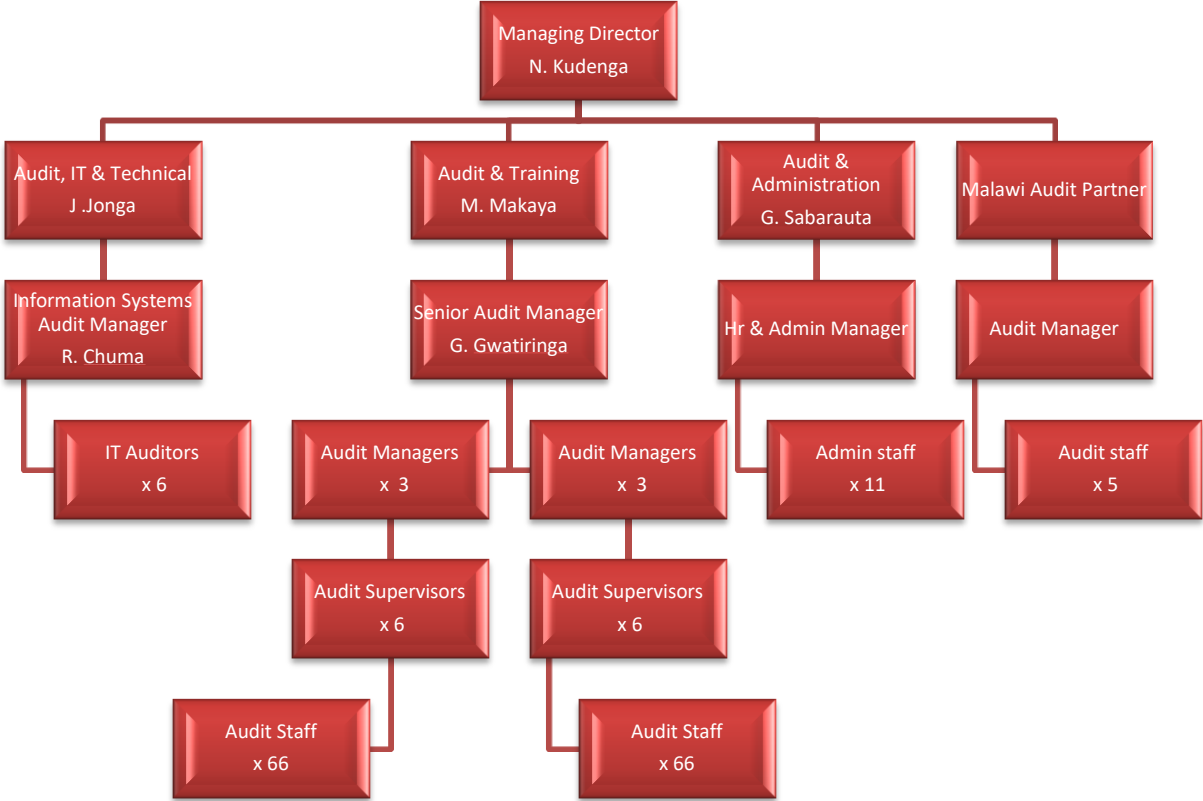


Figure 1.1 Organogram for BDO Zimbabwe

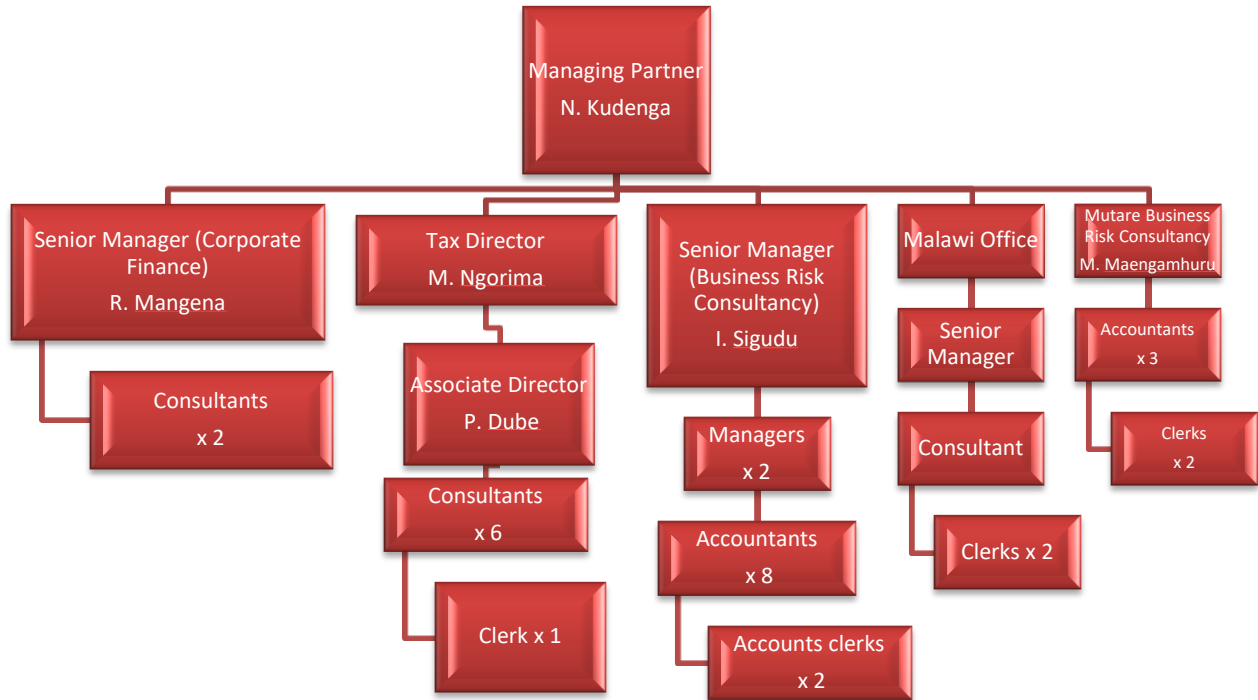


Figure 1.2 Organogram for BDO Tax

1.2.3 Vision

To be the leading Zimbabwean auditing, accounting and management consultancy firm.

1.2.4 Mission

To provide innovative and technology-driven quality business services to our clients paying particular attention to their individual needs so as to achieve complete client satisfaction.

1.3 Problem statement

BDO Zimbabwe faces a problem in the timely delivery of audit services to its various clients.

1.3.1 Problem definition

The problem definition phase seeks to identify the main problems facing the organization that are significant drawbacks on its current day to day operations. Identifying the core problems facing an organization opens a way for devising strategies that create feasible solutions. The main problems identified are as follows:

- Uncontrolled movement of auditors between assignments

During the audit period auditors are frequently re-assigned to new clients as a result it affects the audit process especially the monetary and time budget.

- Auditors are not timely informed of new assignments

When a new assignment is about to begin an engagement meeting is held but auditors are not informed before they finish their on-going assignments

- Auditors take study leave while there are assignments awaiting commencement

As leave forms are submitted to the HR (Human Resources) department, HR personnel might not be aware of prior engagements and any new assignments resulting in the issuance of leave to staff.

- Auditors are at times assigned to more than one client at one time

Especially during the audit process peak period it is difficult for management to coordinate staff thus some staff members would find themselves assigned to two clients at the same time.

1.4 Aim

To develop a system that will enable management regard the timing, availability and other commitments of staff when setting up staff to audit assignments and to aid decision making through the timely provision of information.

1.5 Objectives

- Schedule staff to audit assignments
- Inform auditors of forthcoming assignments through SMS
- Notify management of leave applications through SMS
- Resolve staff schedule conflicts between assignments
- Swap staff between assignments
- Alert management on schedule conflicts

1.6 Hypothesis

An integrated systems approach to the development of the new system will enhance operations from the current level. The problems at BDO Zimbabwe can be curtailed by computerizing the current system. Thus employees benefit from the system through improved resource coordination, time management and communication. The developer would need the following requirements to develop the system:

- Windows 7 Professional
- Microsoft SQL server 2008.
- ASP.Net and
- Microsoft Office 2007
- ESET Nod Antivirus 2013
- SMS tool kit

1.7 Justification

Information systems have become crucial to organizations to the extent that it is true to say that for some organizations “No IT” means no business. As a professional firm, the implementation of such a system is of utmost importance to the success of the firm. An information system will improve performance, service delivery, time management and maintain a positive corporate image. Benefits accrued from the information system include, manageable monetary and time budgets; improved relations with clients; improved resource coordination; improved manager to employee communication and aid in decision making through the timely provision of information

1.8 Conclusion

This chapter has introduced the project by giving an overview on the company background, identified the main problems in the organization, the core objectives the project seeks to accomplish and the justification of the proposed system. The next chapter identifies the plan that is to be used by the project team to attain the project’s objectives.

CHAPTER TWO: PLANNING PHASE

2.1 Introduction

The introduction of the project in the previous chapter provides an awareness of the project to all project members. The planning phase focuses on how the project development time will proceed, as well as the activities that will be undertaken. At this phase the business case of the project is analyzed and evaluated.

2.2 Why build the system

The analyst has to make a survey of potential benefits to accrue from building and implementing the system prior to building the system. The reasons for building the system have to take into consideration the negative and positive impacts the system will have on staff and the organization, ultimately the benefits have to be sound enough to proceed with system development. The following are abilities of the proposed system that justify why the system should be built:

- The ability to send an SMS to auditors informing them of forthcoming assignments enables them to make necessary pre-plans before they make any engagements.
- Scheduling auditors to assignments enable management to organize and coordinate human resources and make the most appropriate decisions from resources available.
- The system will also assist the human resources personnel in making decisions on the issuance of leave days to auditors.
- The system will reduce the human error of assigning multiple clients to an auditor at the same time by detecting and solving schedule conflicts between assignments.
- The system will enhance the level of quality of services offered by BDO Zimbabwe to clients.

2.3 Business value

The process of identifying the project's business value is of great significance because it clarifies all the possible tangible and intangible benefits that may accrue from adopting a new system. The project's business value can be categorized into tangible and intangible benefits.

Intangible refers to items that cannot be easily measured in rupees or with certainty, (Dixit,2007,2)

Tangible	Intangible
Cost savings (audit expenses)	Enhanced corporate image (goodwill)
Lost revenue (audit fee re-negotiation)	Improved relations with clients
	Improved resource coordination
	Improved communication
	Aid in decision making
	Improved time management

Table 2.1 Benefits

2.4 Feasibility study

A feasibility study also known as a feasibility analysis is an analysis of the viability of an idea, (www.umsl.edu). It describes a preliminary study undertaken to determine and document a project's viability. The results of this analysis are used to make the decision whether to proceed with the project or not. This analytical tool used during the project planning phase shows how a business would operate under a set of assumptions, technology used, facilities and equipment, the capital needs and other financial aspects, (Matson, 2000:2).

2.4.1 Technical feasibility

The analyst identifies the existing computer systems (hardware and software) of the concerned department and determines whether these technical resources are sufficient for the proposed system or not. If they are not sufficient, the analyst suggests the configuration of the computer systems that are required. The analyst generally pursues two or three different configurations which satisfy the key technical requirements but which represent different costs. During technical feasibility study, financial resources and budget is also considered. The main objective

of technical feasibility is to determine whether the project is technically feasible, provided it is economically feasible, (www.mbaknol.com).

To assess the technical feasibility of the project the following areas were explored:

- Does the system to be developed use technologies accessible to the firm?

The project's technical viability was analyzed in relation to the availability of technology locally in Zimbabwe. The technologies required are accessible to the firm as many small to medium companies have been established in the country that sells computer hardware and software.

- Does the firm have the needed technical expertise?

BDO Zimbabwe has experienced technical experts who can overlook and maintain the system when implemented. Existing staff members are well skilled in information systems audit and consultancy, security, hardware and software support and a German based support team .

- Will the new system be compatible with the organization's IT infrastructure?

BDO Zimbabwe has a standard hardware and software acquisition policy that states the scope of all hardware and software specifications used when requesting quotations and purchasing. Thus the system will operationally fit on existing hardware and future hardware changes are in accordance to the existing hardware acquisition policy.

2.4.1.1 Hardware requirements

The firm uses standard hardware specifications on the client server side with variations on the proxy, backup and domain servers. Due to new releases of APT (Audit Process Tool) which is a standard audit system used by all BDO International member firms that has specific hardware requirements, hardware is often upgraded at the client server side. Hence the system will use the following existing requirements to operate efficiently and effectively.

IBM-Database server

Component	Minimum Requirement	Recommended Requirement
Processor	2.6GHz	4.2GHz
Memory (ram)	4GB	6GB
Hard Drive Disk	300GB	500GB
Network Interface Card	10/50mbps	10/100mbps
DVD ROM Drive	12x	16x

Table 2.2 Database server

HP-Client server

Component	Minimum Requirement	Recommended Requirement
Processor	1.65GHz	2.6 GHz
Memory (ram)	2GB	4GB
Hard Drive Disk	200GB	320GB
Network Interface Card	10/50mbps	10/100mbps
USB Ports	2	4

Table 2.3 Client server

Networking components

Component	Specifications
Router	Cisco router
Switches	24 port / 16 port / 8 port Cisco switches
Ethernet cables	IEEE 802.3
Wireless adapters	IEEE 802.11

Table 2.4 Networking components

2.4.1.2 Software requirements

Outlined below is the software required to develop and operate the new system

- Windows 7 Professional
- Microsoft Office Word 2007/2010
- ESET Nod Antivirus 2013

- Microsoft SQL Server 2008
- ASP.Net
- SMS Tool Kit

2.4.1.3 Technical expertise

Existing staff members are well skilled and experienced in information systems audit and consultancy, security, hardware and software support. Thus the existing staff is capable of supporting the new system once it becomes operational. One thing to keep in mind is that the project with the high risk can still be conducted. Most companies would have the reasonable combination among high, medium and low risk projects. Without the high risk project the organization couldn't, make the major breakthroughs in innovative uses of systems.

It can be evaluated and concluded from the above analysis that the proposed project is technically feasible for development and implementation.

2.4.2 Economic feasibility

Economic feasibility is the most important study that determines the cost and benefits of the proposed system and compares with the budget. The cost of the project should not outweigh the budget. The cost of the project includes the cost of hardware, software, development and implementation. Cost/benefit analysis is the common method to determine the benefits that are expected from the proposed system and compare them with the costs expected to spend on development of the system. If benefits are found to be more than costs, then the analyst decides to continue the development of the proposed system otherwise considers it economically not feasible, (www.mbaknol.com).

There are several techniques for cost estimation and the two basic approaches are top-down and bottom-up.

- Top down approach

Costs are derived from the business analysis of the major project components or it can start with management expectations on the range of figures then at the end come up with figures for the costs.

- Bottom-up approach

Costs are derived by accumulating estimates from people responsible for various components. With the bottom-up approach a component is broken down into a number of smaller components and then separate estimation is made for each component and then aggregates the estimates.

The primary estimation techniques are:

	Description	Advantage	Disadvantage
Expect Judgment	The use of experts in software development to predict software costs.	Accurate if experts have direct experience of similar systems.	Very inaccurate if there are no experts.
Estimation by analogy	The use of the cost of a similar project on the current project.	Accurate if project data is available.	It is impossible if no similar project has been developed.
Parkinson's Law	The use of any available resources.	There is no over spending.	Very often systems are no finished.
Pricing to win	The project costs whatever the customer can spend.	High chances of winning the contract	The probability that the customer will get the expected system is small.

Table 2.5 Cost estimation techniques

As an accounting and auditing firm various experts across the organization paved way for the use of the expect judgment technique hence enabled the development of a reliable cost benefit analysis as shown by table 2.6 :

2.4.2.1 Cost benefit analysis

Year and Currency ►	2013(USD)	2014(USD)	2015(USD)
BENEFITS			
Tangible benefits			
Cost savings (audit expenses)	3 000	8 600	9 700
Lost revenue (audit fee re-negotiation)	4 000	6 000	9 700
ESTIMATED TOTAL BENEFITS	<u>7 000</u>	<u>14 600</u>	<u>19 400</u>
COSTS			
Development costs			
Software	1 000		
Labor, Internet, Airtime, Transport	1 750		
Training costs and other expenses	5 000		
TOTAL DEVELOPMENT COSTS	<u>7 750</u>		
Operational costs			
Software maintenance and Insurance	5 600	5 000	4 500
Backup and recovery costs	800	800	700
IT Personnel costs	1 200	1 200	1 200
TOTAL OPERATIONAL COSTS	<u>7 600</u>	<u>7 000</u>	<u>6 400</u>
TOTAL ESTIMATED COSTS	<u>15 350</u>	<u>7 000</u>	<u>5 900</u>
TOTAL ESTIMATED BENEFITS	<u>7 000</u>	<u>14 600</u>	<u>19 400</u>
ESTIMATED NET BENEFIT/(LOSS)	<u>(8 350)</u>	<u>7 600</u>	<u>13 000</u>

Table 2.6 Cost benefit analysis

Intangible benefits

- Improved in time management
- Improved communication
- Aid in decision making
- Improved relations with clients

A bar chart creates a summary of the estimated benefits, costs and net benefits for each year and creates an easy to understand visualized data set.

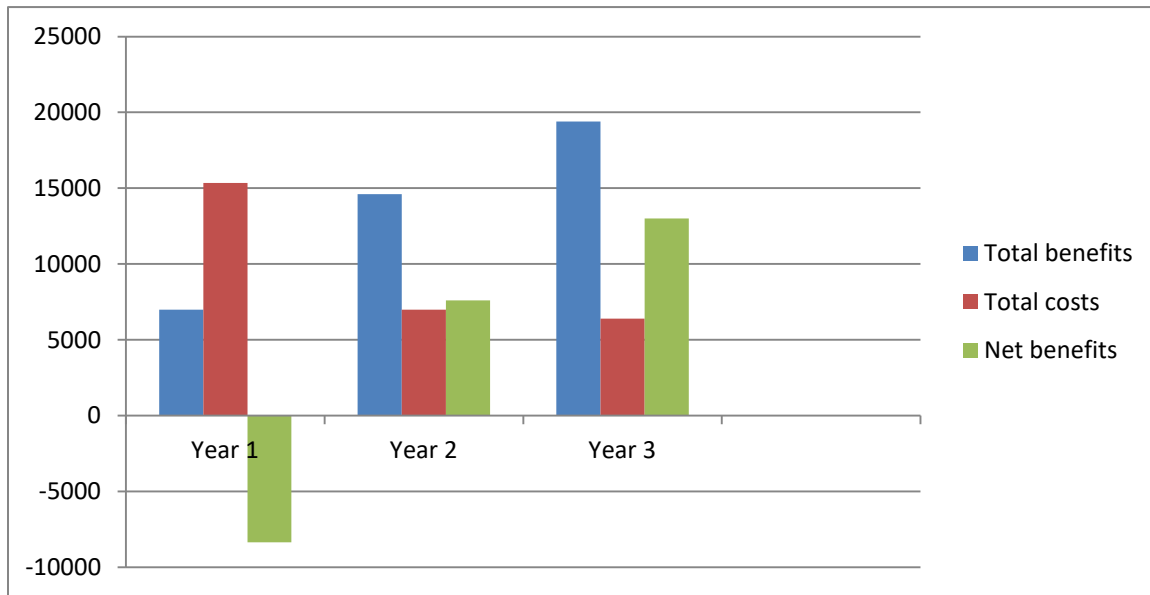


Figure 2.1 Bar chart

2.4.2.2 Payback Analysis

The payback analysis technique measures amount of time required for an investment to generate sufficient cash flows to regenerate its initial cost. The sooner the outlay on a project is covered by the inflow of cash, the better: this is the payback period (Randall, 2001:442). Due to the insecurity and uncertainty associated with projects with a long payback period, a project with a shorter payback period is more favorable under this technique.

Year	Cash inflow / (outflow)	Balance
0	(8 350)	(8 350)
1	7 600	(750)
2	13 000	12 250

Table 2.7 Payback analysis

Payback period =1 year 5 months

2.4.2.3 Net Present Value (NPV)

The net present value determines the economic feasibility of a project in relation to the current value of money (Randall, 2001:444). The time value of money recognizes that \$1 received now is worth more than \$1 received in a year's time. As future cash flows are estimate-based the NPV analysis considers the fact that money may lose value due to inflation or fluctuating bank exchange rates. The table below illustrates how the project's NPV is deduced.

$$\text{Present Value} = \frac{1}{(1+r)^t} * \text{cash flow}$$

Given that: r = discount rate = 10% and t = number of years

Year	Discount factor	Cash inflow/(outflow)	Present Value
0	1	(8 350)	(8 350)
1	0.9091	7 600	6 909.16
2	0.8264	13 000	10 743.20
NPV ►			9 302.36

Table 2.8 Net present value analysis

2.4.2.4 Return On Investment (ROI)

ROI measures the net benefits of the project against the capital employed in earning the benefits (Randall, 2001:463). A positive ROI after a short implementation and operation period is favorable, thus a positive ROI that is greater than the current cost of capital means that the project is economically feasible to be undertaken. Below is an instance on how to deduce the ROI of a requested project.

$$\text{ROI} = \frac{[(\text{Total Benefits} - \text{Total Costs}) / \text{Total Costs}] * 100\%}{}$$

$$\text{Hence ROI} = \frac{[(7\ 000 + 14\ 600 + 19\ 400) - (15\ 350 + 7\ 000 + 5\ 900) / 28\ 250] * 100\%}{}$$

$$= 45.13\%$$

From the above techniques' results it can be concluded that the project is economically feasible, thus the project is economically viable for development and implementation.

2.4.3 Social feasibility

Social feasibility is a determination of whether a proposed project will be acceptable to the people or not. This determination typically examines the probability of the project being accepted by the group directly affected by the proposed system change, (www.mbaknol.com). The following points were noted.

- Employees will be aware of the development of the system from the point of the project's proposal hence they are less likely to be socially affected by the new system. However receiving work related information at non-business hours might socially impact employees negatively.
- The system has an indirect positive impact on the company's clients. The system would enable timely completion of engagements thus creating good relations between the companies.
- The system will support the work of management by improving resource coordination, the quality of decisions and effort required to manage staff.
- For employees in the information technology department (IT) a new system might mean more work in terms of operation, library management, maintenance and user support.

