UNIVERSITY OF DAR-ES-SALAAM

COLLEGE OF INFORMATION AND COMMUNICATION TECHNOLOGIES

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

TE 499 FINAL YEAR PROJECT

PROJECT TITLE: DESIGN AND IMPLEMENTATION OF FRAMEWORK FOR INTERGRATING ETE SERVICES AND PRACTICAL MANAGEMENT SYSTEM AS A MODULE TO THE FRAMEWORK.

DEGREE PROGRAM: Bsc. IN TELECOMMUNICATIONS ENGINEERING

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Submission Date: 3rd June, 2013.

DECLARATION

Certification

Statement of Authorship and Originality

I declare that this report and the work described in it are my own work, with any contributions from others expressly acknowledged and/or cited.

I declare that the work in this report was carried out in accordance with the Regulations of the University of Dar es Salaam and has not been presented to any other University for examination either in Tanzania or overseas. Any views expressed in the report are those of the author and in no way represent those of the University of Dar es Salaam.

SIGNED: ……………………….

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Review Committee Signature: .... Date: ....

Supervisor Signature: ....………. Date: ....

ABSTRACT

Design and implementation of Framework for integrating ETE (Electronics and Telecommunications Engineering) services is a project which is generally intended to facilitate the development of automated systems such as practical management system, project management system, online notification system and student registration system and much more from a single framework.

The project aims to produce a working framework from which systems such as practical training management system will be developed from it and later installed to it as the module/service to the framework.

With this framework in place the development of subsystems will be easy and quick since there will be reuse of the resources from the framework. And also when it comes to maintain ace it will be easy as maintaining the framework will ensure also the maintenance of subsystems.

Considering a practical training as case study the project aims at producing a working module from the framework that will be used to manage practical training process and hence reduce or eliminate the problems being caused by the current manual system.

ACKNOWLEDGEMENT

First of all, I humbly thank the Almighty God for giving me good health and ability to do my project and prepare this report through all the time.

My heartfelt thanks go to my dear family especially my mother Mrs. Revina Bandihai for the good care as well as all the support I have got during the time I have been doing this project.

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Lastly but not least I thank my fellow students from Telecommunications and Computer Engineering & IT, especially Mr. Ng’homi, Vitus, Ms. Moshi, Favourness and Mr. Frimos, Denis for their encouragement, assistance in terms of various materials, ideas, challenges and computer software all of which have been a great help in doing my project.

May our God blessings be with us all!

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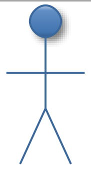
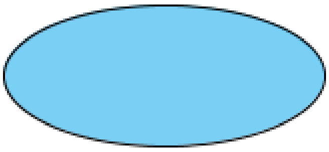
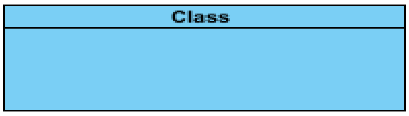
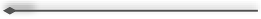
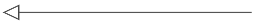
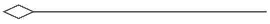
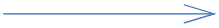
1. Actor of the System	
2. Use Case	
3. Class	
4. Composition	
5. Generalization	
6. Aggregation	
7. Control Flow	

LIST OF ABBREVIATIONS

Acronym	Definition
CSS	Cascading Style Sheet
DB	Database
DBMS	Database Management System
EE	External Examiner
HTML	Hyper-Text Markup Language
IE	Internal Examiner
PHP	Hypertext Preprocessor
PT	Practical Training
SQL	Structured Query Language
UML	Unified Modeling Language
UI	User Interface
XHTML	Extensible Hyper-Text Markup Language

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CHAPTER ONE

BACKGROUND INFORMATION

1.1 INTRODUCTION

Department of Electronics and Telecommunication Engineering (ETE) run different systems during its daily operation. These different systems are intended to help and simplify the amount of work that is being done. Examples of system used by the department include project management and practical training management.

Practical training requires that the training be an integral part of the academic program of study, though it is conducted while student is in school, the knowledge obtained can be utilized even after school. Practical training is done for both first, second, and third year students of Telecom Engineering and first and second for Electronics and communication students at the end of the academic year for two months. Students themselves have to search for a suitable practical training post. Some of the chances for practical training are given by the department to the students who do not manage to get any place for their training. Before training starts, students should read the guidelines and familiarize themselves with the regulations governing practical training, the reports and the activities.

Practical trainees are usually under the care of a training supervisor, who provides for meaningful training in line with company capabilities and the practical training regulations. He or she will instruct practical trainees about relevant matters in conversation and discussion. All practical trainees have to report on what they have to observed and experienced during training.

In order to keep track of all activities such as arrival note submission, certificate signing and report submission, conducted during the training there must be a system which will reduce delays, costs, complexity and connect everything in real time including tools for practical training, help, practical training schedule and other activities.

Apart from having a system to simplify the practical training management, there should be a framework from which all these systems will be developed from. With the framework the maintenance of subsystems will be easy and cost effective.

1.2 PROBLEM STATEMENT

The department has various systems that are not centralized and most of the systems have either been developed or run under different frameworks or they are still being operated manually. Such system includes practical Training and project management.

Currently, the department of Electronics and Telecommunication Engineering (ETE) does not have a refined computer system which allows student to view all the information about practical training, applying for practical training online, send their Arrival Note online and get any help about practical training online.

Also Practical Training Coordinators are facing the hard time to know how many students have not yet got the places for practical training and how to assign them when the chances are available.

Moreover there is no secure way of obtaining the Practical Training Certificate Form which is filled by supervisor at the company and given to the student so that he/she can submit it back to the University.

To keep track of each activity manually is difficult as it takes a lot of time and generates some errors, a computerized system is required to fasten and generate free error system.

1.3 PROJECT OBJECTIVES

1.3.1 Main Objective

My main objective is to design and implement a framework that will be the base platform for developing other subsystems. The framework will allow different developed subsystems or services to be easily integrated and also it will help in case of maintenance since all the subsystem will be running under single framework, thus maintaining single framework will be much easier and cost effective than if each system will be developed on its own.

1.3.2 Specific Objectives

My specific objectives are:-

i. To design and implement a framework that will serve as the basis for the development of other subsystems that are used in daily activities of the department. Examples of such subsystems include the Practical management system, Project management system and others. The framework will allow these subsystems developed to be installed as modules to it.

ii. To design and implement Practical Training management system as module (subsystem/service) to the framework that will help reduce the weight of load done by the PT coordinator in managing activities and also improve performance of the whole practical training process by including direct interaction of students, supervisors and examiners with the system.

1.4 PROJECT SCOPE

The framework being developed will be able to accommodate various subsystems. Each of these different subsystems will be working independent from the other subsystem. Examples of such subsystems that can be developed and integrated using the developed framework are such as Practical training management system, project management system, online notification system and asset management system. But in this particular project I will develop Practical Training Management System.

1.4.1 PRACTICAL TRAINING MANAGEMENT SYSTEM

This subsystem will be used in management of practical training activities undergone by students, supervisors and the practical coordinators. The following are user functions and their respective users for this particular subsystem.

A. PRACTICAL TRAINING COORDINATOR

i. Allow him/her to view how many students have not yet got practical places.

ii. Let him/her post an announcement for available chances for practical training, and then assign students available chances.

iii. Assign the supervisors to the students.

iv. Let him/her evaluating which regions and institutions that have been selected mostly by the students for practical training.

v. Collecting students' scores during the whole training period and their reports. These scores will be collected from:

   a. Supervisors

   b. Internal Examiners

   c. Training officers

   d. External examiners.

B. SUPERVISOR

i. Can view assigned students

ii. Has an ability to send supervision marks to the PT-Coordinator after supervising the students.

iii. View documents (i.e. PT report) uploaded by the student.

C. STUDENT

i. Let the student select the regions they prefer to carry out their practical training.

ii. Permit student to submit the information of the company he or she has been selected for his/her practical training if any.

iii. Allow students to send arrival note online.

iv. Allow a student to send a query to his/her supervisor assigned.

v. Allow a student to submit his/her training certificate after being signed by Training officer.

CHAPTER TWO

LITERATURE RIVIEW

2.1 OVERVIEW OF THE CURRENT SYSTEMS

Currently, there is no framework that allows systems to be developed from it that would help in simplification of daily activities operation. And considering practical training case study there is no automated system that handles the management of practical training process for students, the present system is paper based. Thus it is fair to say that the current system for management of practical training is being operated manually.

2.1.1 PROCESS UNDERGONE FOR THE CURRENT PT SYSTEM

The current process that is being used by the department in managing PT period is manually. The table below summaries the process of PT on the Coordinator's side.

Table 2.1 PT Coordinator Activities

SN	Period	Activities
1	Semester 1: Weeks 1 & 2	➢ Collecting PT reports and Training Certificates from students ➢ Collecting supervisor reports
2	Semester 1: Weeks 3	➢ Preparing the PT marking list ➢ Distributing PT reports for marking among the internal examiners (IE)
3	Semester 1: Weeks 3-10	➢ Marking PT reports (All academic staff)
4	Semester 1: Weeks 9 & 10	➢ Collecting PT reports from IE ➢ Contacting external examiners (EE)
5	Semester 1: Week 11	➢ Submitting PT reports to EE for marking ➢ Later, drafting PT request letters
6	Semester 1: Weeks 16&17	➢ Handing out PT request letters to students
6	Inter-Semester Holidays	➢ Physical visits to Industries for solicitation of PT places
7	Semester 2	➢ Soliciting PT places (sending reminders, further site visits) ➢ Allocating students to PT places ➢ Preparing PT handouts
8	Semester 2: Weeks 16 & 17	➢ Training PT I students on PT etiquette ➢ Handing out PT materials to students ➢ Planning PT Supervision routes ➢ Allocating supervisors to routes

9	Holidays (Weeks 18 – 20)	➢ Receiving Arrival Notes ➢ Handling exceptions ➢ Preparing supervision handouts
10	Holidays (Weeks 18 – 25)	➢ Supervising students as well as managing the supervision exercise
11	Holidays	Receiving supervision reports

The activities undergone by the students during this process of Practical training, include submitting letter to companies for soliciting the places for PT during the first semester of the academic year, Reporting for the Practical Training where he/she has been arranged, sending arrival note to the PT coordinator and finally submitting report after he/she has completed the practical training.

This current system has the following drawbacks in its operation:-

- **Time wasting:**
  Students waste much time in finding the places to conduct their practical training without any insurance of gating the chances. Some students may waste up to three weeks waiting for practical training chances while others already started the training. For the future I expect the system to provide good relationship between training institutions and the university so as to ensure permanent chances for students each period of training. Thus ensuring that training chances are available for students before the start of training period and in return this will eliminate time wasting problem for students waiting to be assigned training places.

- **Poor data management:**
  To simplify the work done by the Practical Training Coordinator there must be a system which manages the information about practical training including the training institutions which have attempted to take students for practical training. This will give the coordinator the ability to book for other chances for the next period of practical training.

- **Insecurity of Information:**

  The information within the Arrival Note which sent through the postal address is not much secure since there is no reliability of mail deliver as well as delay during the process of deliver.

- **Lack of Centralized Resources for Practical Training:**

  Resources for PT are not centralized, but the system will help to provide all required resources for PT including Guideline Book for PT, weekly report sheets and others.

2.1.2 EXISTING SYSTEMS

Currently a number of frameworks exist which allow development of systems on top of them. Such frameworks include Zend, Codeignitor, Joomla, Drupal and others. These existing frameworks are more general (generic) in development of systems, on the other hand the developed framework is more particular hence light in its operation as a number of unwanted libraries have been dropped out.

One of the existing similar systems to the PT management system is the school management system developed by DUXTE LTD. The system manages day to day school activities which include registration of students, teachers' and students' attendance, results publication, subjects registration among others. The link to this system is http://aris.duxte.net.

2.2 WEB TECHNOLOGIES

Below are the technologies that will be used in order to accomplish the framework and its subsystem. For each technology there are some reasons given on why choosing it.

i. PHP

It stands for Hypertext Preprocessor; it is a server side scripting language that is PHP scripts are executed on the server. It provides the dynamic functionality of the web application.

The reasons for using PHP are:

- PHP runs on different platforms (Windows, Linux, UNIX, etc.)
- PHP is compatible with all servers used today (Apache, IIS, etc.)
- PHP is FREE to download from the official PHP resource: www.php.net

- PHP is easy to learn and runs efficiently on the server side.
- PHP supports many databases (MySQL, Informix, Oracle, Sybase, Solid, PostgresSQL, Generic ODBC, etc.)
- Technique support is widely available through different PHP forums.
- PHP is open source software.

ii. MySQL

It is a relational database management system (RDBMS) and the most popular open-source database system.

Why MySQL?

- MySQL is ideal for both small and large applications.
- MySQL supports standard SQL
- MySQL compiles on a number of platforms.
- MySQL is free to download and use.

iii. CSS

It stands for Cascading Style Sheet; used to describe the presentation of a document written in a markup language (HTML). CSS improves content accessibility, provide more flexibility and control in the specification of presentation characteristics and reduce complexity.

Why CSS?

- Style Sheets can serve a lot of work by removing all the formatting from the HTML document and stored in a separate CSS file.
- CSS is cross-browsers; all browsers support CSS today
- External Style Sheets enable to change the appearance and layout of all the pages in a Web site, just by editing one single file!

iv. JavaScript.

JavaScript is a scripting language most often used for client-side web development. The language is mostly used in websites design. The primary use of JavaScript is to write functions that are embedded in HTML.

v. XAMPP

It is an acronym for: X – meaning cross-platform, A – Apache HTTP Server, M – MySQL, P – PHP, P – Perl.

XAMPPs are packages of independently created programs installed on computers and the following principal components: Apache, MySQL and PHP. Apache is a web server, which allows people with web browsers like Internet Explorer or Firefox to connect to a computer and see information through web pages. MySQL is a database manager (keeps track of data in a highly organized way). PHP Is used as a scripting language which can manipulate information held in a database and generate web pages.

Why XAMPP?

- ♦ It runs on different platforms.
- ♦ It comes with a number of other modules includes OpenSSL and phpMyAdmin
- ♦ The program is released under the terms of the GNU General Public License and acts as a free web server capable of serving dynamic pages.
- ♦ XAMPP also provides support for creating and manipulating databases in MySQL and SQLite among others.

CHAPTER THREE

METHODOLOGY

I have used the following methodologies in development of the framework and practical training management system as a module:-

- The waterfall model which has five main phases namely Requirement definition, system analysis and specification, system design, implementation and unit/system testing, and operation maintenance as shown in Figure 3.1

  Reasons for choosing the waterfall model:-

  - Requirements are very well known, clear and fixed.
  - Product definition is stable.
  - Technology is understood.
  - There are no ambiguous requirements
  - Ample resources with required expertise are available freely
  - The project is short.