In conclusion the proposed system is socially feasible thus the system is socially viable for development and implementation.

2.4.4 Operational feasibility

When it is found that the project is both economic and technical feasible, the next step is to determine whether it is operationally feasible or not. During operational feasibility study, it is determined whether the system will operate in the way that user wants. Operational feasibility depends upon human resources for the development and implementation of the system. It is considered whether the qualified and experienced manpower is available for development and implementation of the system, (www.mbaknol.com).

User involvement is more required in determining the operational feasibility. The operational feasibility enables developers to understand how the new system will fit into the current day to day operations of the organization.

The main areas under consideration are:

- Are there major barriers to implementation?
- Will the end users accept the system once implemented?

These areas were exploited under the end users who would be largely impacted by the implementation and operation of the new system.

Management

- With the current system, it is very difficult to get the full information of audit human resources available which is of great importance when making decisions. The new system will consider the lay-off of staff for leave, assigned and unassigned staff to provide management with information on resources available.
- Historically management have undergone various training of international audit software thus the new system would have a higher rate of management acceptance as it seek to support management during the audit period.
- The system would in conjunction with APT (Audit Process Tool) which is used by managers to assign tasks to auditors working together in a virtual workspace re-assign auditors to new assignments.

Employees

- The current system does not offer communication functions to auditors. Communication is based on other software, electronic mail and through Microsoft office groove which is convenient only when auditors are online and logged-on. Employees are eager to experience the informative capabilities of the new system as it keeps them informed of their assignments while they are mobile.
- It is of greater importance for all employees to be fully aware of company risks associated with losing their mobile cell phones as they might contain company information that may be used for industrial espionage thus user training must be adequate enough to attain user acceptance.

From the operational study it can be concluded that the new system is operationally feasible for development and implementation.

2.5 Project plan and schedule

Schedule feasibility assess the duration of the new project, whether it is too long to be completed before it becomes useful. Estimates have to be made on how long the system will take to develop and whether all potential time frames and completion date schedules can be met and whether meeting these dates will be sufficient for dealing with the needs of the organization.

Project activities

- Introduction
- Planning Phase
- Analysis Phase
- Design Phase
- Implementation Phase
- Documentation

Project Activity Scheduling

Activity	Start date	End date	Duration (weeks)
Introduction	25/02/2013	1/03/2013	1
Planning Phase	2/03/2013	8/03/2013	1
Analysis Phase	9/03/2013	22/03/2013	2
Design Phase	23/03/2013	05/04/2013	2
Implementation Phase	06/04/2013	12/04/2013	1
Documentation	13/04/2013	19/04/2013	1

Table 2.9 Project activity schedule

Gantt chart

Activity/Task	Start date	End date	Duration (weeks)	1	1	2	2	1	1
Introduction	25/02/2013	1/03/2013	1	■					
Planning Phase	2/03/2013	8/03/2013	1		■				
Analysis Phase	9/03/2013	22/03/2013	2			■			
Design Phase	23/03/2013	05/04/2013	2				■		
Implementation Phase	06/04/2013	12/04/2013	1					■	
Documentation	13/04/2013	19/04/2013	1						■

Figure 2.2 Gantt chart

The gantt chart is a graphical representation of project activities and their time span. Thus it acts as a scale and control chart from which project progress can be measured against.

2.6 Conclusion

The various techniques of the feasibility study have revealed that the project is feasible for development and implementation. Approval of the planning phase enables the developer to proceed with system development, thus the next chapter focuses on analyzing the current system.

CHAPTER THREE: ANALYSIS PHASE

3.1 Introduction

This chapter will analyze the current system that is its processes and data by utilizing various information gathering techniques such as interviews, observations and questionnaires, its weaknesses, system development alternatives available to the developer and finally the requirements analysis of the new system. The analysis phase seeks to augment the developers understanding of the functionality of the current system and ensure that the developer has fully understood how the current system operates before developing the new system.

3.2 Information gathering methodologies

There are a number of information gathering techniques which include statistical, interviews, questionnaires and observations amongst others. The use of each specific technique would depend on the depth and type of information the developer seeks to attain. A combination of these techniques would also enhance the quality of the outcome.

3.2.1 Interviews

An interview is interactive conversation between two or more people, usually the interviewee and the interviewer, (academic.udayton.edu). Mr R.Chuma was interviewed at BDO Zimbabwe on the 22nd of March at 08:30am covering the main functional areas of the system.

3.2.1.1 Advantages

- They provide a real time two-way exchange of information thus allowing for further clarifications on information provided right on the spot.
- Interviews provide time for the interviewee and the interviewer to make preparations before the interview.
- Allows respondents' to describe what is important to them.
- Useful for gathering quotes and stories.

3.2.1.2 Disadvantages

- The development of questions and preparation for the interview is time consuming and costly.
- Interviews can be on specific select individuals thus, they do not cater for all individual stakeholders.
- Susceptible to interview bias

3.2.2 Questionnaires

This technique is very important especially when there is some information which could not be attained from the interviews and observations that is vital to system development. Various techniques need to be employed when designing the questionnaires if the developer is to attain high quality information from the questionnaires, (www.icbl.hw.ac.uk). Six questionnaires were distributed to staff and management at BDO Zimbabwe head offices on 15th March 2013 covering users' perspectives of the current system and expectations of the new system; four out of six questionnaires were returned.

3.2.2.1 Advantages

- There is no need for close monitoring once the questionnaires have been developed and distributed.
- Questionnaires take into consideration the value of time to some respondents such as high level management who might not have enough time to engage into interviews.
- Potentially, information can be gathered from a large portion of a group.
- The results are gathered in a standardized way, thus questionnaires are more objective.
- Reduce the chance of evaluator bias because the same questions are asked of all respondents.
- Some people might feel comfortable responding to a questionnaire than participating in an interview.

3.2.2.2 Disadvantages

- The quality of questionnaires outcome relies on the developer's skills and experience in designing questionnaires and interpreting the outcome from the questionnaires.
- The designing phase of questionnaire is time consuming if reliable questionnaires are to be produced.
- Questionnaires lack the direct personal communication between the developer and the respondent as compared to interviews.
- The developer is unable to probe respondents for additional details.
- Items may not have the same meaning to all respondents.

3.2.3 Observations

This technique is simple to implement and provides real time feedback on how the current system operates, however it has its disadvantages that may blur the outcome. As the developer was directly involved with the operations of the current system some of the disadvantages of this technique were outweighed by the benefits. Observations were done at BDO Zimbabwe head offices on 18th March 2013. Observations were chosen for identifying the relationship between activities because of the following evaluation, (humanresources.hrvinet.com):

3.2.3.1 Advantages

- They provide real time information, the developer can collect data where and when and event or activity is occurring.
- The developer gets an in-depth understanding and a personal experience of the operations of the system.
- It does not rely on people's willingness to provide information.
- The developer can directly see what people do rather than rely on what they say they do.

3.2.3.2 Disadvantages

- Susceptible to observer bias
- Hawthorne effect-people tend to perform when they know they are being observed.
- Observations are demanding in relation to the commitment required from the analyst if the outcome of the observations is to be credible.

3.3 Analysis of the current system

The above information gathering techniques have enabled the system developer to grasp an in-depth functionality of the current system. The analysis of the current system will identify the main people, processes and data components that are part of the information system. The current system used at BDO Zimbabwe is a manual system that is partly computerized.

Clients

When the audit period is about to begin clients inform the firm of the audit period they wish to accommodate auditors. Thus if it is an existing client the relevant information is captured (i.e agreed on audit period/dates). If it is a completely new client the client information is also captured and audit engagement dates are agreed on by the partners. The firm's partners are responsible for any changes to agreed-on audits dates and assigning staff to the clients is done by the managers. The partners will deliver the audit budget to the HR department for management.

Auditors

When a new client is about to be audited, the audit team will hold an engagement meeting. The meeting will inform auditors of the various information they need to know about their client and how tasks are going to be executed. Due to career development programs at BDO Zimbabwe, team members will receive e-mails and telephone calls informing them of the partners' arrangements and any other changes made. During the peak period when clients requests cannot be adequately be satisfied by the best auditors whom would be assigned to other clients, auditors are re-assigned to the clients. At most of the time especially during the audit period auditors spend most of their time across the country engaged to clients.

Human Resources

Auditors at BDO Zimbabwe are involved in continuous learning and career development programs. Thus they would take mainly study leave from time-to-time. As the duty of the human resources department the HR would check on one's available leave days and decide whether to approve or dis-approve the leave application form. The HR is un-aware of previous clients the auditor has just completed to which the auditor might be asked to re-visit the client to clarify on some pending issues or any awaiting client engagements. Thus there is an operational gap between the two departments. One's leave would be approved but after two or three days the auditor would receive a telephone call requesting the auditor to report for duty which disgruntles employees.

The HR with the help of the audit time and cost budget prepared by the partners assign and coordinate staff from one client to the other. They are responsible for the smooth flow of audit engagements. Communication to auditors is also done by managers and supervisors through e-mail, telephone and Microsoft office groove. Thus the managers ensure that any new clients incorporated into the firm by the partners during the audit period fit in the audit time budget.

Managers

Managers are responsible for coordinating and controlling the actual audit execution process. The audit execution is done through the use of APT (Audit Process Tool) which divides an engagement into individual sub-tasks. Thus management will need progress reports as to the status of audit execution progress. As managers are involved closely with the day to day execution of engagements they play an important role in the approval of leave days to staff.

Computerization

The organization use "Caseware Time" to prepare the time budgets used for managing the audit execution process. Audit dates agreed upon by the organization and the clients are entered into caseware time to enable the partners to plan the audit execution process. All budgets concerning the audit of clients are prepared by the partners. Thus this plan is used by Human Resources to assign staff to clients and control the audit process. Any major audit problems concerning clients are reported to the partners by management.

3.4 Process analysis

An activity diagram is a formal way of representing how a business system operates.

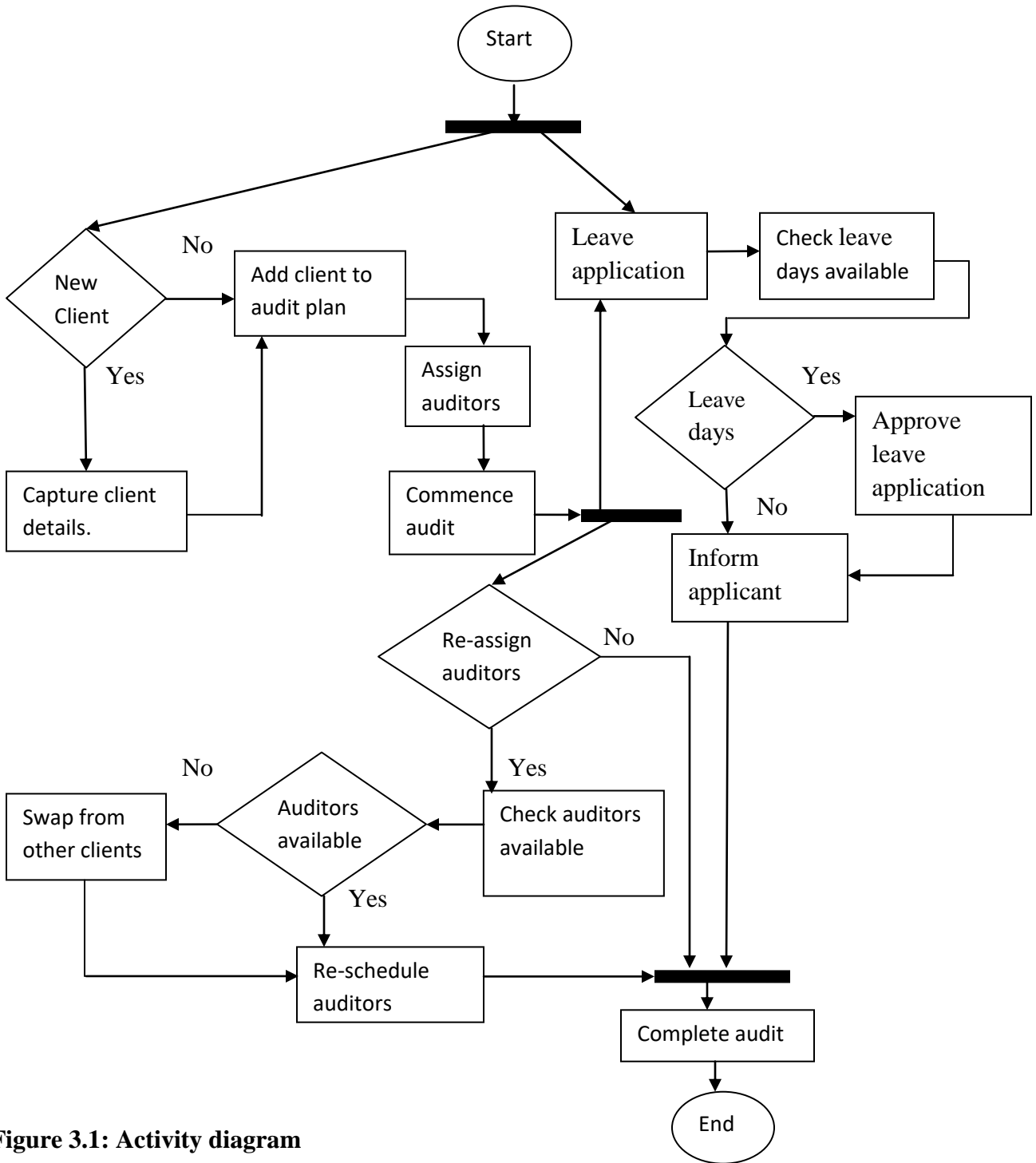


Figure 3.1: Activity diagram

Processes

- 1) Client registration
- 2) Leave application
- 3) Update audit data
- 4) Assigning auditors
- 5) Leave verification
- 6) Generate report

3.5 Data analysis

The context diagram is the highest level in the data flow diagram. It contains only one process (labeled 0) representing the entire business system.

3.5.1 Context Diagram of Current System

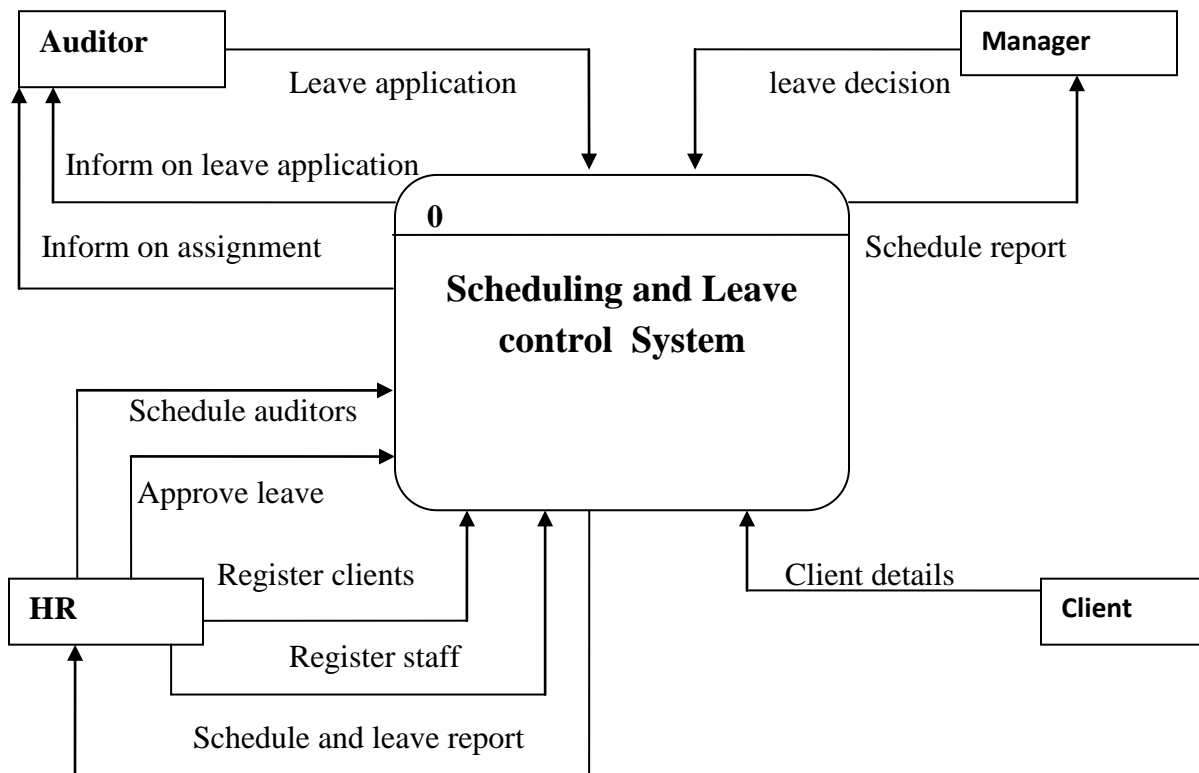


Figure 3.2: Context diagram

3.5.2 Data Flow Diagram of Current System

A DFD is used to graphically represent the flow of data in a business system.

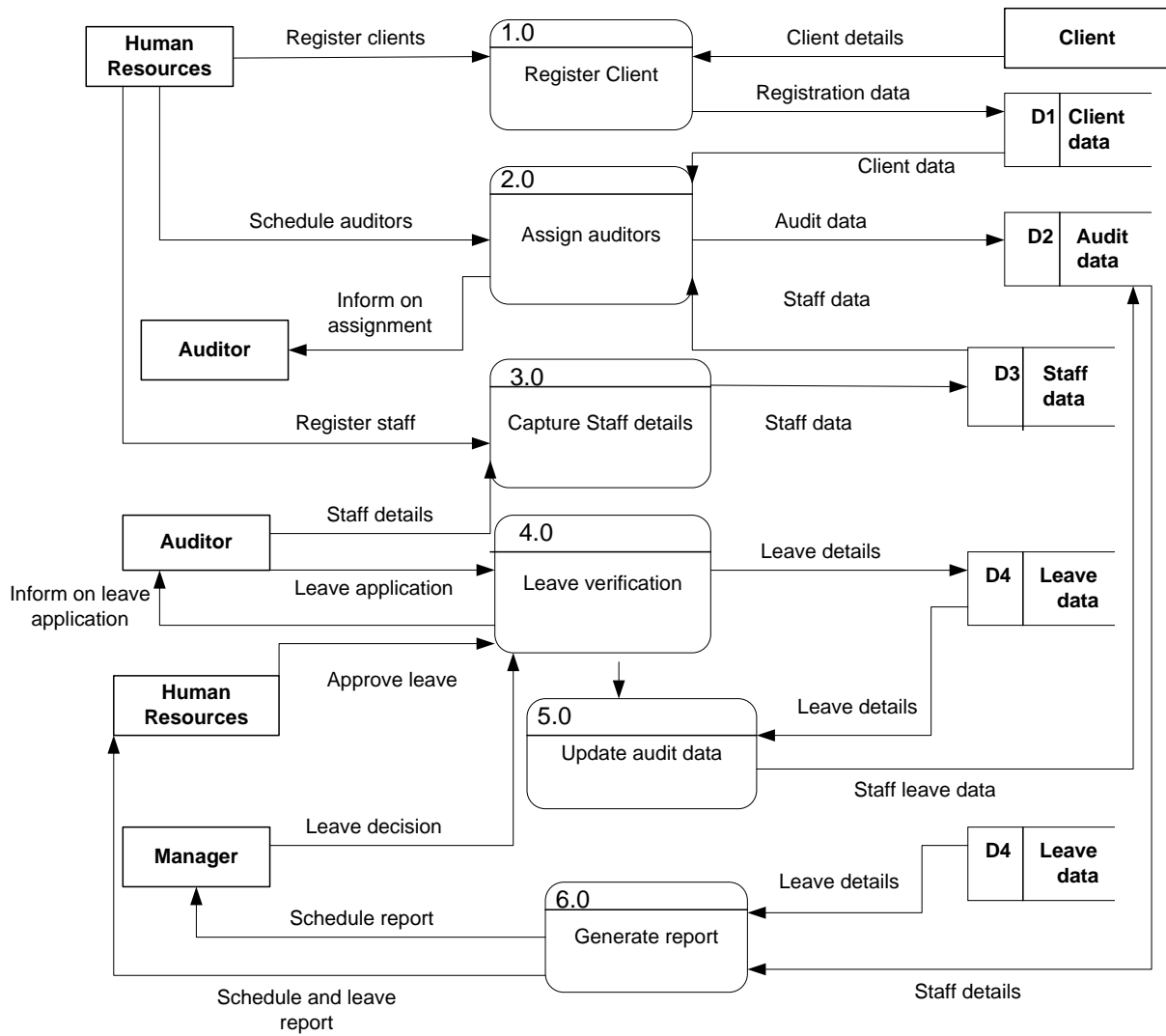


Figure 3.3: Data flow diagram





Symbol	Description
	Process
	Data store
	Data flow
	Entity

Table 3.1: Key for Data flow diagram

3.6 Weaknesses of the current system

- The discrete operation of the system does not provide an integrated communication platform between the audit and human resources departments.
- The system is not flexible enough to allow management to coordinate the human resources with the ever increasing number of clients.
- The system's operations is only confined to the firm's premises, users of the system find it difficult to collaborate while in the field.

3.7 Evaluate alternatives

There are various information system development alternatives available to the developer. The main alternatives that are widely used in organizations are reviewed below.

3.7.1 Outsource

Out-sourcing is the contracting of an external software development house to develop the system for the organization.

3.7.1.1 Advantages

- Flexibility

When software development is out-sourced the need for recruiting, hiring and training employees is eliminated, (orientsoftware.net).

- Rapid technological advancement

It is cost-effective to outsource software development due to the frequent and rapid changes in technology which would be otherwise be costly to the organization.

- IT professionals

The organization will have the opportunity of its system being developed by highly skilled and experienced IT professionals thus enhance the quality of the system.

Below are various reasons why it is not viable to outsource the development of the information system:

- Outsourcing lacks the adherence to security and quality standards.