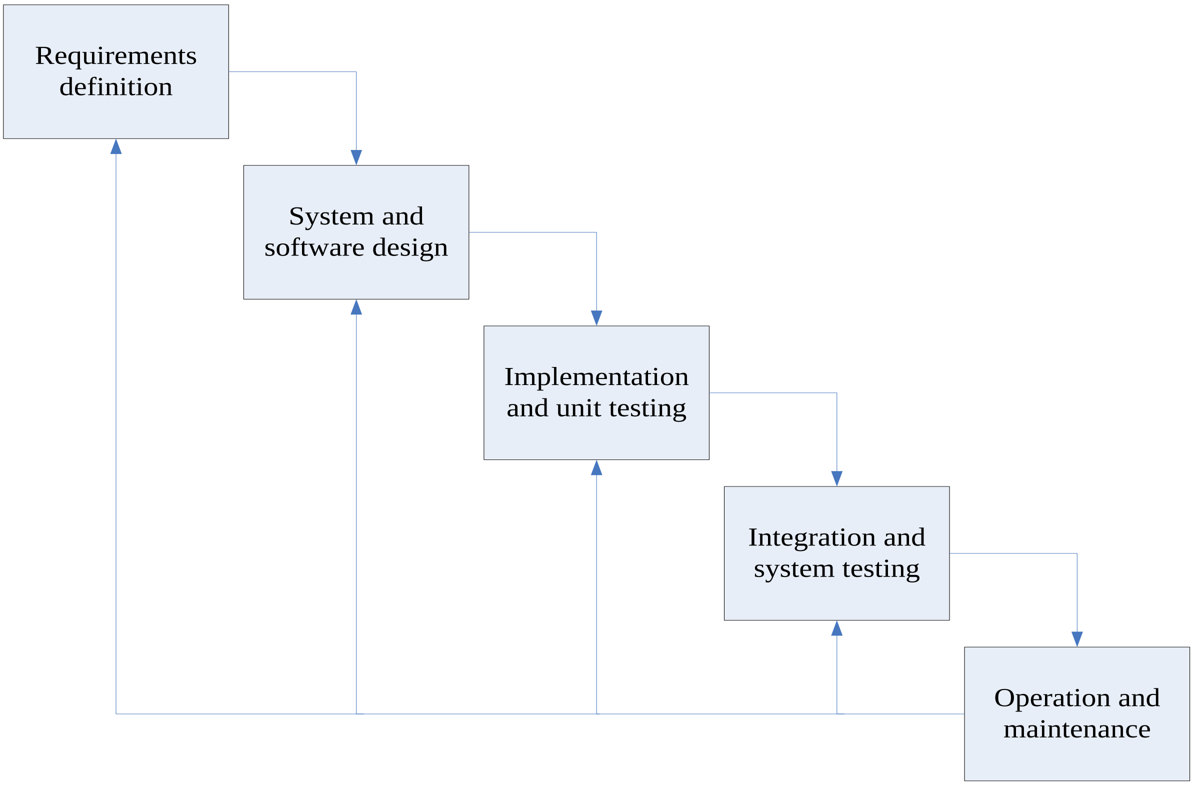

Requirements definition
System and software design
Implementation and unit testing
Integration and system testing
Operation and maintenance

Fig 3.1: Water fall model

- 3- Tier Architecture will be used.

  3- Tier architecture will be used in the system development as it has a considerable reduction of data collision since the server (middle tier) has the ability to process queries. Three-tier architecture is any system which enforces a general separation between the following three parts:

  i. Client Tier or User Interface

  ii. Middle Tier or business logic (Server)

  iii. Data Storage Tier (Database).

- Modal-View-Controller (mvc): this aims at separating business logic from the user interface considerations.

This architecture is chosen since, a lot of end-user can access the system and moreover it is easier to modify the system and easier to modify.

CHAPTER FOUR

REQUIREMENT CAPTURE AND ANALYSIS

Requirements are description or statements of a function, features or conditions that a user seeks to have implemented in a system. Requirement engineering is a critical stage of software development cycles that defines the services that the system is to provide and its operational constraints. The two categories of the system requirements are; Functional Requirement and Non-functional Requirement.

4.1 FUNCTIONAL REQUIREMENTS

These are the statements of the services that a system should provide to users and how the system should reacts to particular inputs.

The table below shows the functional requirements for both the framework and the Practical management system subsystem.

Table 4.1 Functional requirements

REF No.	DESCRIPTION		CATEGORY
F1	Allow users to Login		
	F1.1	User will login by providing password and username.	Evident
	F1.2	Perform user authentication	Hidden
	F1.3	Grant access to valid users and no access to **non-valid** users	Evident
	F1.4	Allow users to logout of the system.	Evident
F2	Provide some options to a validated System Administrator for:		
	F2.1	Installing subsystem to the framework.	Evident

	F2.2	Uninstall subsystem from the framework.	Evident
	F2.3	Updating the subsystem in the framework & framework files	Evident
	F2.4	View subsystems	Evident
	F2.5	User management functionalities (edit, delete, creating accounts)	Evident
	F2.5	Group management functionalities (edit, delete, creating groups)	Evident
	F2.6	Manage framework settings	Evident
F3	Provide some options to a PT-Coordinator after login for :		
	F3.1	Viewing which regions are mostly selected by students for PT	Evident
	F3.2	Viewing how many students doesn’t have chances for PT.	Evident
	F3.3	Uploading available chances for PT	Evident
	F3.4	Publishing any announcement concerning PT.	Evident
	F3.5	Assigning supervisors to the students	Evident
	F3.6	Sending special emails to all companies to thank them and ask for other chances during the next period of PT.	Evident
	F3.7	Viewing which regions are mostly selected by students for PT	Evident
F4	Provide some options to a validated logged in Student for:		
	F4.1	Selecting Regions for Practical Training.	Evident
	F4.2	Submitting Company information of a place where he/she get PT.	Evident
	F4.3	Applying for any available PT chances published.	Evident
	F4.4	Sending Arrival Note	Evident

	F4.5	Viewing assigned supervisor	Evident
	F4.6	Uploading Documents (i.e. final and weekly reports)	Evident
F5	Allow recording of detailed information into database		Hidden.

4.2 NON-FUNCTIONAL REQUIREMENTS

While the users of the system may want some functions which are being performed by the system, they may also want the system to have certain attributes which will be the characteristics of the system. These are called Non-Functional Requirements and they are listed in table below.

Table 4.2 Non-functional requirements

REF No	DESCRIPTION	
NF1	Security:	The system should authenticate all users before allowing them to interact with the system functionalities.
NF2	Maintainability:	The system should be easy maintained, i.e. the system should be able to add new functionality/features without any major redesign.
NF3	Responsiveness:	Short response time is required by the system.
NF4	Robustness:	The system should have ability to continue function accurately if the something wrong happens or multiple requests are received at the same time.
NF5	Scalability:	The system should be easy scalable.
NF6	Operating System:	The system should be cross-platform.
NF7	Language:	The system should be implemented only in English.

4.3 SYSTEM ANALYSIS

4.3.1 USE CASE DIAGRAMS

Framework use case diagram

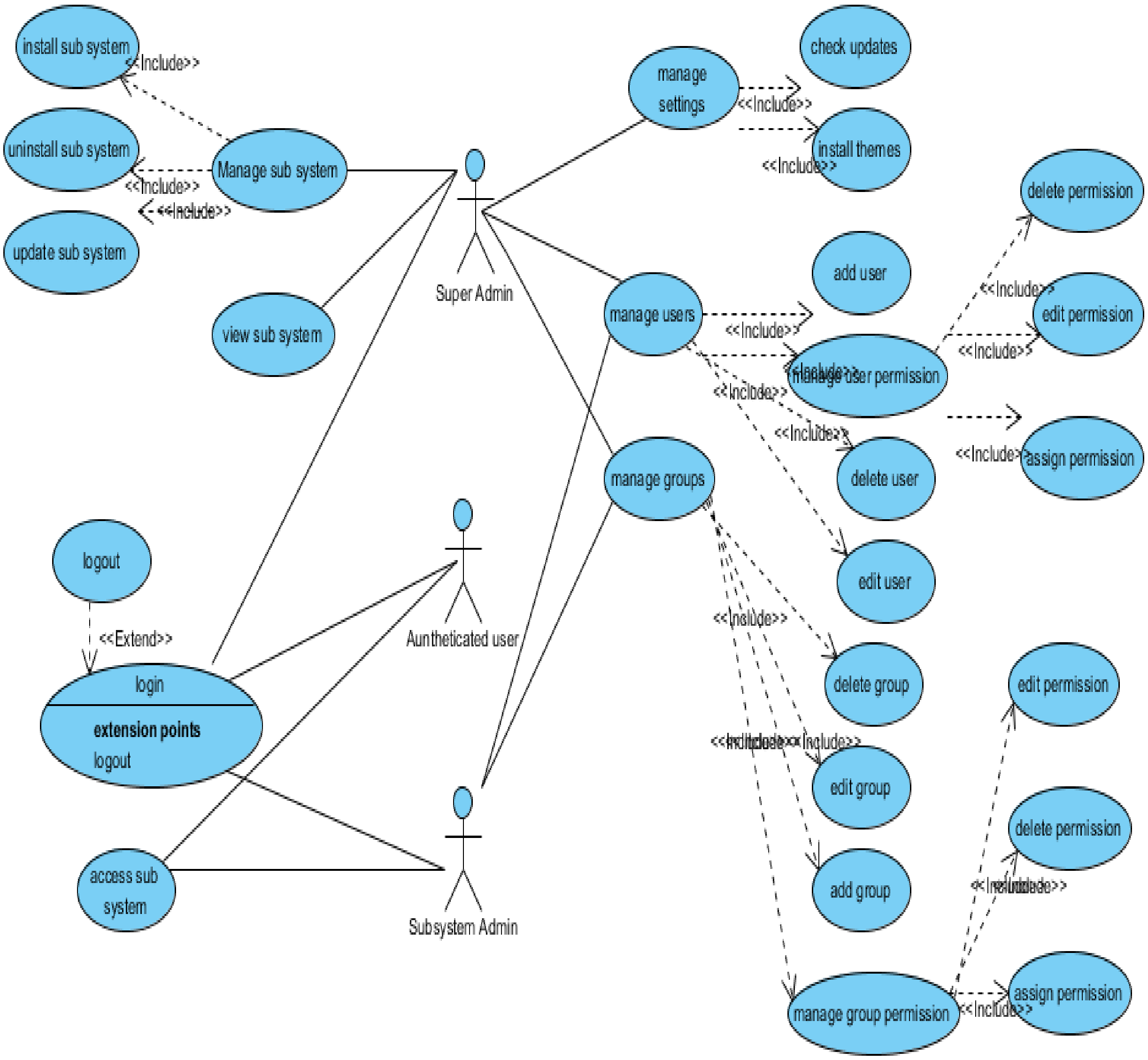


Figure 4.1 framework use case diagram

Student use case diagram

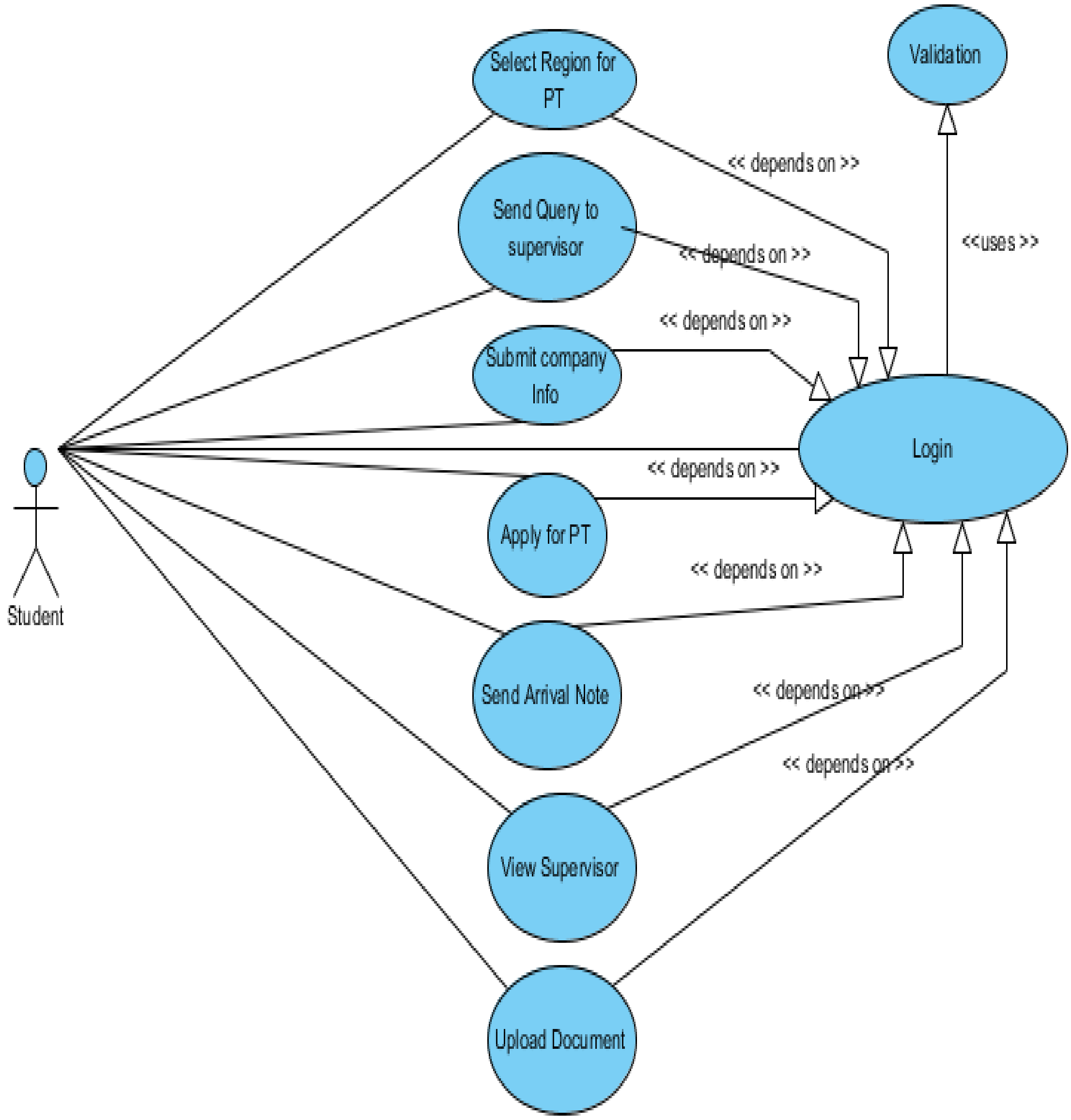


Figure 4.2 student use case diagram

PT Coordinator use diagram

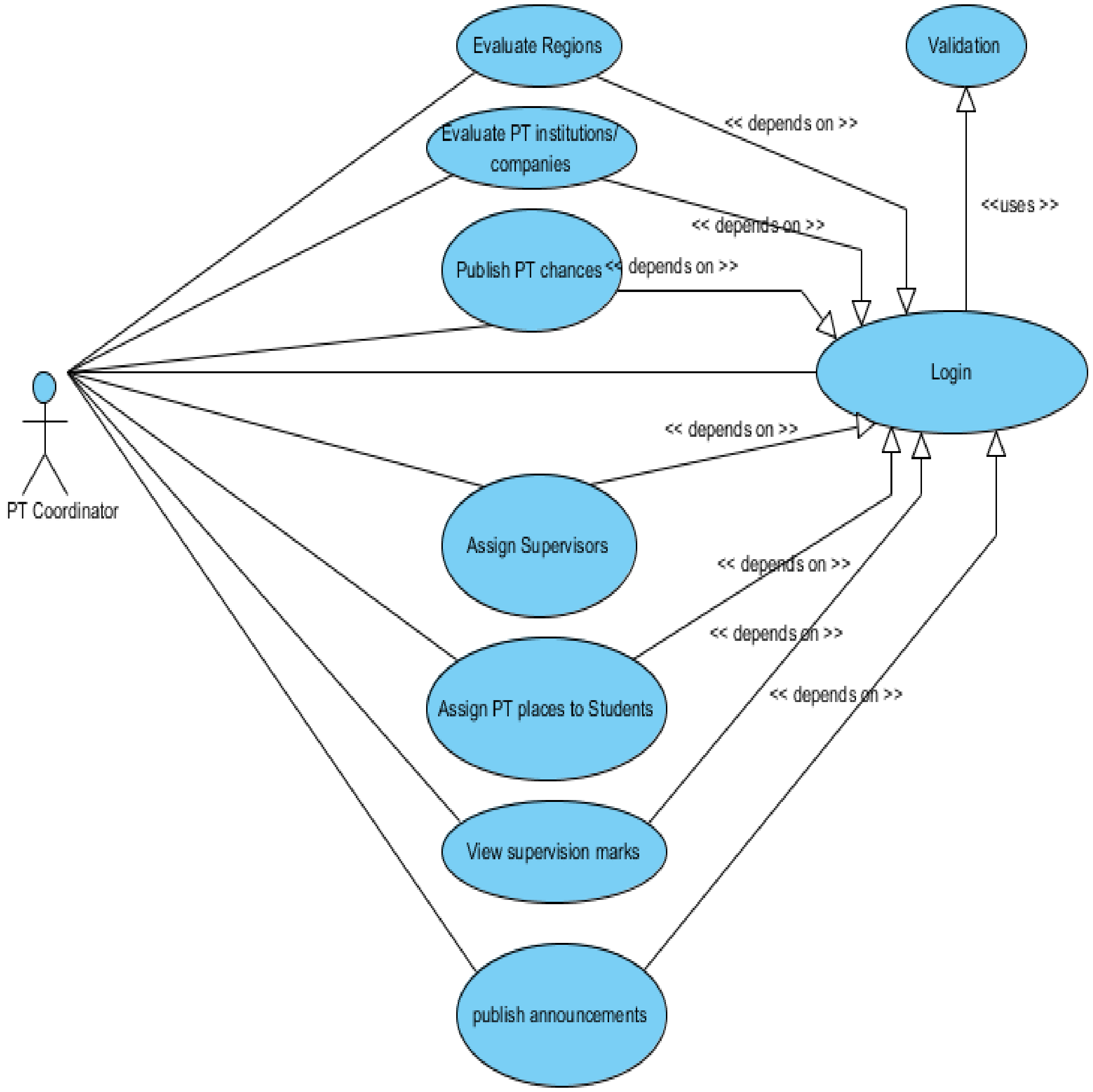


Figure 4.3 pt coordinator use case diagram

Supervisor use case diagram

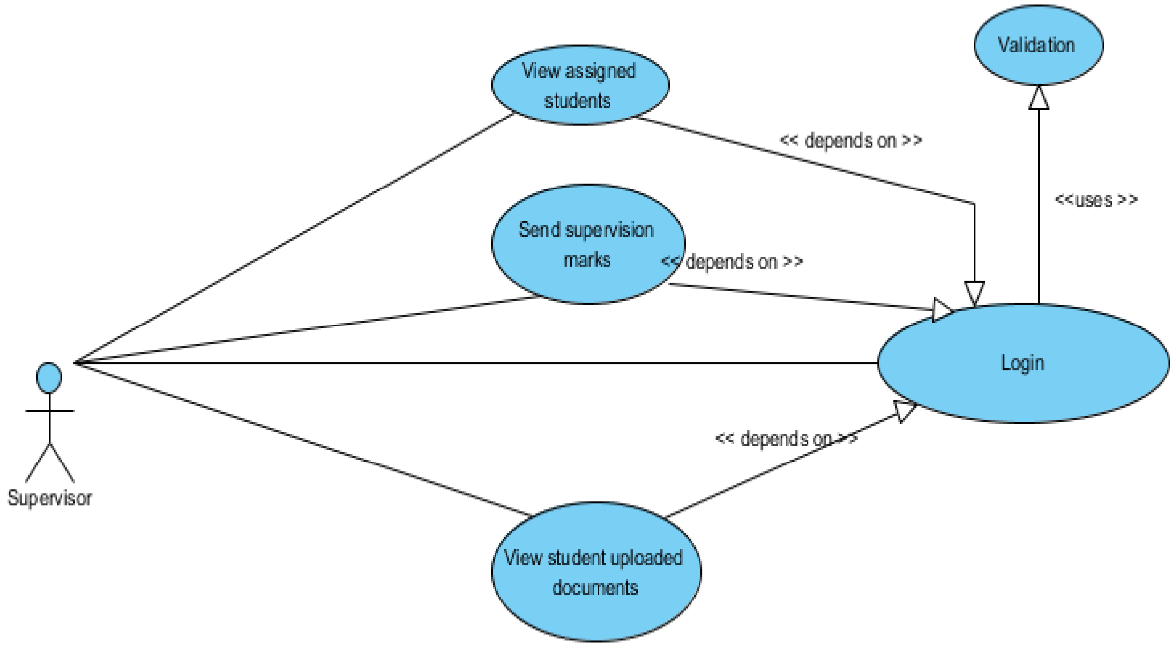


Figure 4.4 supervisor use case diagram

4.3.2 USE CASE DESCRIPTION

In describing use case we give more details of the use case for the system, and any use case description should have the following standard features, Use case name, actors, description, assumptions, pre-conditions, post conditions, main flow of events and exception flow of events.

i. Use-Case Name: Uniquely identify the use case i.e. the name corresponds with the function to be initiated or done by the actor.

ii. Actors(s): Is anything that needs to interact with the system to exchange information i.e. use-case are initiated or triggered by external users. May be a person, a device, another system or subsystem, or time.

iii. Description: It provides the quick overview which intends to save the reader to read the full contents of a use case to understand what the use case is about.

iv. Assumptions: Show things that are assumed as true.

v. Preconditions: Define all conditions that must be true for the trigger to cause the initiation of the use case.

vi. Post Conditions: Describe what the change of the state of the system will be after the use case.

vii. Main flow of events: At minimum, each use case should convey a primary scenario or typical of course of event, also called ‘basic flow’ or ‘happy flow’.

viii. Exceptional flow of events: Use case may contain secondary path or alternative scenario, which are variations on the main theme. Exceptions, or what happens when things go wrong, may also be described, either within the alternative paths section or in a section of their own.

Table 4.3 Validate Use-Case Description

Use Case Name:	Validate (Login)
Actor(s):	Super Administrator, Authenticated user, Student, PT-Coordinator, Supervisor
Description:	Verify password and username.

Assumptions:	Every user has password and username set to the system.