As more software code gets written by outsourced development companies, the lack of supervision of exactly how the code should be written could be of concern. Since the competitive positions of the outsourced developers depend on delivering information systems at the lowest possible cost for the highest achievable quality in the quickest delivery time, much of the software development integrity may be violated. Sacrifices will be made to ensure that the “product” is delivered even though it may not be the most reliable “product” or complete “product”, (www.japaninc.com/article)

- High risk of inadequate validation and testing of the code when a complete information system is developed.

If cost savings is what motivate the outsourced companies, organizations are less likely to go through the proper channels of information systems certification (i.e consulting information systems professionals). This posse the risk of malicious code being placed and going undetected, which may be a source of information or data leaks.

- Physical control over security regarding systems and facilities is limited.

It is nearly impossible to guarantee that the security measures will ensure that the data and system are not compromised. Since outsourced companies are primarily concerned with perimeter and host security, the human aspects of security are often ignored. Moreover the necessity to keep costs low and remain competitive gives rise to the prominence of unlawful practices such as password sharing for access to copyrighted material and multiple users per system which could lead to data leaks and system damage bringing the organization to a halt, (www.buildsecurityin.us-cert.gov).

- Industrial espionage

When an employee leaves an outsourcing company or project, experience and knowledge are lost. For example in the United States, legal agreements between employees and employers are put in place in order to intellectual property from being placed in the hands of competitors.

- Time factor

When there is an emergency with the information system during its operation, it will have to wait until the outsourced company can get someone to the organization's premises. Thus the organization is subject to the calendar of the outsourced company and many factors can cause the emergency to be pushed back. At this point the organization is at the mercy of the outsourced company. Had the system been built in-house the emergency would be dealt with right away.

3.7.2 Improvement

Improving the current system would not significantly change the nature of operations and eliminate the problems of the current system.

3.7.2.1 Advantages

- User Training

There is no need for user training as the end users are very familiar with the current system.

- Improvement Cost

There is very little improvement costs that will be incurred.

- User Acceptance

The improved system is mostly likely to receive much end-user acceptance as much of the operations of the system do not change very much.

Below are various reasons why it is not viable to improve the development of the information system:

- Costs of improving a manual system will not equate the benefits accrued by the system.
- Improving the manual system will result in the need for further improvement in the lifetime of the system.
- As a professional firm improving the current system will not result in a more professional approach of operating.
- The problems identified with the current system are more likely to be incorporated into the improved system.

3.7.3 Development

In-house development refers to when an information system is developed by an information systems professional to match the business requirements of the organization, (Hardcastle, 2008:74)

3.7.3.1 Advantages

- It has the benefit of producing software tailored precisely to the requirements of the business.
- System development will conform to the security and adhere to standards of the organization.
- IT professionals well experienced in information systems consultation and certification will ensure adequate system validation and testing during and prior implementation.

- It is easier to maintain and support an information system that people were involved in the development and implementation of the system.

3.8 Requirements analysis

A requirement is statement of what the system must do or a statement of the characteristics of the system. Requirements will change over time as the project moves from analysis to design to implementation. They can be categorized as functional and non-functional requirements.

3.8.1 Functional requirements

Functional requirements deal with what the system should do or provide users, (sqa.org.uk). Thus it identifies the processes the system has to perform and the information the system must contain. The functional requirements document (FRD) is a formal document of an application's functional requirements. The developer agrees to provide the capabilities identified. Quality is meeting requirements, for that reason FRD is a central document in systems development

Schedule auditors

The system should allow management to schedule employees to clients.

Send SMS text to auditors and managers

The system should be able to inform auditors of upcoming assignments and managers of leave applications through SMS.

Detect and prevent schedule conflict

The system should be able to detect schedule conflicts and prevent them.

Swap staff between assignments

The system should enable management to swap staff between assignments more flexibly.

Leave application and review

Staff should be able to apply for leave on-line even when they are engaged to clients across the country and review the status of their application.

User Case Diagram

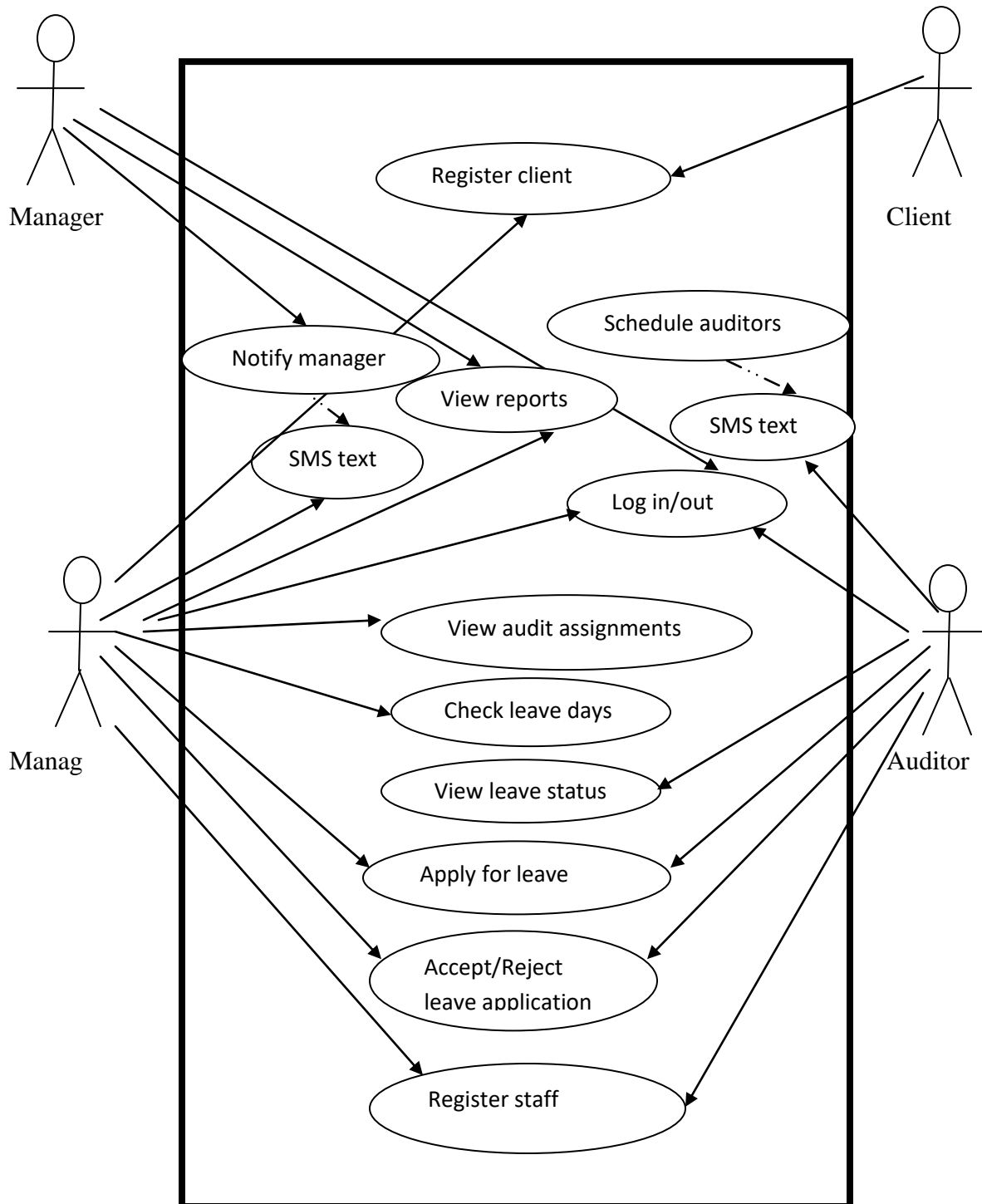


Figure 3.4: Use case diagram



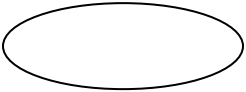


Symbol	Description
	System boundary
	Actor
	Use Case
	Uses
	Includes

Table 3.2: Key for Use case diagram

3.8.2 Non-functional requirements

Non-functional requirements define the overall qualities or attributes of the resulting system. They place restrictions on the system to be developed, the development process and specify external constraints the system should meet. Non-functional requirements include safety, security, usability, reliability and performance requirements, (www.sqa.org.uk). These tend to conflict and interact with other system requirements.

Security

Unauthorized access to the system and its data is not allowed. Ensure the integrity of the system from accidental or malicious damage.

- The access permissions for the system data may only be changed by the system's data administrator.
- All system data must be backed-up in accordance with the BDO Zimbabwe IT department back-up policy.

Performance

This requirement concerns the speed of operation of the system

- The system should be readily available for service when requested by end-users.
- The system should be able to accomplish many user requests within a specified amount of time.

Usability

Usability is the ease with which a user can learn to operate, prepare inputs for, and interpret output of the system or a component.

- The system should have well structured user manuals and informative error messages.
- The system should have well-formed graphical user interfaces.

Supportability

Supportability requirements are concerned with the ease of changes to the system after development.

- The system code should be grouped into classes to ease the ability of the system to deal with new technology and to fix defects/bugs.

3.9 Conclusion

This chapter has identified and explained why the system should be built, information gathering techniques employed by the system developer, evaluated various system development alternatives, formal and theoretical description of the current system as well as the functional and non functional requirements of the proposed system. The next chapter will explain and present how the new system will be designed.

CHAPTER FOUR: DESIGN PHASE

4.1 Introduction

This chapter will describe and diagrammatically present how the new system is going to be developed through context and data flow diagrams, its architectural, physical, database, program and interface designs. The chapter seeks to illustrate the granular designs that will be included to develop the new system.

4.2 System Design

The major objective of system design stage is to ensure that an efficient, effective, maintainable and reliable system is built. Based on the general preliminary user requirements defined in the requirements definition phase, a detailed design can be developed. System design specifies the various components of the project that integrated together will result in a complete functional information system.

According to Head (2011:170) key system design activities include:

- Developing system flowcharts and entity relationship models to illustrate how information will flow through the system .
- Determining the use of structured design techniques (which are processes to define applications through a series of data or process flow diagrams) that show various relationship from the top level down to the details.
- Describing inputs and outputs such as screen designs and reports.
- Determining data file or database system file design.
- Preparing program specifications for various types of requirements of information criteria defined.

4.2.1 Context Diagram

A Context diagram represents a high-level view of the overall business or system boundary of interest, (www.kinzz.com). It represents the entire software element as a single bubble with input and output data indicated by incoming and outgoing arrows respectively.

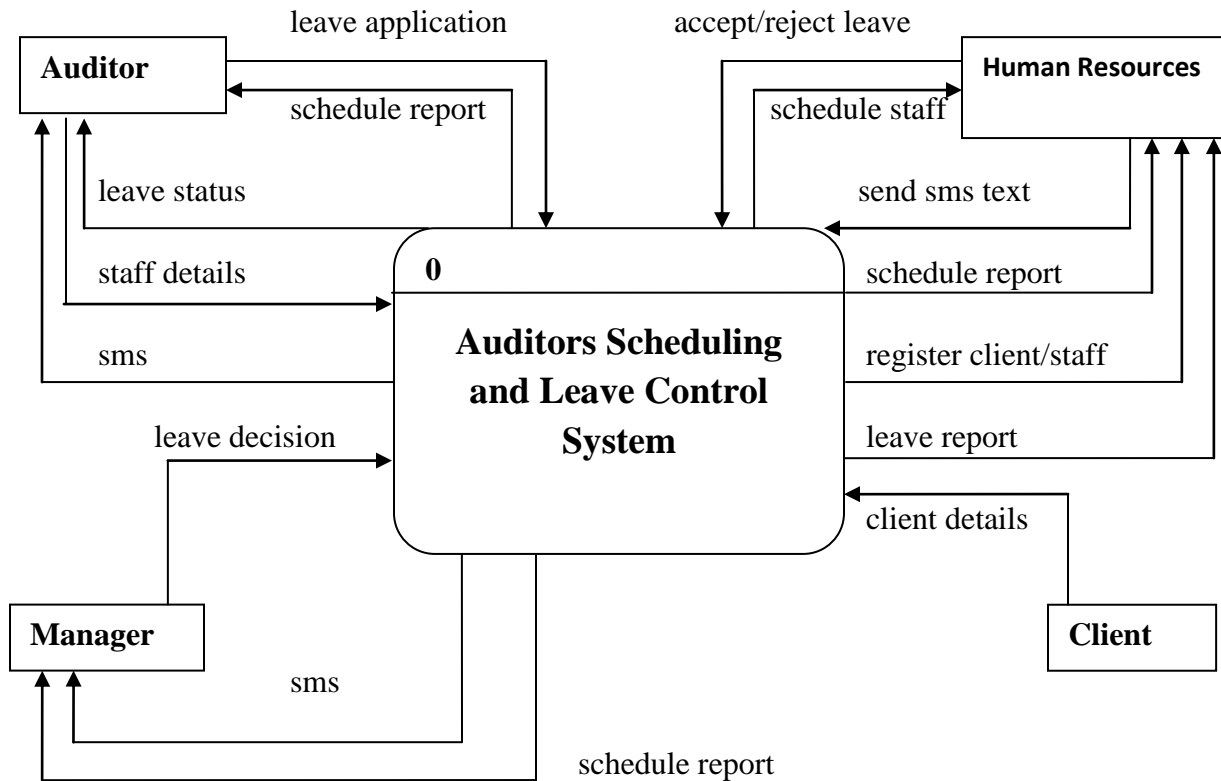


Figure 4.1 Context diagram

Symbol	Description
	Process
	Entity
	Data store
	Data flow

Table 4.1 Key for DFD and Context diagram

4.2.1.1 Data Flow Diagram of the proposed system

A data flow diagram show the flow of data from external entities into the system, showed how the data moved from one process to another, as well as its logical storage,(agilemodeling.com).

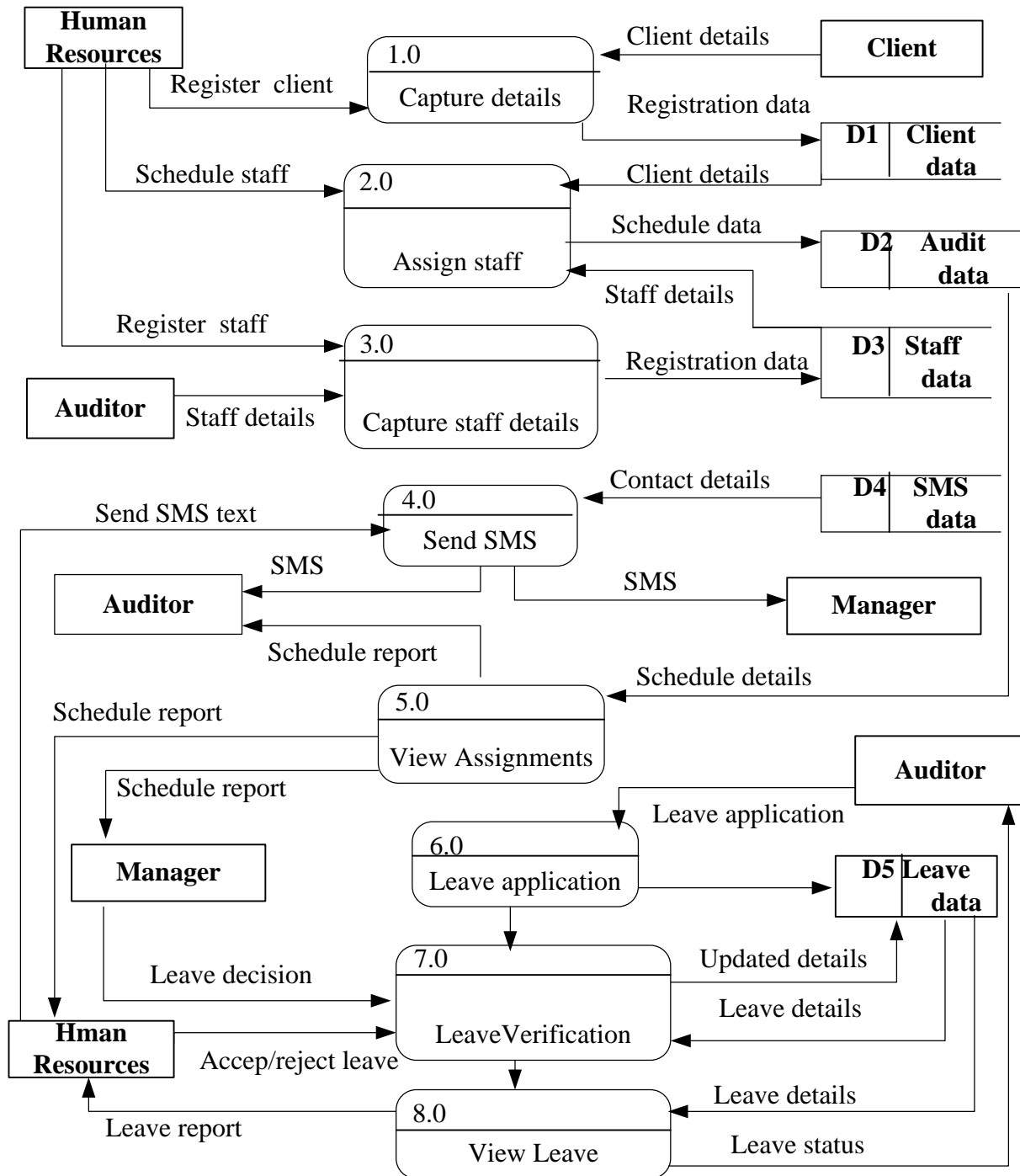


Figure 4.2 Data Flow Diagram

4.3 Architectural Design

The application will follow a three-tier architecture that is a client tier, application server tier and database server tier. As the name suggests there is a client process, which requires some resource, and a server, which provides the resource, (Connolly, 2005:109). This can be diagrammatically presented as shown by Figure 4.3 below:

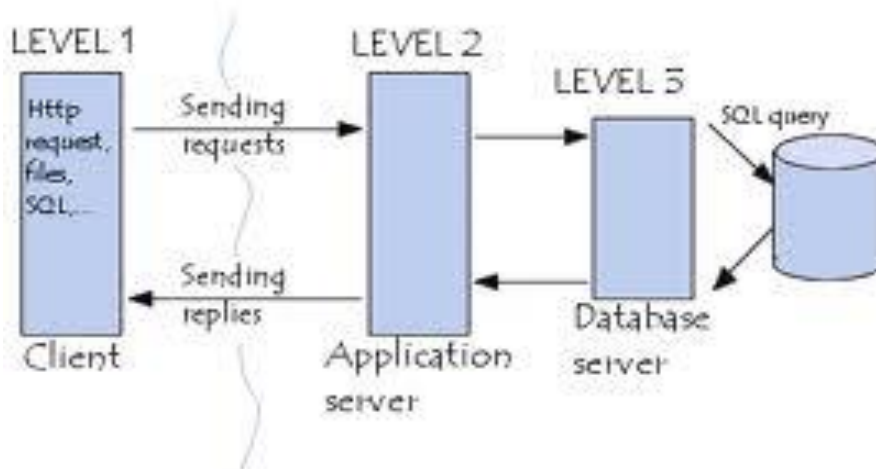


Figure 4.3 Three-tier architecture (www.en.kioskea.net)

A three-tier architecture will contain the following tiers and their properties

Client Tier	Application Server Tier	Database Server Tier
Manages the user interface	Accepts and processes requests from clients	Provides concurrent database access
Accepts and checks syntax of user input	Checks authorization	Provides database integrity controls
Processes application logic	Ensures integrity controls are not violated	Provides database access controls
Passes response back to user	Provides recovery control	
Generates database requests and transmits to server	Performs query processing and transmits response back to the client	

Table 4.2 Three-tier properties

4.4 Physical Design

The physical design will illustrate how the system software will interact with the hardware components of the LAN (Local Area Network) of BDO Zimbabwe. Thus the system will be implemented and operated on existing hardware components with the client-server configuration. Below is a review of the hardware and software components the system shall interact with.

Client workstation

The graphical application for the user will reside on the client workstation from which database requests are communicated to the server. Thus client workstation can be located anywhere on the company's local area network or external networks.

Server

The necessary access and processing of data is going to be done on the IBM server. The server hardware is tolerant to hardware stress and shall facilitate local and remote accessibility and interoperability. Server application software and database will reside on this server.

Operating systems

The client workstations will be running the Windows 7 operating system or later to ease administration of microsoft security update patches. The IBM server will be running Microsoft 2000 network operating system which is well known for its ease of management and low cost of ownership.

Printers

The application shall interact with network printers that will be residing in the printing pool. Thus client workstations shall be configured to share and access the network printers in case there is need to print reports generated by the application.

Routers and Switches

The router shall control and monitor remote access to the network and application resources especially when users are on external networks while switches will control local data flow.

Internet Connection

Users will need browsers such as internet explorer, firefox, opera and netscape to access the system. The internet connection will be enabled by Ecoweb which currently the company's service provider. A firewall will protect the system from internet threats and related risks.