Preconditions:	All system users have been registered into the system database.
Post Conditions:	After validation system retains user identification information.
Main flow of events:	**1.** User request to log on **2.** System prompt user to enter username and password **3.** User will enter the information that will be validated. **4.** The system will make comparison with the user information it has within the database for validation. **5.** If they match the system acknowledges the entry
Exceptional flow of Events:	If the user enters invalid information, the use case restarts.

Table 4.4 Manage users Use-case Description

Use Case Name:	Manager users
Actor(s):	Super Administrator, Sub system Admin.
Description:	This function will enable different system Administrators to manage users that interact with the system.
Assumptions:	At least one subsystem is installed and the system has users to manage already.
Preconditions:	The Super Administrator or Sub system Admin is already validated by the system.
Post Conditions:	The managed user information will be saved to the database.
Main flow of events:	**1.** User will first request the management function which are adding, deleting, assigning permission and editing. **2.** Then user will select the appropriate management

	function from the list. **3.** From the function information will be entered and the submitted for saving.
Exceptional flow of Events:	The user can cancel the process anytime by clicking the cancel button.

Table 4.5 Select Region for PT Use-case Description

Use Case Name:	Select Region for PT
Actor(s):	Student
Description:	Each student selects the region for conducting his/her practical training.
Assumptions:	All regions are available.
Preconditions:	The student already validated by the system.
Post Conditions:	The requested region will be saved to the database.
Main flow of events:	**1.** User will first request for selecting regions **2.** Then selecting the region. **3.** Submit the selected region.
Exceptional flow of Events:	none

Table 4.6 Assign Supervisor Use-case Description

Use Case Name:	Assign Supervisors
Actor(s):	PT-Coordinator
Description:	A PT-Coordinator assigns some of the lecturers for supervision to the student based on the regions.