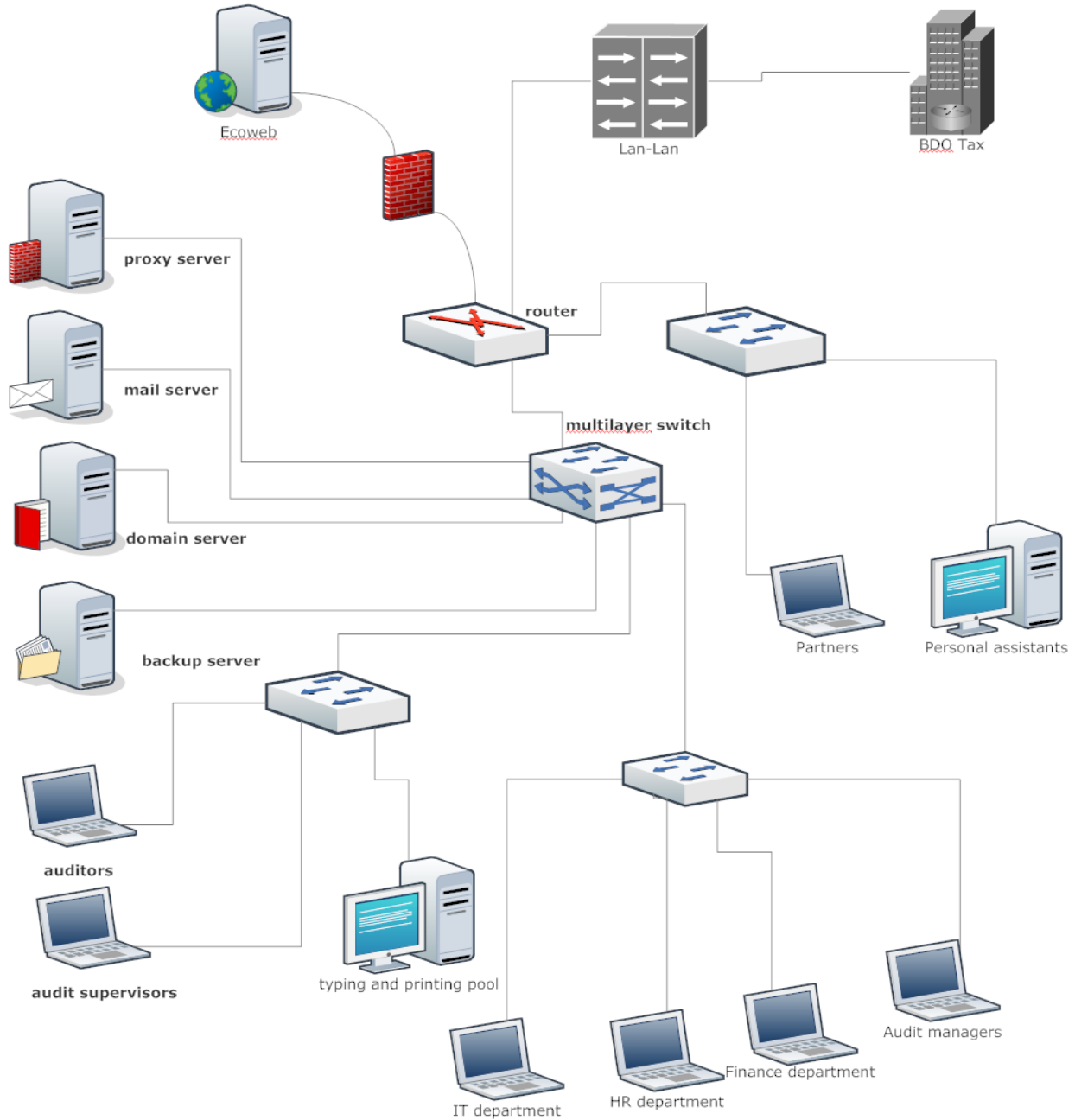


Figure 4.4 Network setup

The above figure shows an overview of the hardware components the proposed system is going to operate on. Thus the system shall operate on a client-server network where the server will provide the application services to the client workstations while on the local area network and when they are engaged to clients across the country.

4.5 Database Design

A database is a shared collection of logically related data, and a description of this data, designed to meet the information needs of an organization, (Connolly, 2005:15). Database architecture refers to the arrangement of data in a database in layers or strata known as schemas namely the:

- External Level Schema
- Conceptual Schema
- Internal Level Schema

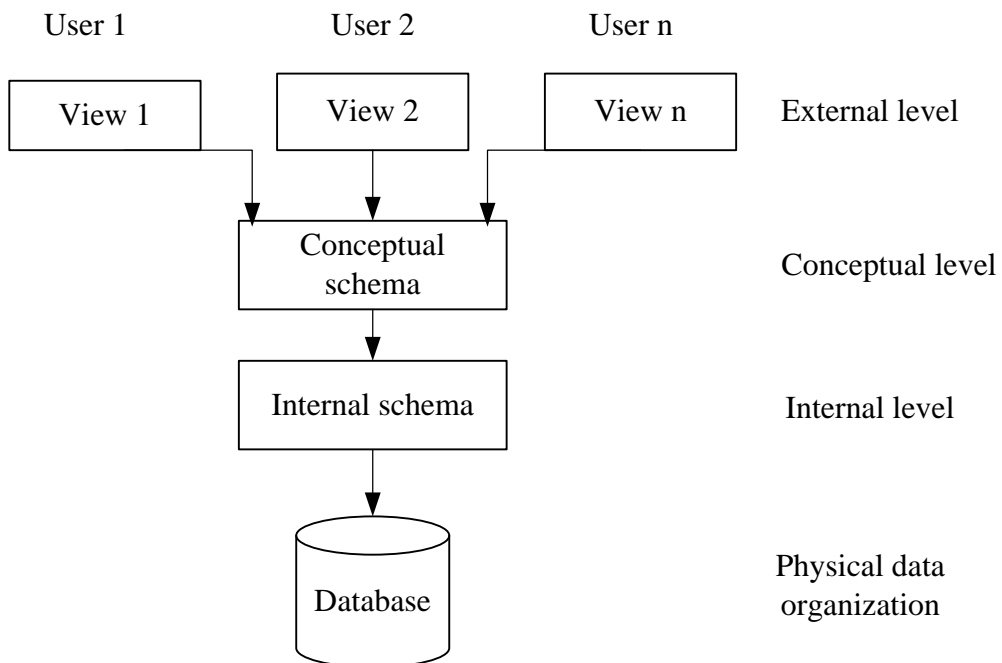


Figure 4.5 Three level ANSI-SPARC Architecture

4.5.1 External Level

The external level consists of a number of different external views of the database. Each user has a view of the 'real world' represented in a form that is familiar for that user. The external view includes only those entities, attributes, and relationships in the 'real world' that the user is interested in. Other entities, attributes, or relationships that are not of interest may be represented in the database, but the user will be unaware of them. The system will have 3 user levels.

4.5.2 Conceptual Level

The middle level in the three-level architecture is the conceptual level. This level contains the logical structure of the entire database . It is a complete view of the data requirements of the organization that is independent of any storage considerations. The conceptual level supports each external view, in that any data available to a user must be contained in, or derivable from, the conceptual level. The system will have six tables.

The conceptual level represents:

- all entities, their attributes, and their relationships;
- the constraints on the data;
- semantic information about the data;
- security and integrity information.

4.5.3 Internal level

The internal level covers the physical implementation of the database to achieve optimal runtime performance and storage space utilization. It covers the data structures and file organizations used to store data on storage devices. It interfaces with the operating system access methods (file management techniques for storing and retrieving data records) to place the data on the storage devices, build the indexes, retrieve the data, and so on. The internal level is concerned with such things as:

- storage space allocation for data and indexes

- record descriptions for storage (with stored sizes for data items)
- record placement
- data compression and data encryption techniques.

4.5.4 Database table design

The system will use tables in the database to store the organizational data used by the application program. Below are tables in the database.

Field name	Data type	Constraints(key)	Description
Username	Text	Primary key	User identity name
Password	Text	Null	User login password
Access level	Text	Null	User access level

Table 4.3 User credentials

Field name	Data type	Constraints(key)	Description
F_name	Text	Null	User's first name
L_name	Text	Null	User's last name
Employee_ID	Int	Primary key	User identification
Employee level	Text	Null	User's level of experience
Address	Text	Null	User's Physical address
Cellphone	Int	Foreign key	User's contact details
Email ID	Text	Null	User's email address

Table 4.4 Employee details

Field name	Data type	Constraints(key)	Description
Client_name	Text	Null	Name of client
Client_ID	Int	Primary key	Client identification
Physical address	Text	Null	Physical location
Date	Date	Null	Date of registration
Type	Text	Null	Type of client
City	Text	Null	City of client's location

Table 4.5 Client details

Field name	Data type	Constraints(key)	Description
Client_ID	Int	Foreign key	Client identification
Schedule_number	Int	Primary key	Client audit position
Employee_number	Int	Foreign key	Name of client
Audit_start	Date	Null	Audit start date
Duration	Date	Null	Audit duration
Status	Text	Null	Status of audit progress

Table 4.6 Schedule details

Field name	Data type	Constraints(key)	Description
Leave_type	Text	Primary key	Type of leave
Employee_ID	Int	Foreign key	Employee identification
Allocated_days	Int	Null	Fixed annual days
Leave_start	Date	Null	First day of leave
Duration	Date	Null	Last day of leave
Status	Text	Null	Status of leave application

Table 4.7 Leave details

Field name	Data type	Constraints(key)	Description
Cellphone	Int	Primary key	Users contact number
Message	Text	Null	Message body
Date	Int	Null	Date text is sent

Table 4.8 SMS details

4.5.5 Extended Entity Relationship Diagram (EER)

EER schemas can be expressed in a diagrammatic form called an extended entity relationship diagram. Entity-sets, relationship-sets, and attributes are represented graphically by rectangles, diamonds, and ellipses, respectively. Every vertex is labeled by the name of the object-set or attribute it represents; entity and relationship vertices must be uniquely identified by their labels globally, while attribute vertices must be uniquely identified by their labels only locally, with respect to their object-set, (cs.unc.edu).

Edges in an EER diagram are directed and represent the interaction of the various object-sets and attributes. Thus, there are edges:

- i) directed from vertices representing entity-sets or relationship-sets to vertices representing attributes;
- ii) directed from vertices representing relationship-sets to vertices representing entity-sets or other relationship-sets;
- iii) directed from vertices representing weak entity-sets to vertices representing other entity-sets, labeled ID;

An EER diagram includes the concept of superclass and subclass and the concept of specialization and generalization. These concepts describe the relationship between external entities of the same type. Specialization is the process of defining a set of subclasses of an entity type and thus the entity type becomes the superclass of the specialization. Generalization is the process of suppressing different entity types while identifying their common features then generalize them into a single superclass in which the original entity types are special subclasses

Another concept included in the EER diagram is the concept of category of union type. This concept is used to represent a collection of entities or objects that is the union of objects of different entity types

Associated with these concepts is the mechanism of attribute and relationship inheritance. Thus the subclass entity inherits the attributes from its parent entity: the superclass, (Elmasri, R, 2011:246)

4.6 Program Design

This stage looks at how the system will be functioning and it models the processes that are involved in the system being designed.

4.6.1 Package Diagram

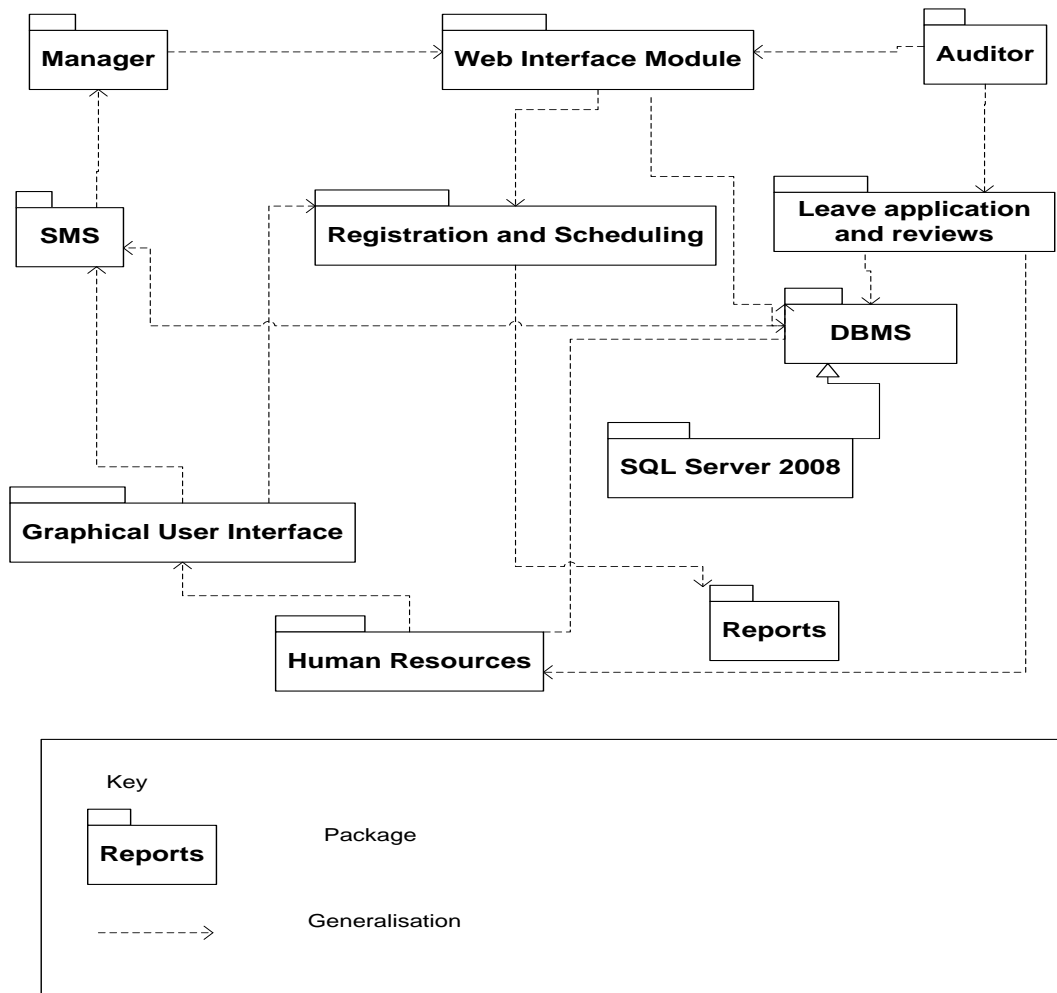


Figure 4.7 Package diagram

4.6.2 Class Diagram

It is an object oriented development and design tool that is used both to represent both the persistent state of the system and its behavior. A class represents a relevant concept from the domain, a set of persons, objects, or ideas that are depicted in the information system,

(www.sourcemaking.com). They are static and describe what interacts but not what happens when there is an interaction. The class diagram below illustrates how the different classes of the system interact with each other.

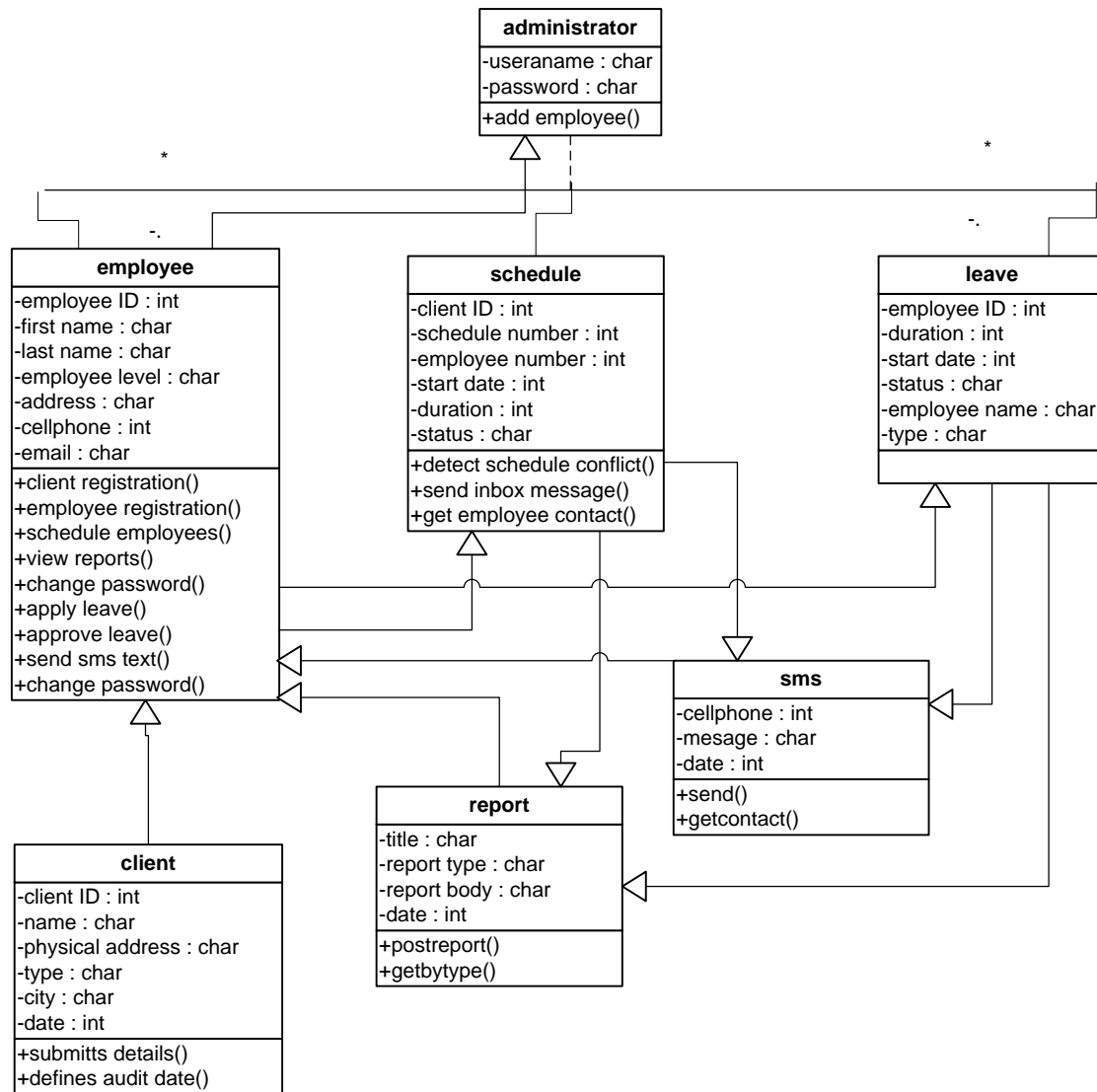


Figure 4.8 Class diagram

4.6.3 Sequence Diagram

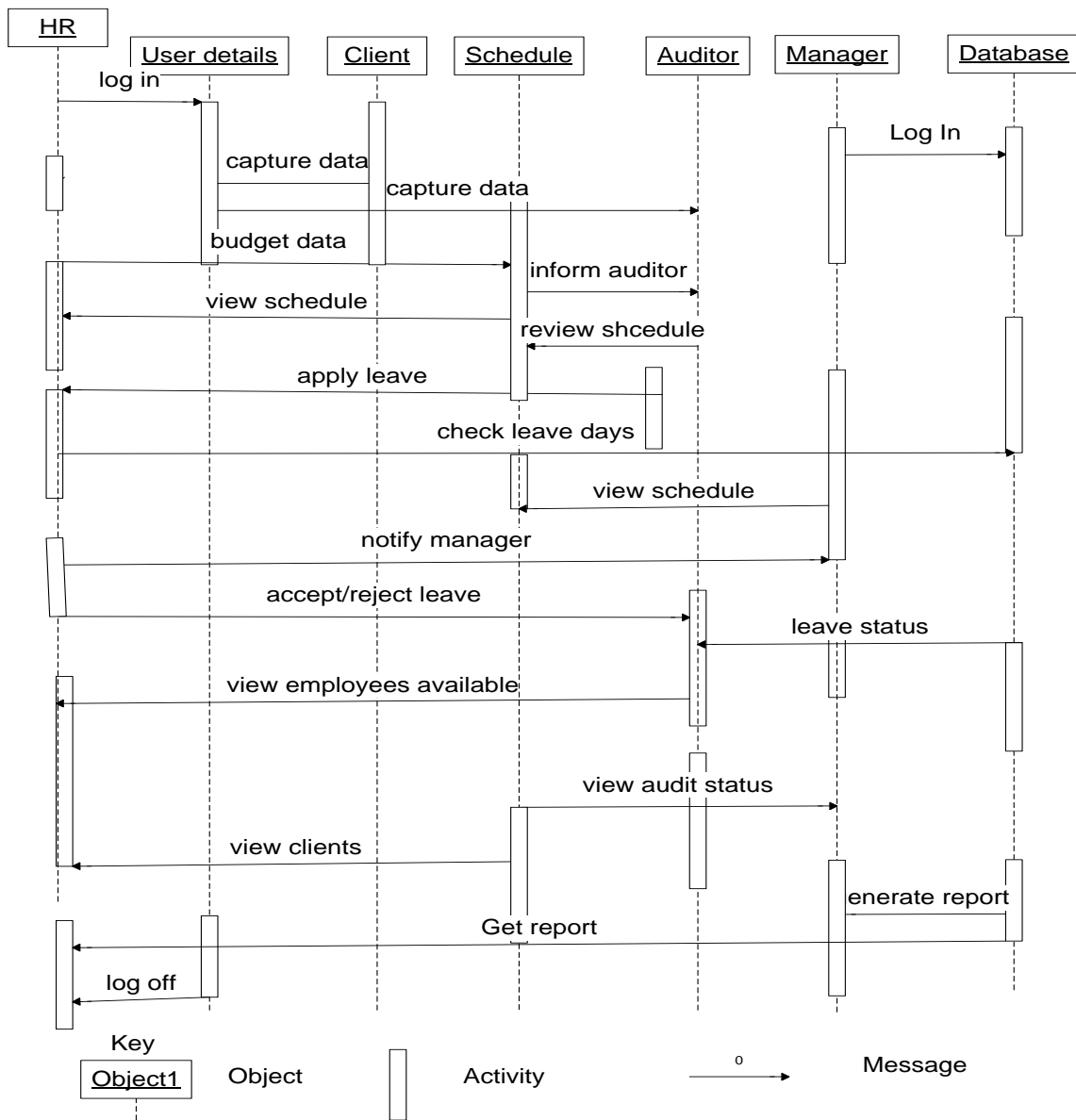


Figure 4.9 Sequence diagram

4.7 Interface Design

This section focuses on the design of the user interface of the proposed system that meets user and technical expectations. Thus the following diagrams explain how the system user interface is expected to be. The system is expected to be:

- User friendly
- Light-weight in terms of graphics to allow for speedy execution and loading
- Should contain all necessary functionalities for the system to be usable

4.7.1 Input design

The input design will show how the system will interact with external entities. The nature of inputs and outputs that the system accepts and produces will be defined in the interface design.

The main menu form is the first point the user interfaces with the system before they can login to their respective user accounts. Below is the main menu of the proposed system.