Assumptions:	All students have already sent their Arrival Note form.
Preconditions:	The PT-Coordinator already validated by the system.
Post Conditions:	After assignment of supervisors, student will be capable to view his/her supervisor.
Main flow of events:	**1.** Login into the system. **2.** Then select the students from the list. **3.** Assign the supervisors to the selected students **4.** Submit the information.
Exceptional flow of Events:	none

Table 4.7 Send supervision marks Use-case Description

Use Case Name:	Send supervision marks
Actor(s):	Supervisor
Description:	A PT Supervisor sends the marks collected from the assessment of students to the PT-Coordinator.
Assumptions:	Supervisor has been assigned students to supervise.
Preconditions:	The Supervisor has already been validated by the system.
Post Conditions:	After submitting the student marks, the PT-Coordinator will be able to view marks of that student.
Main flow of events:	**1.** Login into the system. **2.** Then selecting the send marks function **3.** Enter the marks for a particular student **4.** Submit the entered marks for that student
Exceptional flow of Events:	none

4.3.3 CLASS DIAGRAMS

Concept represents idea or thing .In process of creating class diagram, we are trying to find out which classes or concepts are important to the system and relationship between them. This process helps us to understand the problem further and developing a better awareness of customers' business. A class has its instances which are known as objects.

Class diagram for the practical management system

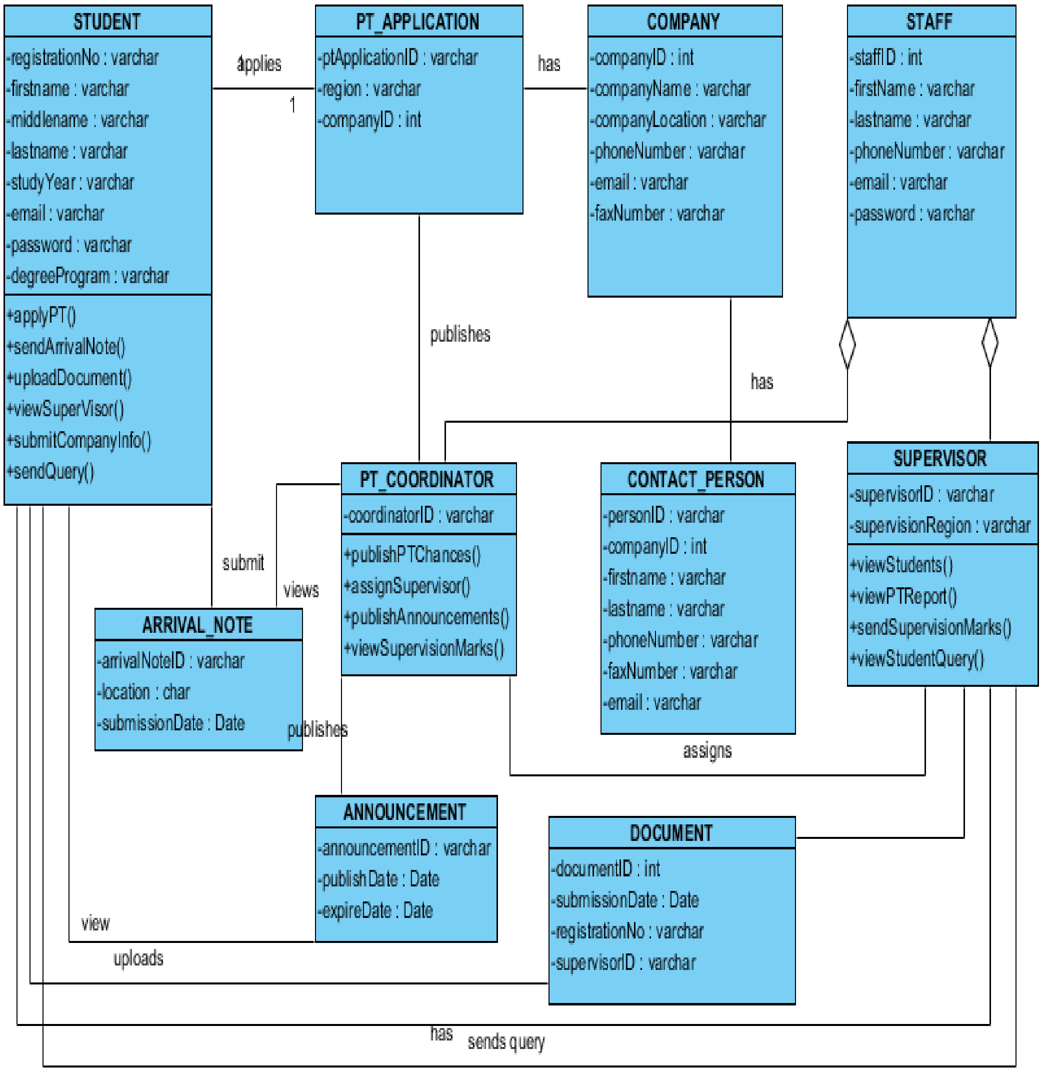


Figure 4.5 class diagram

CHAPTER FIVE

SYSTEM DESIGN

5.1 SYSTEM ARCHITECTURE

This system will be designed using the model-view-controller which is similar to three-tier architecture and sometimes it is considered to be a part of three-tier architecture when dealing with large applications. MVC is triangular in nature whereas Three-tier architecture is Linear in nature. The MVC architecture consists of the following:

- **The view**: This part consists of the elements of the user interface such as text and form inputs. XHTML, CSS and JAVASCRIPT are used in the of design user interface.
- **The Controller**: This part sends commands to its associated view to change the view's presentation of the model (e.g., by scrolling through a document). It can send commands to the model to update the model's state (e.g., editing a document). Manages the communication between the model and the view.
- **The Model**: This part notifies its associated views and controllers when there has been a change in its state. This notification allows the views to produce updated output, and the controllers to change the available set of commands. It represents the information (the data) and the business rules.

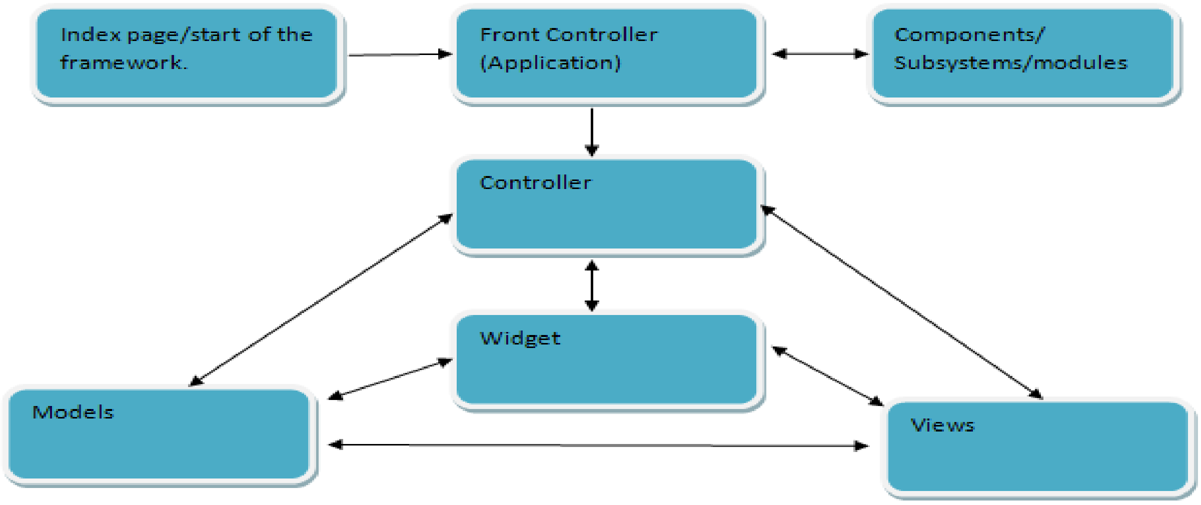

Index page/start of the framework.
Front Controller (Application)
Components/ Subsystems/modules
Controller
Widget
Models
Views

Figure 5.1 Architecture diagram

5.2 DATABASE DESIGN

This part is mainly focusing on determining what kind of data specified should be stored in the database, this basically is resulted from the concept of data model, and this concept is different from functional model, in which functional model is mainly concentrated on data processing.

Data modeling design is basically involves the design of the entity relational diagram, entity relational diagram indicates data in each object(entity) and the relationship existing between entity, this part acts as an initial stage of the database design.

The following are the steps that are undertaken in design of the database for the complete framework and the PT management system subsystem.

5.2.1 Database Requirement Analysis

This is the first step in designing database application which require the knowledge of what data to be stored in the database, what applications must be built on top of it, and what operations are most frequent and subject to performance requirements.

5.2.2 Conceptual database design

The information gathered in the requirements analysis step is used to develop a high level description of the data to be stored in the database, along with the constraints that are known to hold over this data. This step is often carried out using Entity Relationship Diagram (ERD) model. The model in figure 5.2 was obtained after going through this stage of database design.

5.2.3 Logical database design

In this step the choice of DBMS to implement the database design is made and converts the conceptual database design into a database schema in the data model of the chosen DBMS. The design will only consider the Relational DBMS and therefore, the task in the logical design step is to convert the Entity Relationship schema into a relational database schema

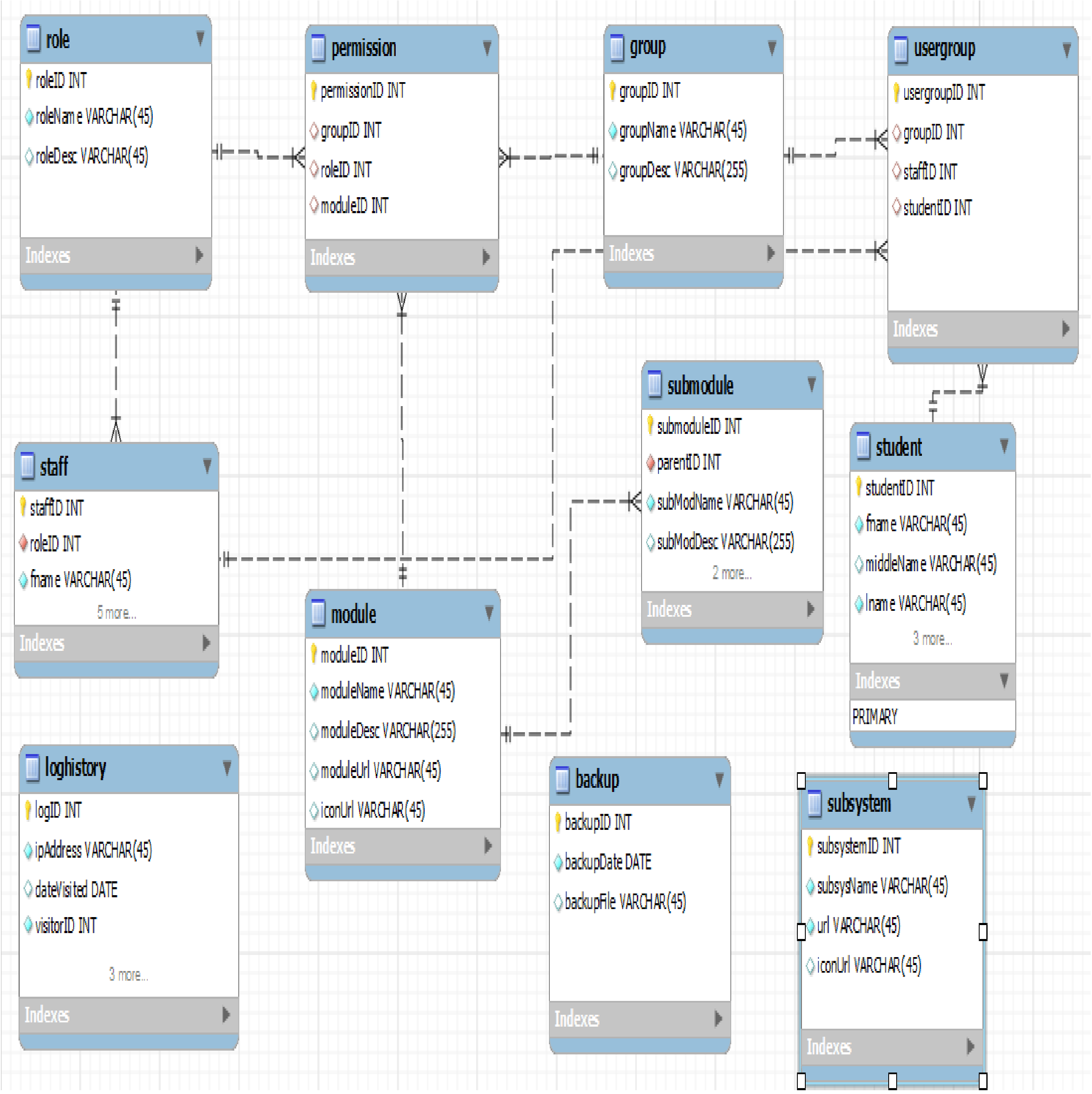


Figure 5.2 Entity Relationship (E-R) diagram

5.2.4 Physical database design

This step involves typical expected workloads that the database must support and further refine the database design to ensure that it meets desire performance criteria. This step simply involves building indexes on some tables and clustering some tables or it may involve redesign of parts of the database schema obtained from earlier designs steps. The following is the resulting physical database for both the framework and PT management subsystem.

A. Physical schema (database) for the framework

The following shows the tables and their primary keys (bolded fields) modeled for the framework.

STAFF (**lecturerID**, firstName, middleName, lastName, gender, phoneNumber, email, userName, password)

STUDENT (**studentID, registrationNo**, firstName, middleName, lastName, gender, studyYear, degreeProgram, phoneNumber, email, Password)

PERMISSION (**permissionID**, groupID, roleID, moduleID)

ROLE (**roleID**, roleName, roleDesc)

GROUP **(groupID**, groupName, groupDesc)

USERGROUP (**usergroupID,** groupID, staffID, studentID)

MODULE (**moduleID**, moduleName, moduleDesc, moduleUrl, iconUrl)

SUBMODULE (**submoduleID, parentID**, subModName, subModDesc, subModUrl, subModIcon)

SUBSYSTEM (**subsystemID**, subsysName, url, iconUrl)

BACKUP (**backupID**, backupDate, backupFile)

LOGHISTORY (**logID**, ipAddress, dateVisited, visitorID, browser, page, action)

B. Physical schema (database) for the PT management subsystem

The following shows the tables and their primary keys (bolded fields) modeled for the PT management subsystem.

SUPERVISOR (**ID**, staffID, supervisionRegion)

PT_COORDINATOR (**ID**, staffID)

COMPANY (**ID**, companyName, region, district, phoneNumber, companyEmail, locationDescription)

PT_STATUS (**ID**, registrationNo, companyID,supervisorID)

PT_REGIONS **(id**, registrationNo, region)

ARRIVALNOTE (**ID**, registrationNo, pt_startDate, form_submittedDate, std_position, workingHours, workingDays, companyName, region, district, locationDescription, trainerName, trainerPosition, trainerEmail, trainerPhoneNumber)

PT_APPLICATION (**ID**, companyID, comments, vacancy, submissionDate)

This part is mainly focusing on determining what kind of data specified should be stored in the database, this basically is resulted from the concept of data model, and this concept is different from functional model, in which functional model is mainly concentrated on data processing. The figures below present the implemented database with their tables for both the framework and the PT management system.