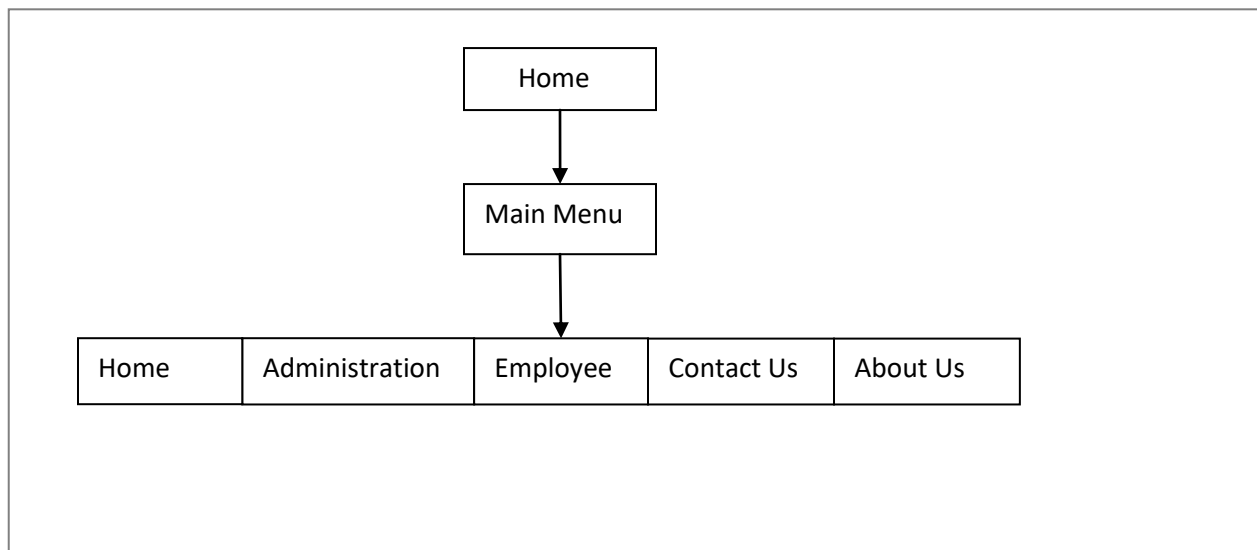
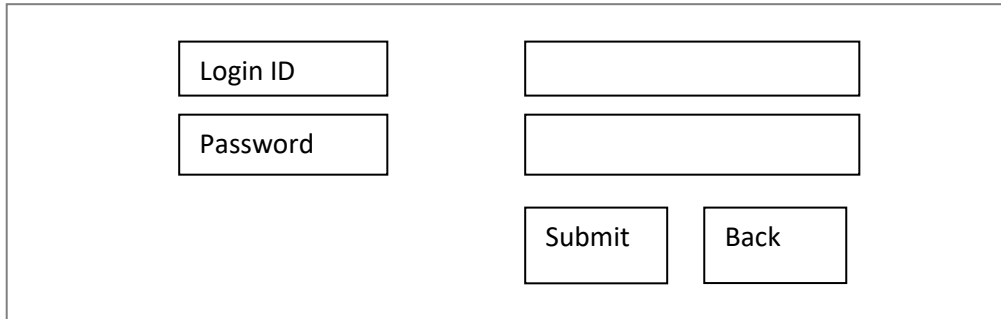


Figure 4.10 Main menu form

User login form

This form is used by users to gain access into the system.

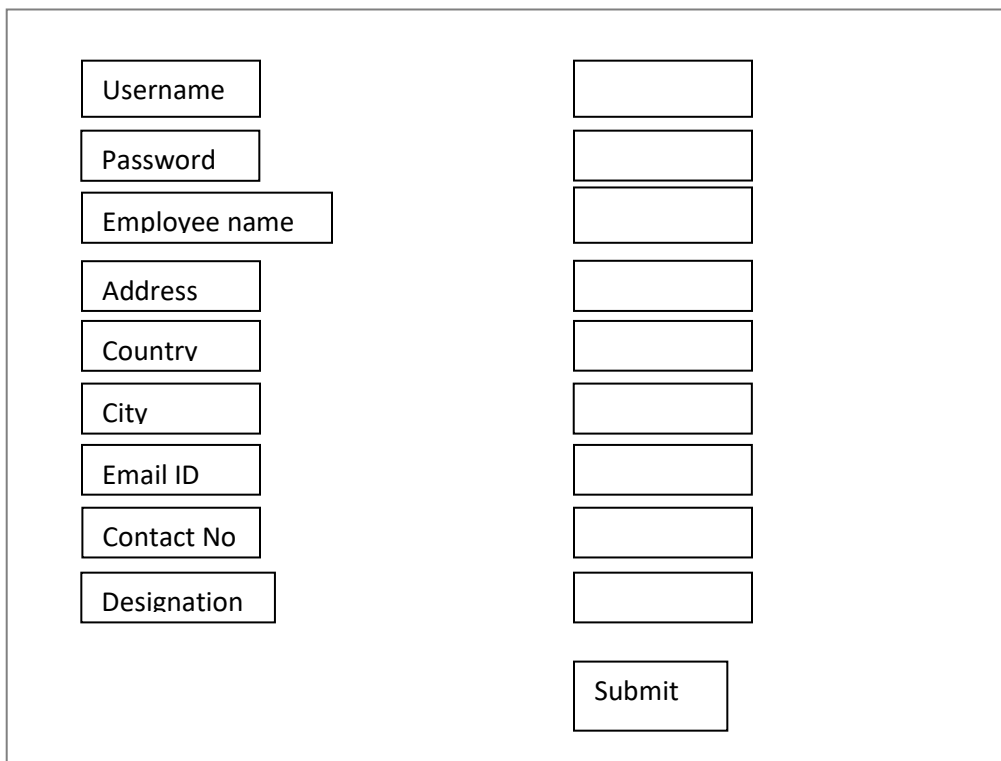


A diagram of a user login form. It consists of a large rectangular container. Inside, on the left side, there are two vertically stacked rectangular boxes labeled "Login ID" and "Password". To the right of these boxes are two empty rectangular input fields, one aligned with the "Login ID" box and one with the "Password" box. Below these input fields, there are two rectangular buttons labeled "Submit" and "Back" positioned side-by-side.

Figure 4.11 User login form

Add employee

This form is used by the manager to capture details of an employee.



A diagram of an add employee form. It consists of a large rectangular container. On the left side, there are eight vertically stacked rectangular boxes labeled "Username", "Password", "Employee name", "Address", "Country", "City", "Email ID", and "Contact No". To the right of these boxes are eight empty rectangular input fields, one aligned with each label box. Below the input fields, there is a single rectangular button labeled "Submit".

Figure 4.12 Add employee form

Add task

This form is used by the manager to add a client into the system.

Client	
Task name	
Start date	
Description	
Duration	
	Add

Figure 4.13 Add task form

Assign task to a member

This form is used to assign an employee to a client.

Task		
Member		
Position		
Start date		
End date		
	Submit	Back

Figure 4.14 Assign task form

Apply for leave

This form is used by employees to apply for a leave.

User name	<input type="text"/>
Leave type	<input type="text"/>
Balance leave	<input type="text"/>
Start date	<input type="text"/>
No. of days	<input type="text"/>
Purpose	<input type="text"/>
	<input type="button" value="Apply"/> <input type="button" value="Back"/>

Figure 4.15 Leave application form

Change password

This form is used by users to change their passwords.

Old password	<input type="text"/>
New password	<input type="text"/>
Confirm password	<input type="text"/>
	<input type="button" value="Submit"/> <input type="button" value="Reset"/>

Figure 4.16 Change password form

4.7.1 Output design

Leave application status

This form shows a report of the status of each leave application

Application No	User name	Leave type	Starting date	Ending date	Number of days	Status
----------------	-----------	------------	---------------	-------------	----------------	--------

Figure 4.17 Leave status report form

List of employee available the next day

This form will show a report of employees that will be available the following day.

Employee ID	Employee name	User name	Employee Designation	Email ID	Contact No	Address
-------------	---------------	-----------	----------------------	----------	------------	---------

Figure 4.18 Employees available report form

View task members

This form will show all members assigned to a particular client.

ID	Task ID	Member	task	Client	Start	End	Status
----	---------	--------	------	--------	-------	-----	--------

Figure 4.19 View task members report form

View tasks

This form will show a report of all clients to be audited.

ID	Task name	Client	Description	Duration	Start	End	Status
----	-----------	--------	-------------	----------	-------	-----	--------

Figure 4.20 View tasks report form

User inbox

This form will show inbox messages received by employees.

Mail ID	Subject	Date
---------	---------	------

Figure 4.21 User inbox report form

4.8 Conclusion

This chapter has identified, explained and represented how the system should be built thus various design activities that include system design, architectural design, physical design, database design, program design and interface design have been reviewed. The next chapter will explain and present how the new system will be implemented.

Chapter Five: Implementation Phase

5.1 Introduction

This phase will focus on the system coding, testing, installation and maintenance. The implementation phase is the final stage of the system development process where the theoretical design is turned into the operational system and will give confidence to the users that it is reliable and will work efficiently and effectively.

5.2 Coding

This is the turning of program logic into machine readable commands through a programming language that can be understood by the computer.

5.2.1 Pseudo Code

Pseudo code is a kind of structured english for describing algorithms. It allows the designer to focus on the logic of the algorithm without being distracted by details of language syntax, (www.csc.calpoly.edu).

Log in Authentication

If login details = null Then

 Message (Please enter all user details.)

Else get login details from database to match with submitted details

 If submitted login details == login details in database

 User login == Successful

 Welcome user

 Else

 User login == Fail

 Invalid user details

 End if

End if

Scheduling an employee

Connect to database

Select client from database where client ID == input ID.

Select employee from database where name == selected name.

Retrieve from database designation where employee == selected name.

If start date = null

 Message (Enter start date)

 Else if

 End date = null

 Message (Enter end date)

 If end date includes schedule of another client for employee

 Message (Schedule conflict, employee is assigned to another client
 between dates)

 Else if

 Start date == date on leave

 Message (Employee is currently on leave)

 Else

 Message (Employee scheduled successfully)

 End if

 End if

End if

Send an SMS text

Connect to database

Select employee from database where employee ID ==input ID .

If input ID is not == employee ID

 Message (Employee ID does not exist)

 Else if

 Text message = empty

 Message (Enter text message)

Else if

Input ID is == employee ID

Retrieve employee name from database where name == employee ID.

Retrieve from database employee contact number.

Else

Connect to SMS tool and send SMS text to employee number and system inbox

End if

End if

5.3 Testing

The main goal of system testing is to develop software that has no errors at all or a few errors that are acceptable (Engel, 2010:37). For the testing process to be effective and successful it is important that a test plan be used; test plans identify the specific portions of the system that need to be tested (Head, 2011:172). Two reciprocal approaches to system testing are:

- **Bottom up**

The bottom up approach begins testing of atomic units such as programs or modules and work upward until a complete system testing has been done.

Advantages

- No need for stubs or drivers
- Can be started before all programs are completed
- Errors in critical modules are found early

- **Top Down**

The top down approach begins with in depth-first or breadth-first search order

Advantages

- Tests of major functions and processing are conducted early.
- Interface errors can be detected sooner
- Confidence is raised in the system since programmers and users actually see a working system

5.3.1 Test plan

A software test plan is a document describing the scope, approach, resources and schedule of intended test activities, (softwaretestingfundamentals.com). It is the basis for formally testing any software project.

i) The bottom-up approach will be used for system testing, (figure 5.1).

ii) Identify types of test to be used

iii) Develop testing procedures and identify test objectives

iv) Report test results

v) Identify outstanding issues

5.3.1.1 Testing Procedure

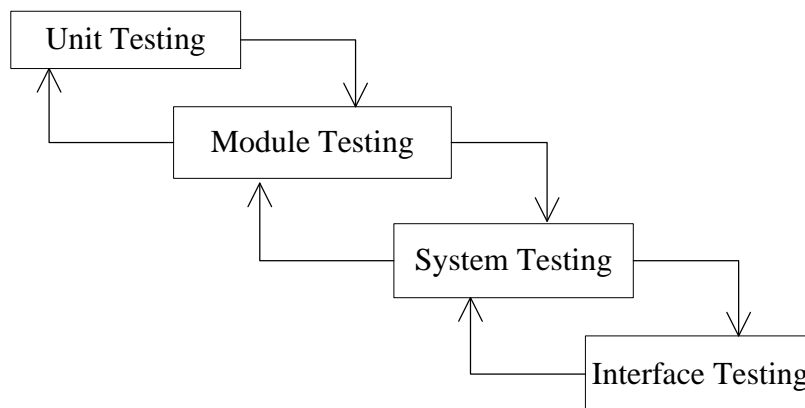


Figure 5.1 Testing procedures

5.3.2 Types of testing

The following types of test are related in varying degrees to the above identified approaches.

5.3.2.1 Unit testing

This involves the testing of an individual program or module of the system. In unit testing each module can be tested using the following strategies:

5.3.2.1.1 Black box testing

This is an integrity-based form of testing associated with testing components of an information system's functional operating effectiveness without regard to any specific internal program structure, (Connolly, 2011:174). This testing has been used to detect errors in the following categories:

- Incorrect or missing functions
- Interface errors
- Performance errors
- Initialization and termination errors

The black box test results can only be measured using the system output for correctness.

5.3.2.1.2 White box testing

This test is used to assess the effectiveness of software program logic. This testing has been used to generate test cases in the following categories:

- To guarantee that all independent paths have been executed
- Execute all logical decisions i.e true or false
- Execute internal data structures for validity

5.3.2.2 Integration testing

This ensures that software and sub-systems work together as a whole. It also tests the relation between module interfaces, thus ensuring a positive behavior of an integrated system.

5.3.2.3 System testing

The system is tested in-house before delivery to the users. The test aims at proving to the user that the system meets user requirements specification.

5.3.2.4 Acceptance testing

This is testing of the system at its operating environment at the client's site using real world data.

5.3.2.5 Validation testing

This is used to test the functionality of the system against the detailed requirements to ensure that the right product has been built.

5.3.2.6 Test cases

Case No.	Test case name	Test procedure	Precondition	Expected result	Output
1	User login	<p>i) Enter valid username and password and click submit</p> <p>ii) Enter valid username and invalid password and click submit</p>	Start browser User must have an account	<p>i) Display the respective user home page</p> <p>ii) Display an informative error message</p>	<p>i) Success</p> <p>ii) Success</p>
2	Create a schedule	<p>i) Select employee to assign to a client, define start and end dates of the assignment and click submit</p> <p>ii) Select an already assigned employee with the same dates as that of the new assignment</p>	Start browser Clients must be registered	<p>i) Display an informative message of a successful schedule</p> <p>ii) Display an informative message of an unsuccessful schedule</p>	<p>ii) Success</p> <p>ii) Success</p>
3	Generate report of employees available the next day	On the user menu use the mouse pointer navigate and click the report	Register employees	Display the details of employees available the next day	Success
4	Apply for leave	On the user menu click leave application and enter respective details	User must be registered	Display an informative message of a successful leave	Success

				application	
5	View my leave report	On the user menu click application status	Any leave should be applied	Display all leave types applied for.	Success
6	Send SMS text	On the user menu click sms	Any cellphone number should receive a message	Check the user inbox for the same copy of message and the test message in the cellphone inbox	Success

Table 5.1 Test cases

5.3.3 Test results

5.3.3.1 Security test

To test for authentication and authorization wrong credentials were entered on the login interface

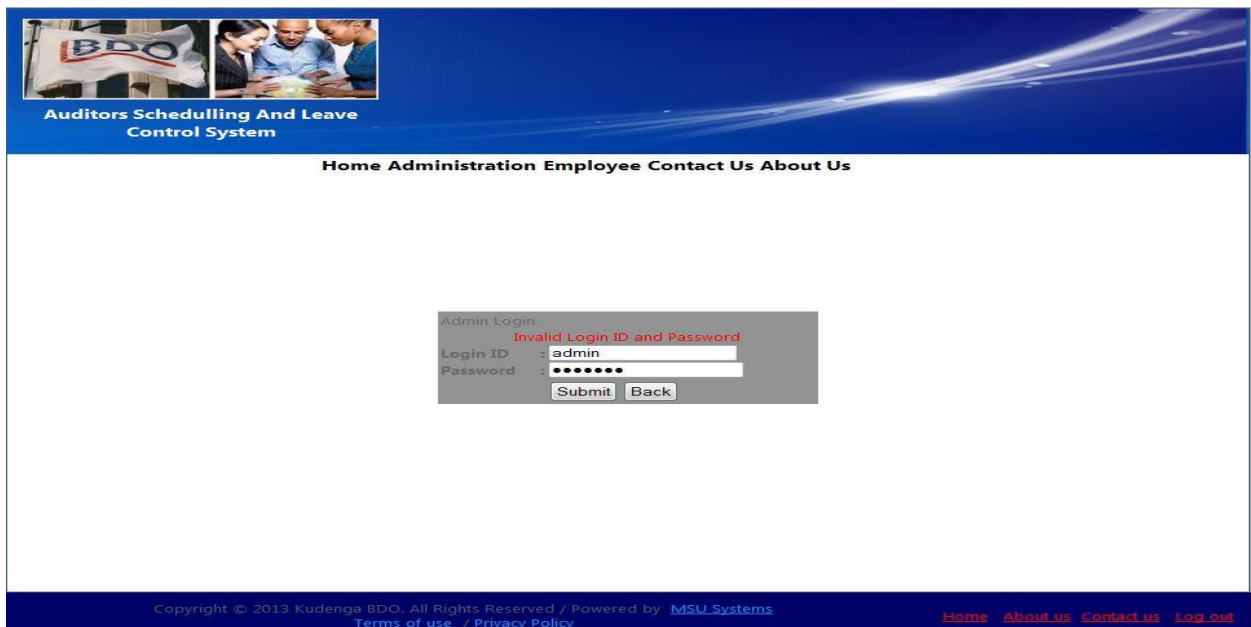
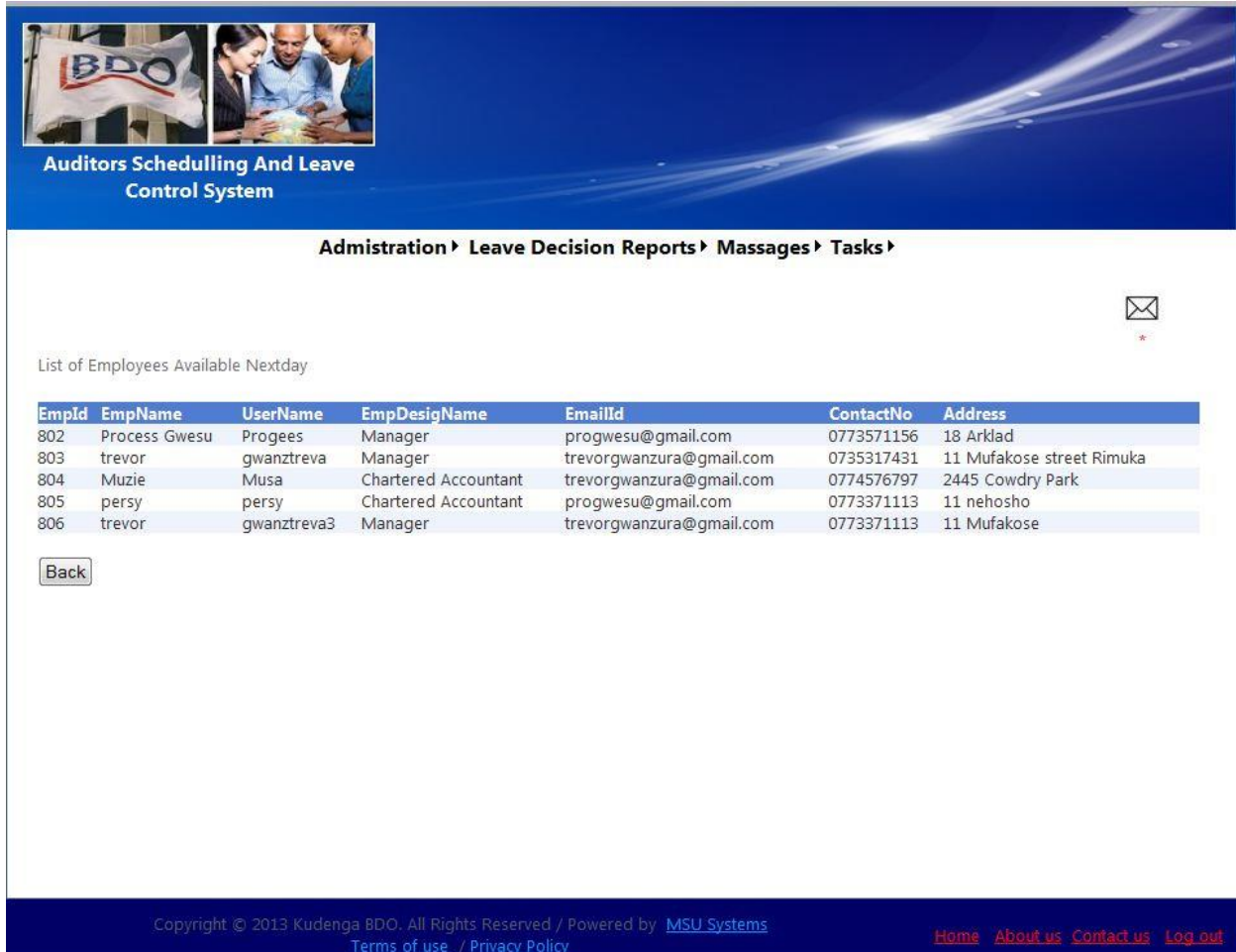


Figure 5.2 Security test

5.3.3.2 Testing functionality

Employees were scheduled to some clients while some were left un-assigned and other employees were granted leave days.



Auditors Scheduling And Leave Control System

Administration ▶ Leave Decision Reports ▶ Messages ▶ Tasks ▶

List of Employees Available Nextday

EmpId	EmpName	UserName	EmpDesigName	EmailId	ContactNo	Address
802	Process Gwesu	Progees	Manager	progwesu@gmail.com	0773571156	18 Arklad
803	trevor	gwanztreva	Manager	trevorgwanzura@gmail.com	0735317431	11 Mufakose street Rimuka
804	Muzie	Musa	Chartered Accountant	trevorgwanzura@gmail.com	0774576797	2445 Cowdry Park
805	persy	persy	Chartered Accountant	progwesu@gmail.com	0773371113	11 nehosho
806	trevor	gwanztreva3	Manager	trevorgwanzura@gmail.com	0773371113	11 Mufakose

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Figure 5.3 Functionality test

5.3.3.3 Test for integrity

An existing username was used when registering a new employee

Auditors Scheduling And Leave Control System

Admistration > Leave Decision Reports > Massages > Tasks >

Add Employee

username already taken

*- Mandatory fields

User Name* : Brighton (Must Be Unique)

Password :

Employee Name* : Brighton

Address : 34 Bensam Flats

Country Name* : Zimbabwe

City Name* : Gweru

EmailId : bmuzhanje@gmail.com

ContactNo : 0773659464

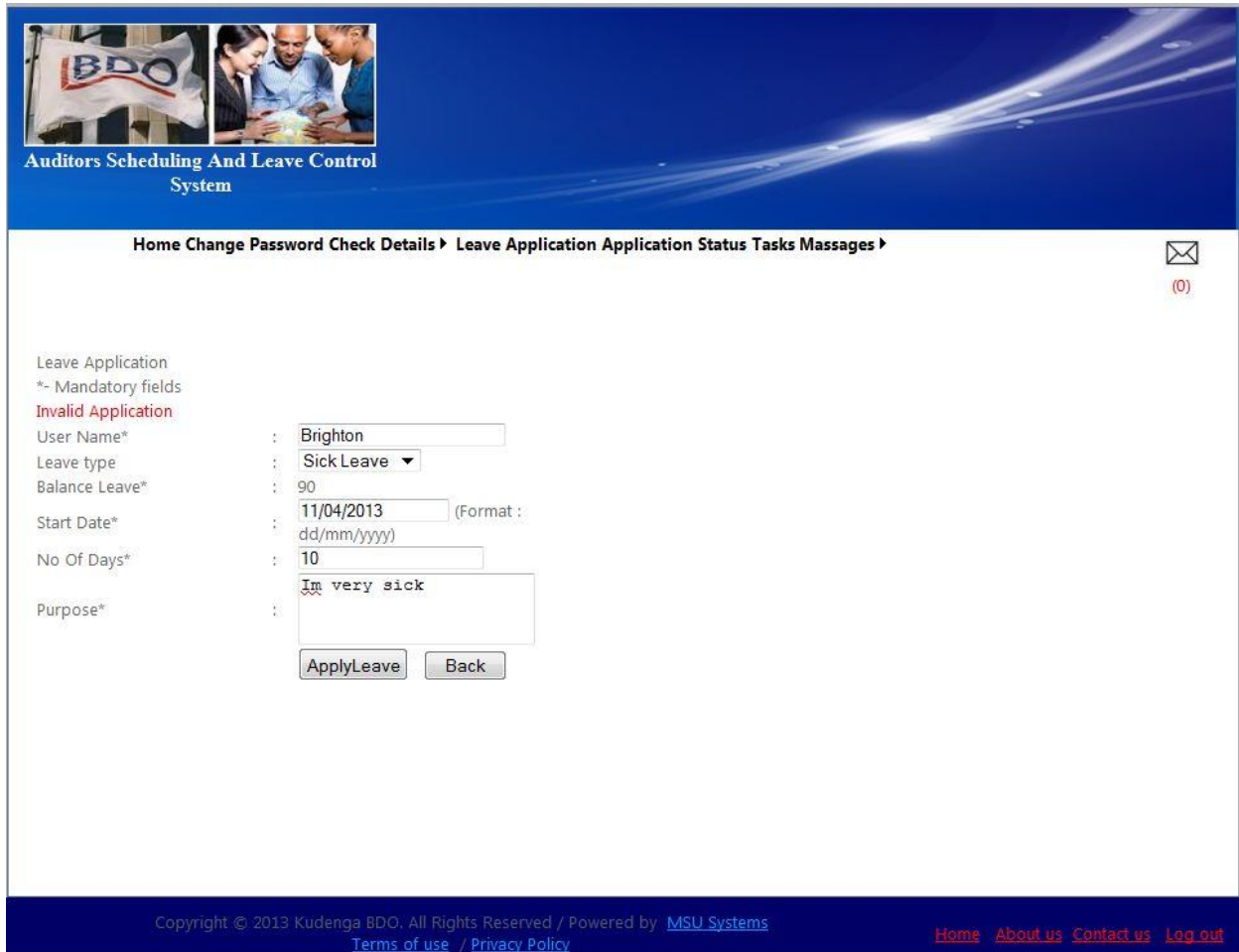
Designation : Chartered / ▾

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Figure 5.4 Integrity test

5.3.3.4 Test for validation



Auditors Scheduling And Leave Control System

Home Change Password Check Details ▶ Leave Application Application Status Tasks Messages ▶ ✉ (0)

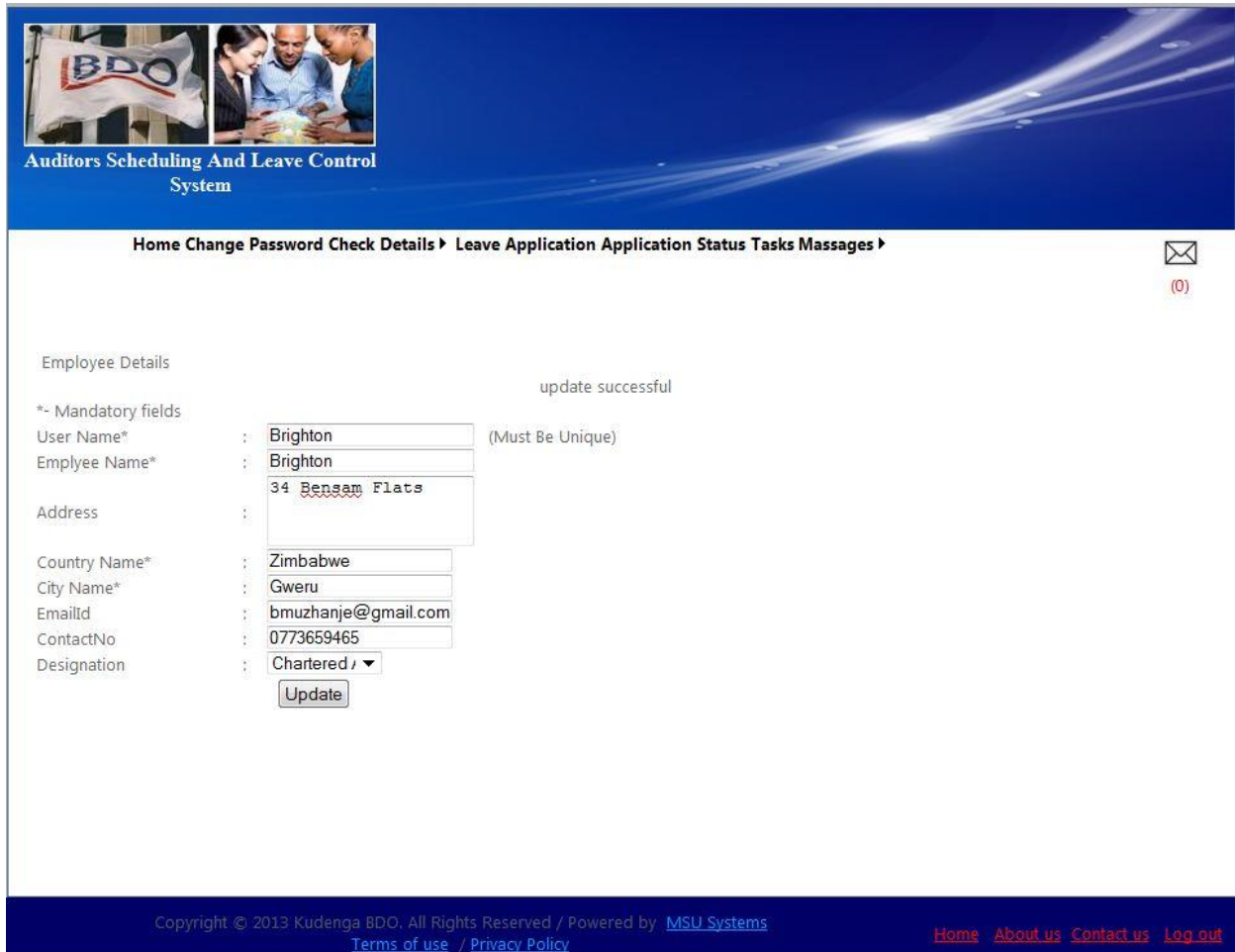
Leave Application
*- Mandatory fields
Invalid Application

User Name* : Brighton
Leave type : Sick Leave ▼
Balance Leave* : 90
Start Date* : 11/04/2013 (Format : dd/mm/yyyy)
No Of Days* : 10
Purpose* : Im very sick

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Figure 5.5 Validation test

5.3.3.5 Test for integration



The screenshot displays the 'Auditors Scheduling And Leave Control System' interface. At the top, there is a navigation menu with links: Home, Change Password, Check Details, Leave Application, Application Status, Tasks, and Messages. A message icon with '(0)' is visible in the top right corner. The main content area is titled 'Employee Details' and shows a form with the following fields and values:

Employee Details		update successful
*- Mandatory fields		
User Name*	Brighton	(Must Be Unique)
Employee Name*	Brighton	
Address	34 Benson Flats	
Country Name*	Zimbabwe	
City Name*	Gweru	
EmailId	bmuzhanje@gmail.com	
ContactNo	0773659465	
Designation	Chartered / ▼	
<input type="button" value="Update"/>		

At the bottom of the page, there is a footer with copyright information: 'Copyright © 2013 Kudenga BDO. All Rights Reserved / Powered by MSU Systems'. There are also links for 'Home', 'About us', 'Contact us', and 'Log out', along with 'Terms of use' and 'Privacy Policy'.

Figure 5.6 Integration test

5.4 Installation

System installation was done at the company premises under the environment the system shall be operated on.

5.4.1 Software installation

The software installation procedure is as follows:

- i) Copy the system to system root of web/application server.
- ii) Verify that the system is installed properly, that is all folders are installed.

iii) Add the system data source.

iv) Connect data source to the database on the main server housing the system database.

5.4.2 Database installation

This considers the installation of the MySQL database software onto the main server.

i) Run the software disc on the main server and install the DBMS

ii) Ensure that the software is successfully installed on the server

iii) Define database boundaries and applicable settings

iv) Verify that there is connectivity between the database and the web server

5.4.3 System changeover

Changeover refers to an approach to shift users from using the application from the existing (old) system to the replacing (new) system. Thus the type of change employed is viable and appropriate only after testing the new system with respect to its program and relevant data. There are three main types of system conversion:

5.4.3.1 Parallel Changeover (recommended strategy)

This changeover technique involves running the old system, then running both the old and the new systems in parallel and finally fully changing over to the new system after gaining confidence in the working of the new system. With this approach the users will have to use both systems during the period of overlap. Using this technique minimizes the risk of using the newer system, and at the same time help in identifying problems or issues in the new system. The user will gain confidence and assurance in relying on the new system after a period of time, thus at this point the use of the older system is discontinued and the new system becomes fully operational.

5.4.3.1.1 Reasons for selecting the parallel changeover approach:

- The use of both systems will eliminate the risks associated with using the new system

With the level of impact of the system to the day to day operations of the users and client relations a total failure of a new system without backup will be costly to the organization.

- It is easy to switch from one system to the other in the case of a failure or other problems affecting operations.
- Helps in identifying problems and issues or concerns that the user may come across in the new system
- Provide a more convenient platform for gaining user acceptance.

5.4.3.2 Phased changeover

When using the phased changeover the older system is broken into deliverable modules. The first module of the old system is phased out using the first module of the newer system and the same is done for all the other modules until the last module. Change from the old system to the system is done in a preplanned phased manner.

5.4.3.3 Abrupt or Direct Changeover

With abrupt changeover the new system is changed over from the older system on a cutoff date and time and the older system is discontinued once the changeover to the new system has been successfully done.

5.4.4 Post Implementation Review

A successful system implementation requires a follow up review known as a post implementation review. This review is beneficial to verify the system has been properly designed and developed, and proper controls have been built into the system. Information system auditors should perform the following functions:

- Assess the adequacy of the system i.e does it meet user requirements and business objectives
- Evaluate the project cost benefit or ROI measurements
- Assess the development project process

- Review program request changes performed to assess the type of changes required of the system.
- Review controls built into the system to ensure that they are operating according to design
- Review input and output control balances and reports to verify that the system is processing data accurately.
- Develop recommendations that address the system's inadequacies and deficiencies
- Develop a plan for implementing the recommendations

5.5 Maintenance

Software maintenance is defined in the IEEE Standard for Software Maintenance as the modification of a software product after delivery to correct faults, to improve performance or to adapt the software to a modified environment, (cnx.org). Maintenance is required because there are often some residual errors remaining in the system that must be removed as they are discovered. Maintenance involves understanding the effects of the change, making the changes to both the code and the documents, testing the new parts and retesting the old parts that were not changed. However management should implement a change management plan to ensure that only authorized changes are made. Maintenance is mainly of three types namely:

- Corrective
- Adaptive
- Perfective

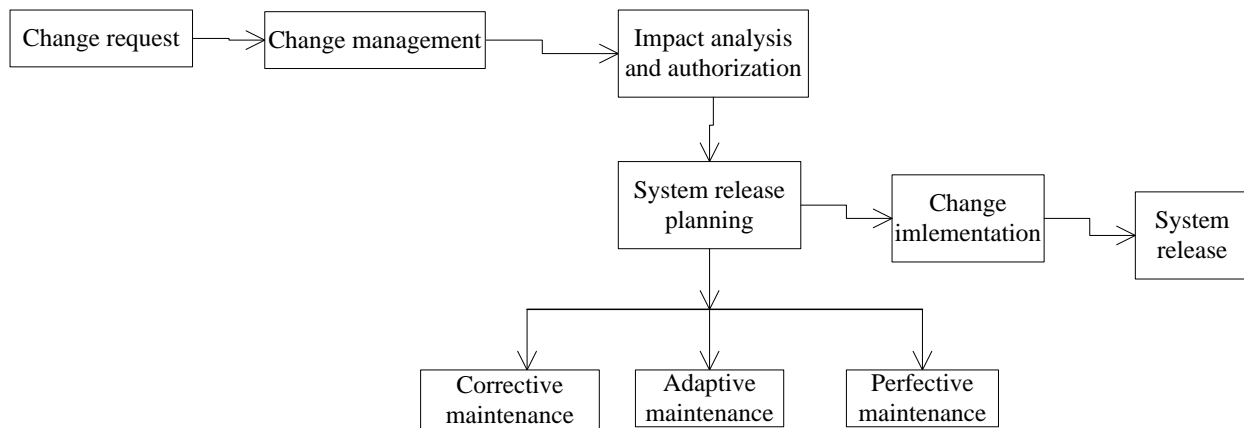


Figure 5.7 Maintenance procedures

5.5.1 Corrective Maintenance

Almost all software that is developed has residual errors or bugs in them. Many of these surfaces only after the system have been in operation, sometimes for a long time. These errors once discovered need to be removed, leading to the software to be changed. This is called “Corrective Maintenance”.

5.5.2 Perfective Maintenance

Even without bugs, software frequently undergoes change. The software often must be upgraded and enhanced to include more features and provide more services. This requires modification of the software especially in response to organizational and business change. This type of maintenance is known as the “Adaptive Maintenance”.

5.5.3 Adaptive Maintenance

This is maintenance to adopt the software to a different operating environment. This type of maintenance is required when some aspect of the system’s environment such as the hardware, the platform operating system or other support software changes. The application system must be modified to adapt it to cope with these environment changes and this is “Adaptive Maintenance”.

5.5.4 Recommended Maintenance Strategy (Corrective Maintenance)

The corrective maintenance method of system maintenance is recommended once the system has been implemented in the production environment and through-out its life cycle. The frequency of repairs will depend on the severity and impact of an error in the system i.e it affects confidentiality, integrity and availability of data.

- Maintenance will be done as follows after system implementation:

Affecting data confidentiality - Everyday

Affecting data integrity- Everyday

Affecting data availability – Everyday

- Maintenance will be done as follows six months after system implementation:

Affecting data confidentiality – Once a week

Affecting data integrity – Everyday

Affecting data availability – Once a week

5.6 Conclusion

This phase has explained the more basic pseudo code, various testing scenarios and their goals, how the new system will be installed and maintained during its life cycle. Thus the implementation phase will define the pay-offs of the aggregate effort from all previous phases through the successful delivery of an operational system.

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Appendices

Appendix A - User Manual

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1.0 Introduction

A User manual has been prepared to complement on user training and to provide help whenever users need to interact with the system.

1.1 Overview

This user manual provides the step-by-step instructions on the usage of the auditors scheduling and leave control system.

1.2 System functionality

The system will be able to deliver the following capabilities in conjunction with the system users in performing their day to day duties and responsibilities.

- Authenticate and authorize users when accessing the system resources
- Register clients and employees
- Schedule employees to clients
- Enable employees to apply for leave
- Enable management to re-schedule staff to clients
- Facilitate leave verification
- Send SMS text to employees
- Generate reports as per user needs
- Create user accounts

1.3 Using the system

1.3.1 Home page

The home page provides the first point of user interaction with the system.



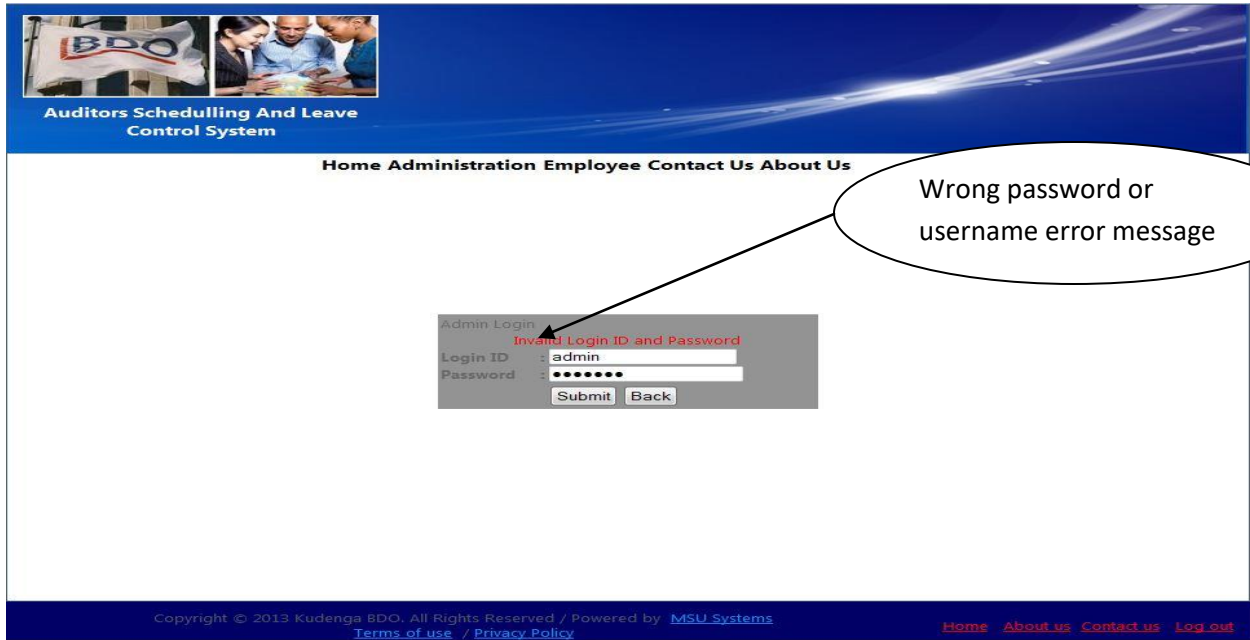
1.4 Access Control

Application Functions	Role 1 Administrator	Role 2 Manager	Role 3 Auditor	Role 4 Human Resources
Authenticate and authorize users	✓			
Register clients and employees				✓
Schedule employees to clients				✓
Apply for leave	✓	✓	✓	
Re-schedule staff to clients				✓
Approve leave		✓	✓	
Send SMS text		✓		✓
Generate reports as per user needs	✓			✓
View reports	✓	✓	✓	✓
Create user account	✓			

1.5 Common functions

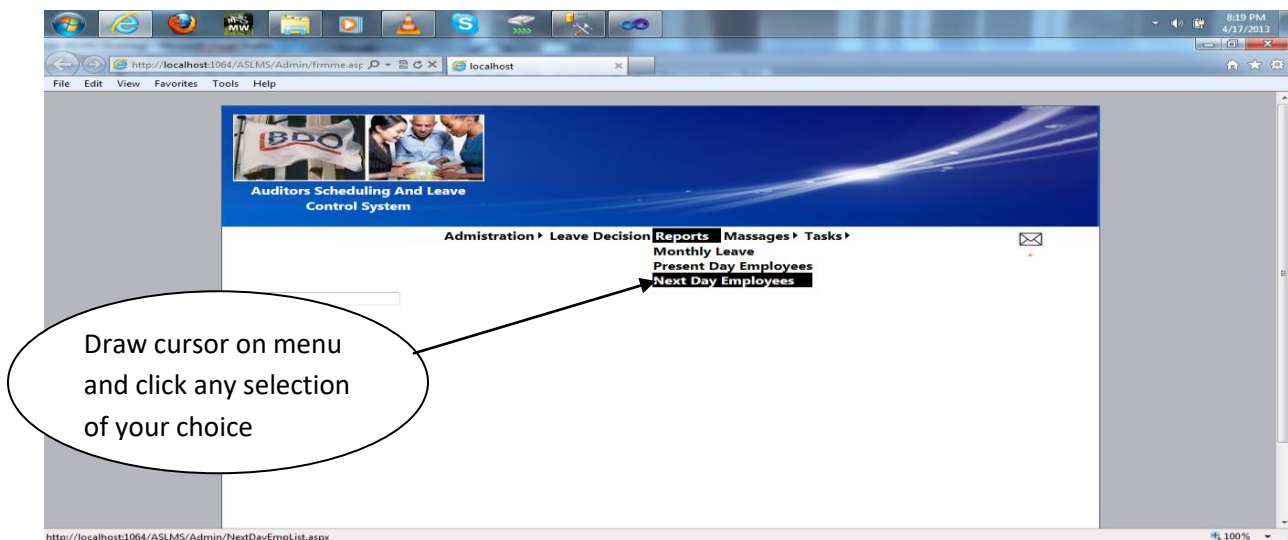
1.5.1.1 Login

A common login screen is available to all users of the system as shown by the login screen used by the administrator below:

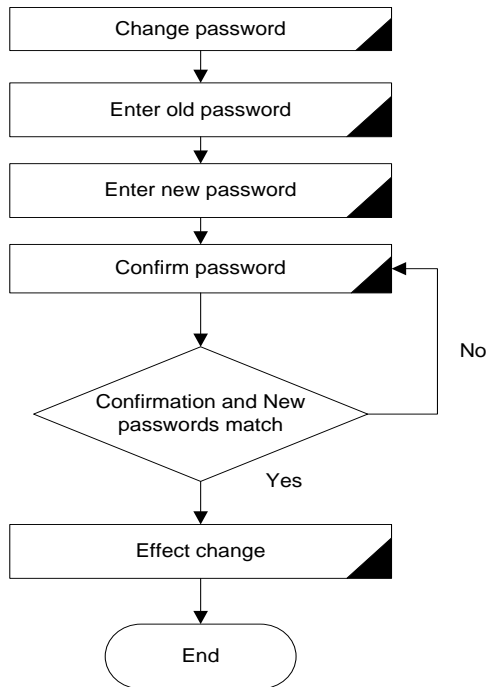


Main menu

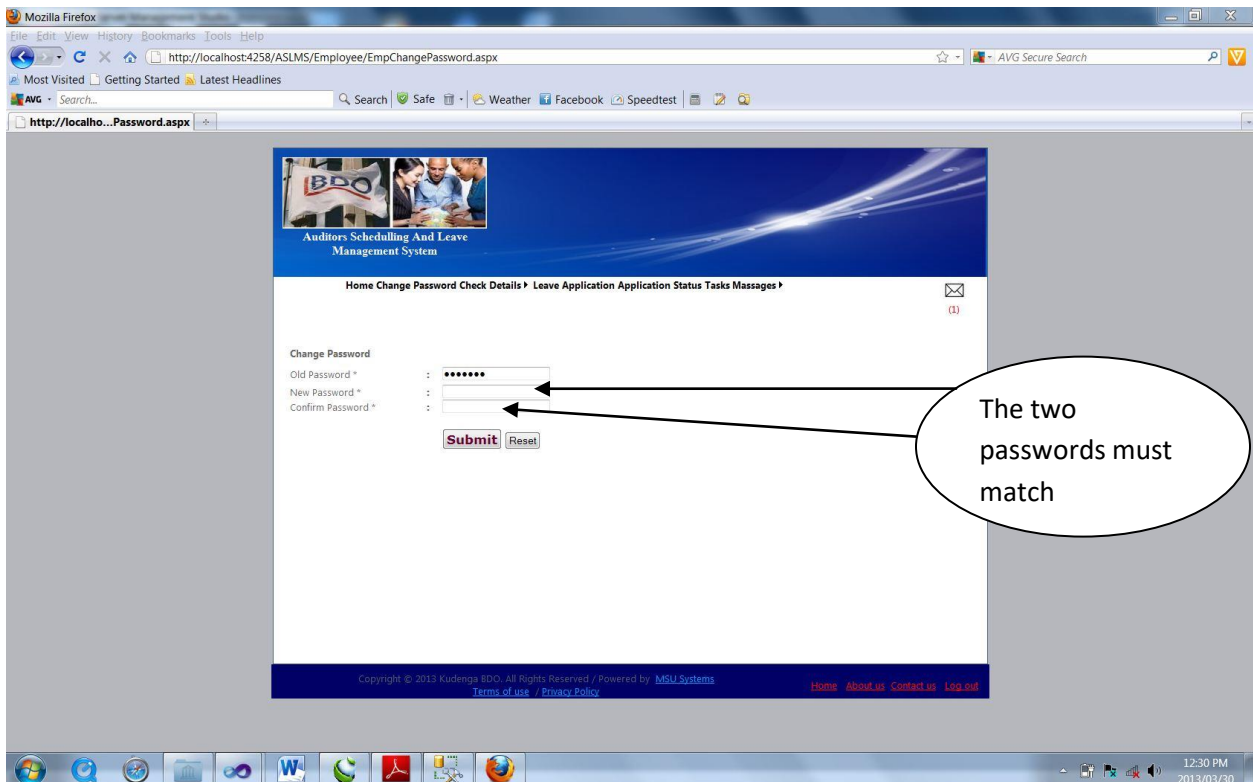
The main menu is customized as per user needs. Thus each user has a unique main menu panel with drop down options in respect of the user access permissions and job description.



1.5.1.2 Change password

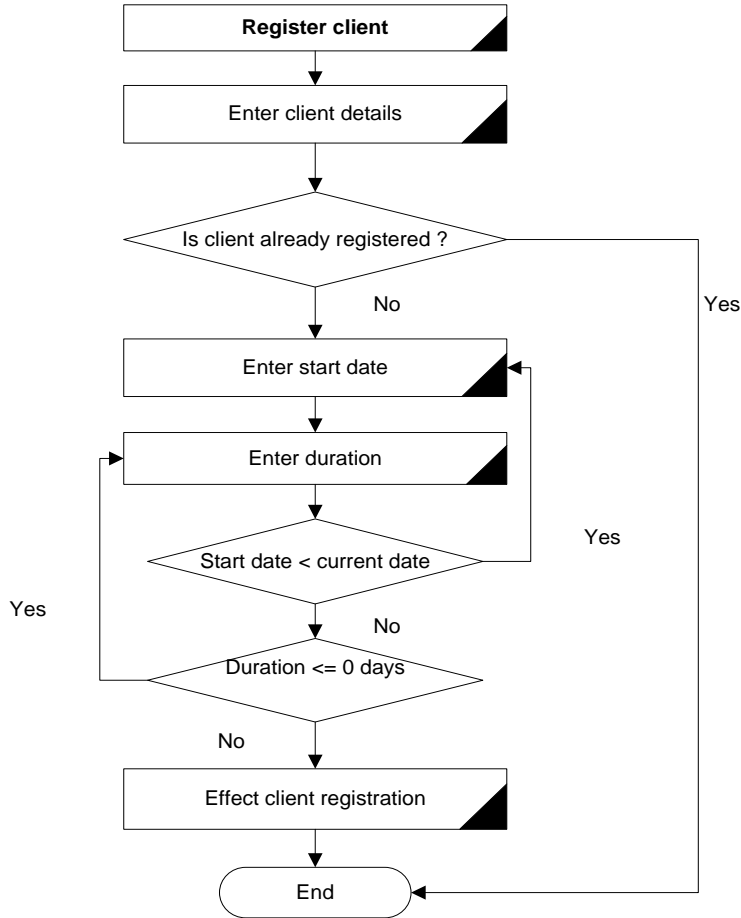


Enter the old password then the new password and re-confirm the new password and press the 'submit' button. The form below shows how the user will change a password



1.5.1.3 Register client

Client registration requires that the client has not been registered before else an informative message informing the user that the client is already registered is displayed.



i) On the main menu click task → Add task.

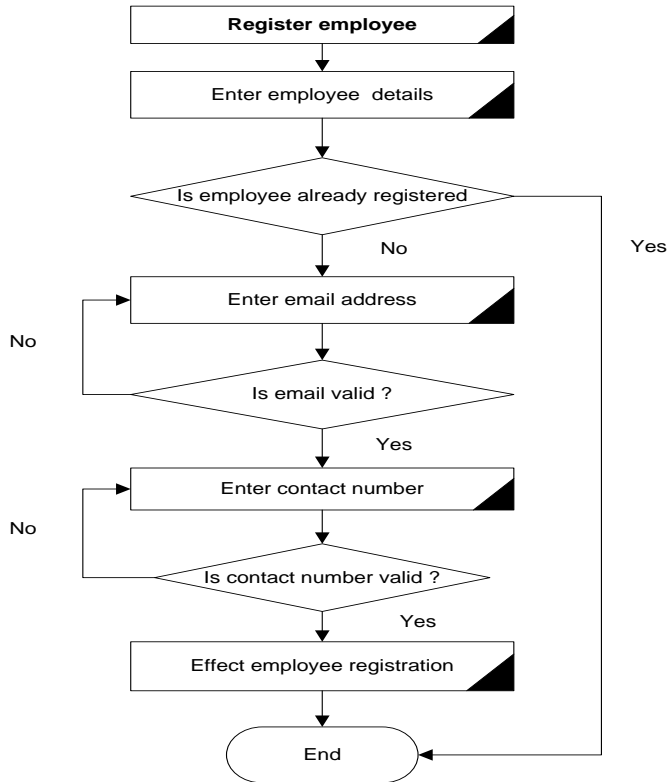


ii) Enter client details in all respective fields and click the 'add' button.

The screenshot shows a web browser window displaying the 'Add Tasks' form in the 'Auditors Scheduling And Leave Management System'. The breadcrumb navigation is 'Administration > Leave Decision Reports > Messages > Tasks'. The form includes the following fields: Client, Task Name*, Start Date, Description, and Duration*. An 'Add' button is located below the form. Two callouts are present: one pointing to the 'Start Date' field with the text 'Start date should not be earlier than current date', and another pointing to the 'Duration*' field with the text 'Duration should not be negative'. The footer of the page contains copyright information for 2013 Kudenga BDO, powered by BMSI Systems, and links for Home, About us, Contact us, and Log out. The system tray at the bottom right shows the time as 12:45 PM on 2013/03/30.

1.5.1.4 Register employee

If the employee is already registered the informative message shown on the details form is displayed. Each employee should have a unique username to be successfully registered.



Auditors Scheduling And Leave Control System

Administration > Leave Decision Reports > Messages > Tasks >

Add Employee

*- Mandatory fields

User Name* : Brighton (Must Be Unique)

Password :

Employee Name* : Brighton (username already taken)

Address : 34 Benson Flats

Country Name* : Zimbabwe

City Name* : Gweru

EmailId : bmuzhanje@gmail.com (E-mail address should be valid)

ContactNo : 0773659464 (Contact number should be valid)

Designation : Chartered /

Submit

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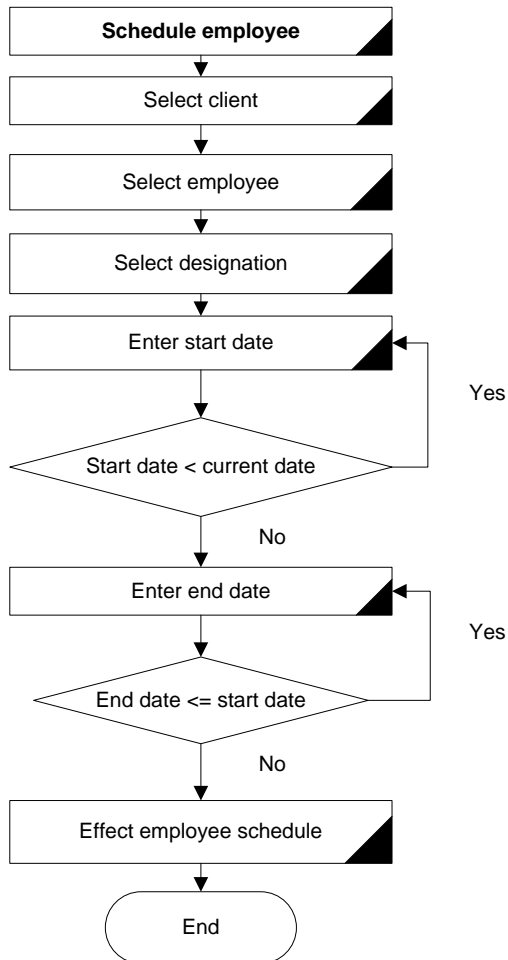
1.5.1.5 Schedule employee

The user should first consider that adequate information is available such as name of client and employee who is to be scheduled to clients.

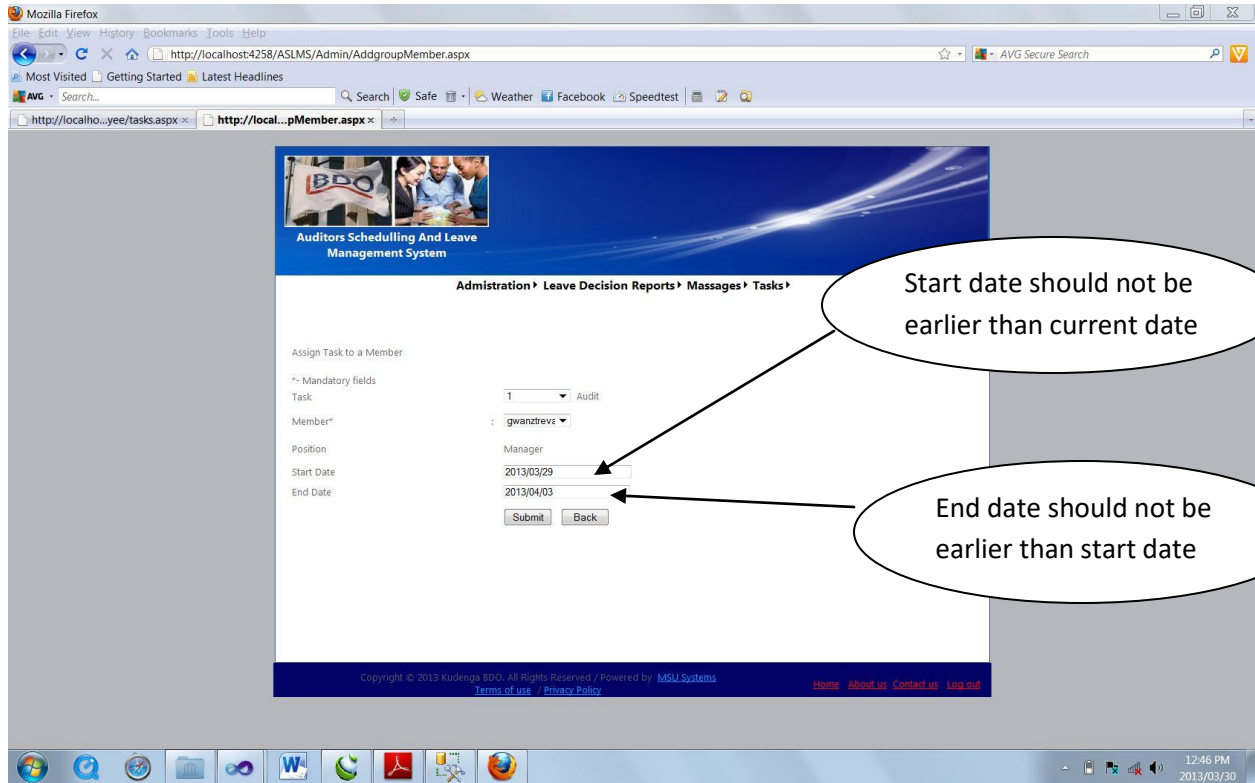
i) On the main menu click tasks → Assign task.



The steps below illustrate how the system facilitates the scheduling of an employee to a client.



ii) Select auditor from the select box and enter all details of the schedule and click the 'submit' button.



1.5.1.6 View schedule by client

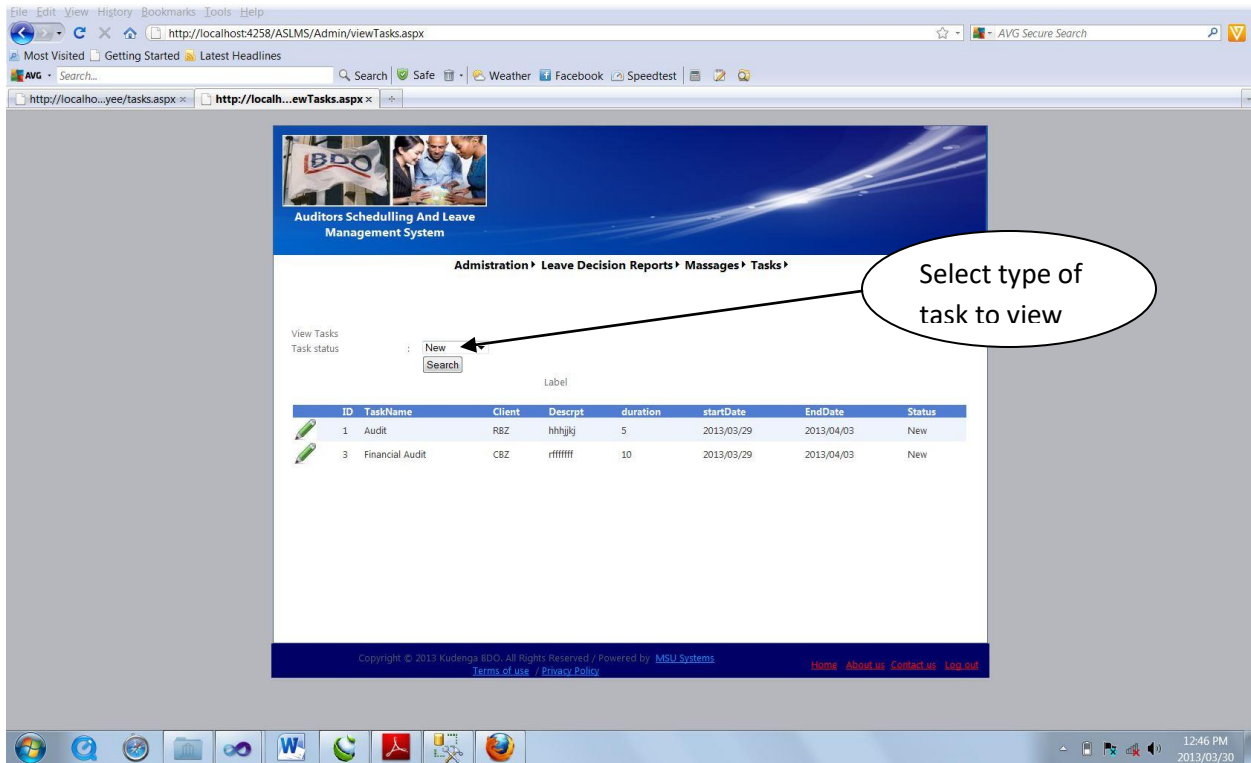
The view task selection enables a user to view the report of all new tasks, executed and pending tasks.

The two forms below illustrates on how a user can view schedules.

i) On the main menu click tasks → View tasks.



ii) Select the type of task you want to view e.g. new tasks only and click the ‘Search’ button.



1.5.1.7 View scheduled employees

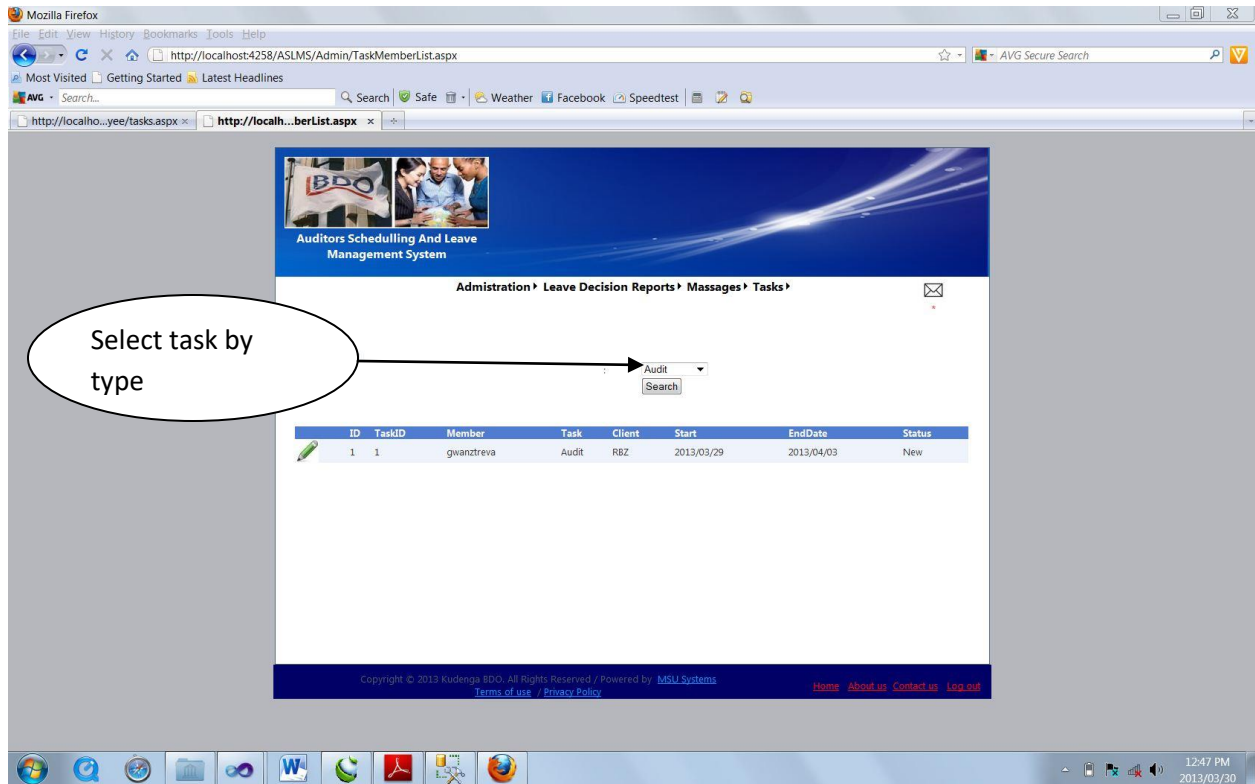
The ‘Task member list’ select enables the user to view all employees scheduled to a particular client.

The two forms below illustrates on how a user can view task members of a particular assignment.

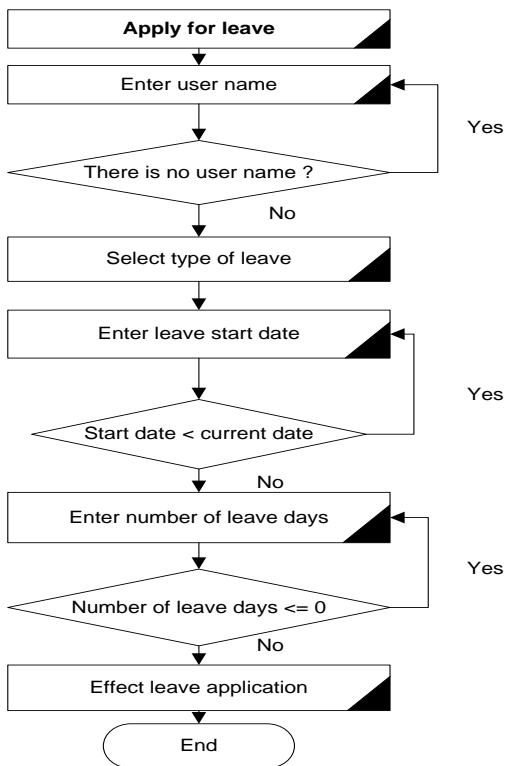
i) On the main menu click tasks → View tasks

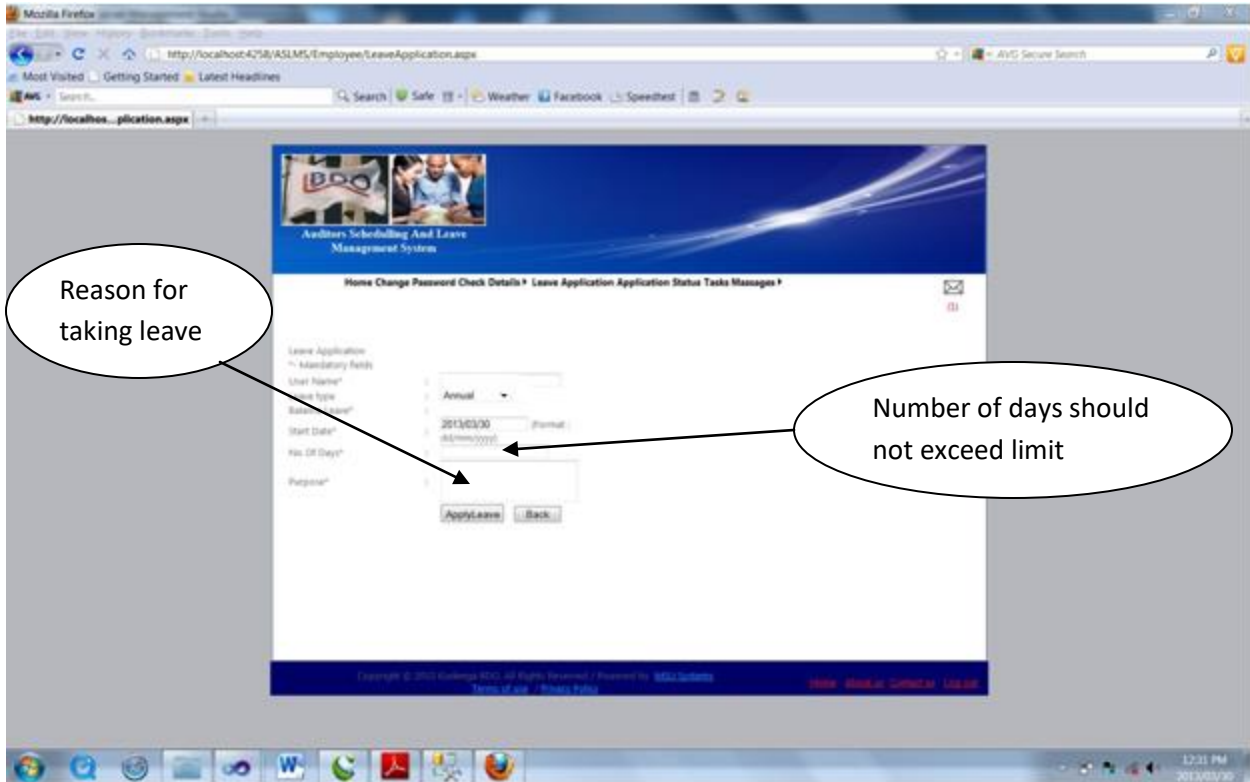


ii) Select the type of task you want to view and click the ‘Search’ button.



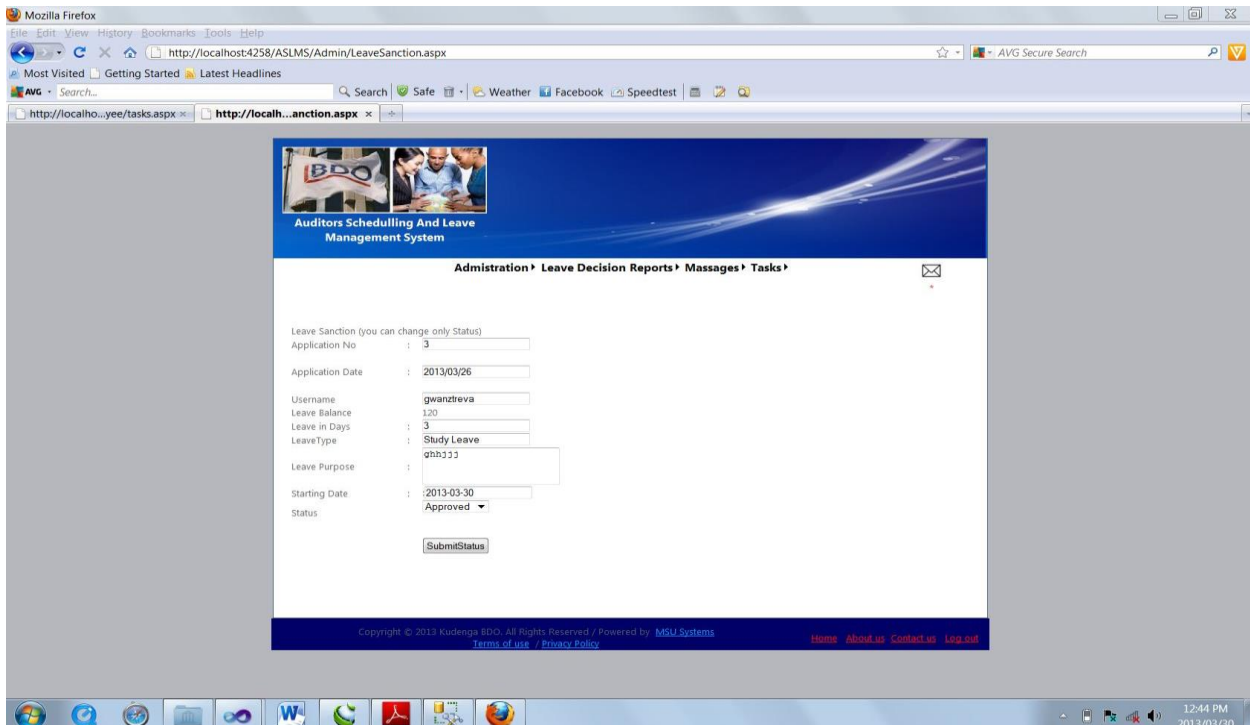
1.5.1.8 Apply for leave



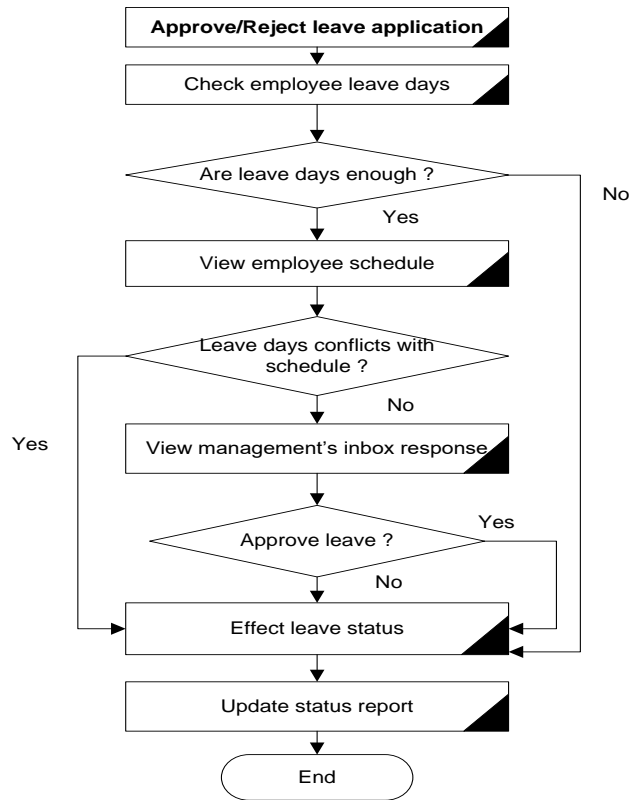


1.5.1.9 Approve/Reject leave application

The decision to approve or reject an application for leave is effected after considering the schedule status of the employee, number of leave days available and management' decision .

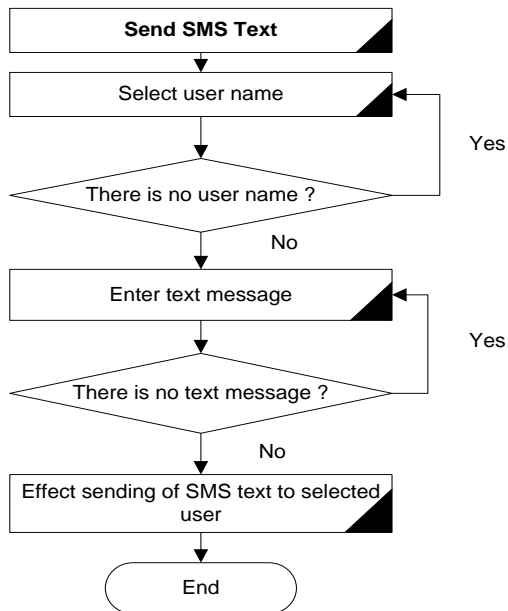


The steps below illustrate how the system facilitates the decision making process when issuing leave to employees.



1.5.2.0 Send SMS text

To send an SMS text message click the 'Send SMS' tab and follow the steps shown below.



Appendix B: Interview Checklist

Target group -Management

1. How do you feel about the idea of computerizing the existing manual system?.
2. Computerization of the manual system will positively enhance the approach of doing your work, can you please identify and explain the main tasks you are involved in when assigning staff to clients?.
3. Are there any problems you encounter during or after making these tasks?.
4. Is there any criteria applied by management or company policy that guide you in assigning auditors to clients?.
5. During the audit process when auditors are executing the audit, what information do you need for you to keep track of the various engagements being executed?.
6. Before you engage with a client what information about the client do you need?
7. Does this information affect the assignment of auditors to clients anyhow?.
8. When auditors have been scheduled to these clients how are they informed about these management plans?.
9. Have you had any problems communicating these plans to auditors.
10. If yes, how have you managed to cope with the problems.
11. As employees how do the auditors respond to your means of communication, are they happy?.
12. With the perspective that most auditors take study leave for their UNISA examinations how does this affect the audit assignment process and execution.
13. What kind of control mechanisms are there in place that ensure that you have adequate human resources to be assigned to the various clients?.
14. Can you please identify the steps one takes when applying for leave?.
15. Can you provide any documentation that you use when applying for leave?.
16. Are there any problems encountered when applying and approving leave?.
17. Would you have any suggestions on how those problems can be solved?.
18. How do you perceive your efficiency with the current system?.

Appendix C: Questionnaires checklist

Company: BDO Zimbabwe

Target: Management

Answer all questions

Questionnaire to be returned to (B. Muzhanje) by 31th March 2013

1).What problems are you experiencing when using the current system?

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

2).Is the current system efficient and reliable? If not what do you think should be done?

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

3). Are there any restrictions in accessing staff available for assignments?

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

4).What problems do you encounter when preparing progress reports?

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

5).What problems do you encounter when managing employee leave ?

i).....

ii).....

iii).....

6).Do you find any difficulties in the way employees are assigned to clients?

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

7).Are there problems encountered in co-ordinating employees to clients?

YES NO

If yes explain:

.....
.....

8).What means of communication is used to inform auditors of upcoming assignments?

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

9). Any there any recommendations?

i.

ii.....

iii.....

Company: BDO Zimbabwe

Target: All Staff

Tick appropriate box

1. Is the current means of communication good enough for effective communication?

YES NO

2. Does the current system enable effective control of audit engagements?

YES NO

3. Is there a platform for employees to review their client schedules?

YES NO

4. If there is a platform to do so and is it anonymous?

YES NO

5. If not, would you want such a platform to exist?

YES NO

6. Is there a need to enhance the means of communication amongst departments and employees?

YES NO

7. Is the current system convenient for management and staff accessibility and usability while off company premises i.e engaged to clients across the country?

Yes NO

8. On average how often do you receive new clients annually?

None

0 to 3 times

4 to 7 times

8 to 10 times

Appendix E: Snippet of code

Home page display

```
Partial Class Admin_frmme
```

```
    Inherits System.Web.UI.Page
```

```
    Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)  
        Handles Me.Load
```

```
    End Sub
```

```
End Class
```

Log in administrator

```
Imports System.Data
```

```
Imports System.Data.SqlClient
```

```
Partial Class Admin_AdminLogin
```

```
    Inherits System.Web.UI.Page
```

```
    Public conn As New ADODB.Connection
```

```
    Public rs As New ADODB.Recordset
```

```
    Public sql As String
```

```
    Public Function opendb() As Object
```

```
        If conn.State = 1 Then conn.Close()
```

```
        conn.Open("Provider=SQLOLEDB.1;Persist Security Info=False;User  
ID=sa;password=Password-2013;Initial Catalog=LeaveManager;Data Source=(local)")
```

```
        Return 0
```

```
    End Function
```

```
    Protected Sub Button1_Click(ByVal sender As Object, ByVal e As  
System.EventArgs) Handles Button1.Click
```

```
        Response.Redirect("~/home.aspx")
```

```
    End Sub
```



```
Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
    opendb()
    Session.Remove("userole")
End Sub
```

```
Protected Sub btnSubmit_Click(ByVal sender As Object, ByVal e As
System.EventArgs) Handles btnSubmit.Click
    sql = "select * from tbl_AdminLogin where AdminLoginId = '" & txtLoginId.Text
& "' and Password='" & txtPassword.Text & "'"
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    If rs.EOF = False Then
        Session("userid") = txtLoginId.Text
        Session("userole") = rs(1).Value

        Response.Redirect("Adminhome.aspx")

    Else
        lblError.Visible = True

    End If
End Sub
End Class
```

Re-schedule employee

```
Partial Class Admin_ReAssgnTask
    Inherits System.Web.UI.Page
    Inherits System.Web.UI.Page
```

```

Dim con As New SqlConnection("Data Source=(local);Initial
Catalog=LeaveManager;Integrated Security=false;user id=sa;password=Password-
2013;")
Public qry As String
Dim cmd As SqlCommand
Dim dr As SqlDataReader
Dim ds As DataSet
Public category As String
Public conn As New ADODB.Connection
Public rs As New ADODB.Recordset
Public sql As String
Public Rid, model As String
Public constr As String
Public da As SqlClient.SqlDataAdapter
Public mySqlConnection1 As New SqlClient.SqlConnection(constr)
Public usedleaves, totalleave As Integer
' Sub update()
Sub Add()
    sql = "select * from Members where TaskID =" & ddltask.Text & " and Member
=" & TxtMember.Text & ""
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    If rs.EOF = False Then
        Response.Redirect("AddgroupMember.aspx")
    Else
        'sql = "insert into Members (TaskID, Task, Member, Start, Status)"values(" &
ddltask.Text & ", " & lblTaskID.Text & ", " & ddlMember.Text & ", " & txtStart.Text
& ", " & TxtEnd.Text & ", " & "New" & ""
        'conn.Execute(sql)
        sql = "INSERT INTO Members (TaskID, Task, Member, Start, Status)"

```

```

        sql = sql & "values('" & ddltask.Text & "', '" & lblTaskID.Text & "', '" &
TxtMember.Text & "', '" & txtStart.Text & "', '" & "New" & "')"
        conn.Execute(sql)
    End If
End Sub
' End Sub
Sub Update2()
    sql = "update Members set Status ='Completed', ID= '" & Session("taskID2") & "'"
    conn.Execute(sql)
End Sub
Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
    opendb()
    If Not IsPostBack Then
        loadTask()
        lblTaskPrev.Text = Session("taskID2")
        TxtMember.Text = Session("MemberID")
        sql = "select * from tbl_EmpDetails where username ='" & Session("MemberID")
& "' "
        If rs.State = 1 Then rs.Close()
        rs.Open(sql, conn)
        If rs.EOF = False Then
            lblPosition.Text = rs(2).Value
        End If
    End If
End Sub
Sub loadTask()
    sql = "select * from TaskLists where status <> 'Completed'"
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    ddltask.Items.Clear()

```

```

Do While Not rs.EOF
    ddltask.Items.Add(rs(1).Value)
    rs.MoveNext()
Loop
End Sub

Public Function Nz(ByVal var As Object) As Double
    If IsDBNull(var) Then
        Nz = 0
    ElseIf Not IsNumeric(var) Then
        Nz = 0
    Else
        Nz = Val(var)
        Nz = CDbI(Nz)
    End If
End Function

Public Function opendir() As Object

    If conn.State = 1 Then conn.Close()
    conn.Open("Provider=SQLOLEDB.1;Persist Security Info=False;User
ID=sa;password=Password-2013;Initial Catalog=LeaveManager;Data Source=(local)")
    Return 0
End Function

Protected Sub ddltask_SelectedIndexChanged(ByVal sender As Object, ByVal e As
System.EventArgs) Handles ddltask.SelectedIndexChanged

End Sub

Protected Sub btnUpdate_Click(ByVal sender As Object, ByVal e As
System.EventArgs) Handles Button1.Click

```

End Sub

End Class

Apply leave

Partial Class Employee_LeaveApplication

Inherits System.Web.UI.Page

Dim con As New SqlConnection("Data Source=(local);Initial
Catalog=LeaveManager;Integrated Security=false;user id=sa;password=Password-
2013;")

Public qry As String

Dim cmd As SqlCommand

Dim dr As SqlDataReader

Dim ds As DataSet

Public category As String

Public usedleaves, totaleave As Integer

Public conn As New ADODB.Connection

Public rs As New ADODB.Recordset

Public sql As String

Public Pass, model As String

Public constr As String

Public da As SqlClient.SqlDataAdapter

Public mySqlConn1 As New SqlClient.SqlConnection(constr)

Public Function Nz(ByVal var As Object) As Double

If IsDBNull(var) Then

Nz = 0

ElseIf Not IsNumeric(var) Then

Nz = 0

Else

Nz = Val(var)

Nz = CDb1(Nz)

```

End If
End Function

Protected Sub btnApplyLeave_Click(ByVal sender As Object, ByVal e As
System.EventArgs) Handles btnApplyLeave.Click
    If ddlLeaveType.Text > "" Then
        If txtNoOfdays.Text > lblLeaveBal.Text Then
            Dim startdate, enddate As Date
            startdate = txtPatientDOB.Text
            enddate = startdate.AddDays(txtNoOfdays.Text)

            MsgBox(enddate)

            sql = "INSERT INTO tbl_ApplicationData (UserName, LeaveTypeId,
StartingDate, EndingDate, ApplyingDate, NoOfDays, LeavePurpose, LeaveBal,
ApplicationStatusId)"
            sql = sql & "values('" & txtUserName.Text & "', '" & ddlLeaveType.Text &
"', '" & txtPatientDOB.Text & "', '" & enddate & "', '" & Today & "', '" & txtNoOfdays.Text
& "', '" & txtPurpose.Text & "', '" & lblLeaveBal.Text & "', '" & "Not Approved" & "')"
            conn.Execute(sql)
            lblError.Text = "You applied Leave-Application sucessfully"
            lblError.Visible = True
            Response.Redirect("LeaveApplicationSuccessful.aspx")
        Else : lblError.Visible = True
        End If
    End If
End Sub

Protected Sub btnBack_Click(ByVal sender As Object, ByVal e As
System.EventArgs) Handles btnBack.Click
    Response.Redirect("EmployeeHome.aspx")
End Sub

Public Function opendb() As Object

```

```

    If conn.State = 1 Then conn.Close()
    conn.Open("Provider=SQLOLEDB.1;Persist Security Info=False;User
ID=sa;password=Password-2013;Initial Catalog=LeaveManager;Data Source=(local)")
    Return 0
End Function

Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
    opendb()
    If Not IsPostBack Then
        txtUserName.Text = Session("username")
        Dim tody As Date
        tody = Today
        txtPatientDOB.Text = Today
        loadleavetype()
    End If

End Sub

Sub loadleavetype()
    sql = "select * from tbl_LeaveType"
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    ddlLeaveType.Items.Clear()
    Do While Not rs.EOF
        ddlLeaveType.Items.Add(rs(1).Value)
        rs.MoveNext()
    Loop

End Sub

```

```

Protected Sub ddlLeaveType_SelectedIndexChanged(ByVal sender As Object, ByVal
e As System.EventArgs) Handles ddlLeaveType.SelectedIndexChanged
    leavebal()
End Sub
Sub leavebal()
    sql = "select SUM(UsedLeaves) as totalLEavesTaken from tbl_LeaveDetails where
username='" & txtUserName.Text & "' and LeaveTypeId = '" & ddlLeaveType.Text & "'"
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    If rs.EOF = False Then
        usedleaves = Nz(rs("totalLEavesTaken").Value)
    End If

    sql = "select NoOfLeavesPerYear as totYearleaves from tbl_LeaveType where
LeaveTypeName='" & ddlLeaveType.Text & "'"
    If rs.State = 1 Then rs.Close()
    rs.Open(sql, conn)
    If rs.EOF = False Then
        totalleave = Nz(rs("totYearleaves").Value)
    End If
    lblLeaveBal.Text = Val(totalleave) - Val(usedleaves)
End Sub
End Class

```