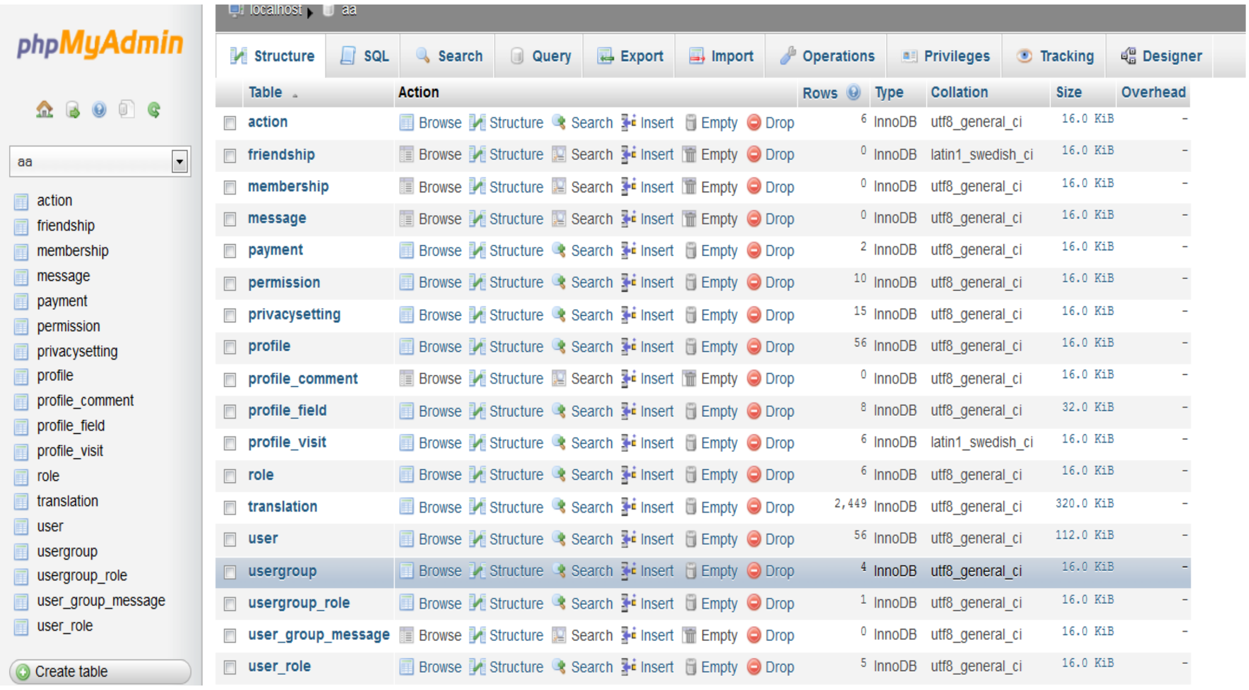


	Table	Action	Rows	Type	Collation	Size	Overhead
□	action	Browse Structure Search Insert Empty Drop	6	InnoDB	utf8_general_ci	16.0 KiB	-
□	friendship	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	membership	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16.0 KiB	-
□	message	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16.0 KiB	-
□	payment	Browse Structure Search Insert Empty Drop	2	InnoDB	utf8_general_ci	16.0 KiB	-
□	permission	Browse Structure Search Insert Empty Drop	10	InnoDB	utf8_general_ci	16.0 KiB	-
□	privacysetting	Browse Structure Search Insert Empty Drop	15	InnoDB	utf8_general_ci	16.0 KiB	-
□	profile	Browse Structure Search Insert Empty Drop	56	InnoDB	utf8_general_ci	16.0 KiB	-
□	profile_comment	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16.0 KiB	-
□	profile_field	Browse Structure Search Insert Empty Drop	8	InnoDB	utf8_general_ci	32.0 KiB	-
□	profile_visit	Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	role	Browse Structure Search Insert Empty Drop	6	InnoDB	utf8_general_ci	16.0 KiB	-
□	translation	Browse Structure Search Insert Empty Drop	2,449	InnoDB	utf8_general_ci	320.0 KiB	-
□	user	Browse Structure Search Insert Empty Drop	56	InnoDB	utf8_general_ci	112.0 KiB	-
□	usergroup	Browse Structure Search Insert Empty Drop	4	InnoDB	utf8_general_ci	16.0 KiB	-
□	usergroup_role	Browse Structure Search Insert Empty Drop	1	InnoDB	utf8_general_ci	16.0 KiB	-
□	user_group_message	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16.0 KiB	-
□	user_role	Browse Structure Search Insert Empty Drop	5	InnoDB	utf8_general_ci	16.0 KiB	-

Figure 5.3 Framework database as implemented in phpMyAdmin.

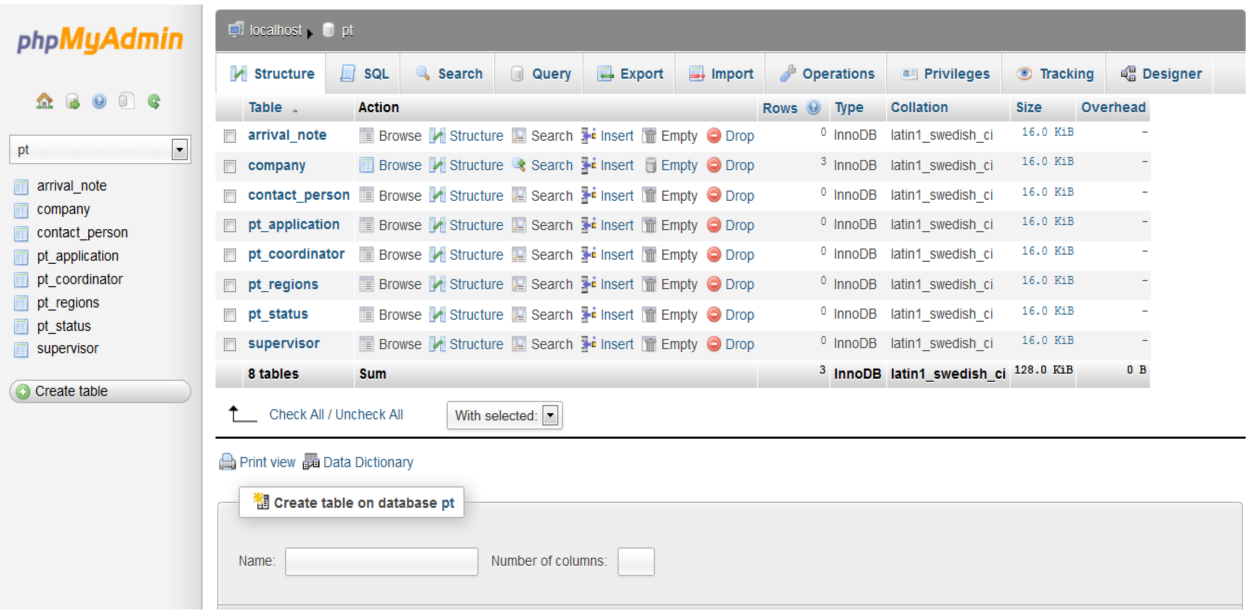


	Table	Action						Rows	Type	Collation	Size	Overhead
□	arrival_note	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	company	Browse	Structure	Search	Insert	Empty	Drop	3	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	contact_person	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	pt_application	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	pt_coordinator	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	pt_regions	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	pt_status	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
□	supervisor	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	latin1_swedish_ci	16.0 KiB	-
	8 tables	Sum						3	InnoDB	latin1_swedish_ci	128.0 KiB	0 B

Figure 5.4 PT management system database as implemented in phpMyAdmin.

5.2.5 Database system security design

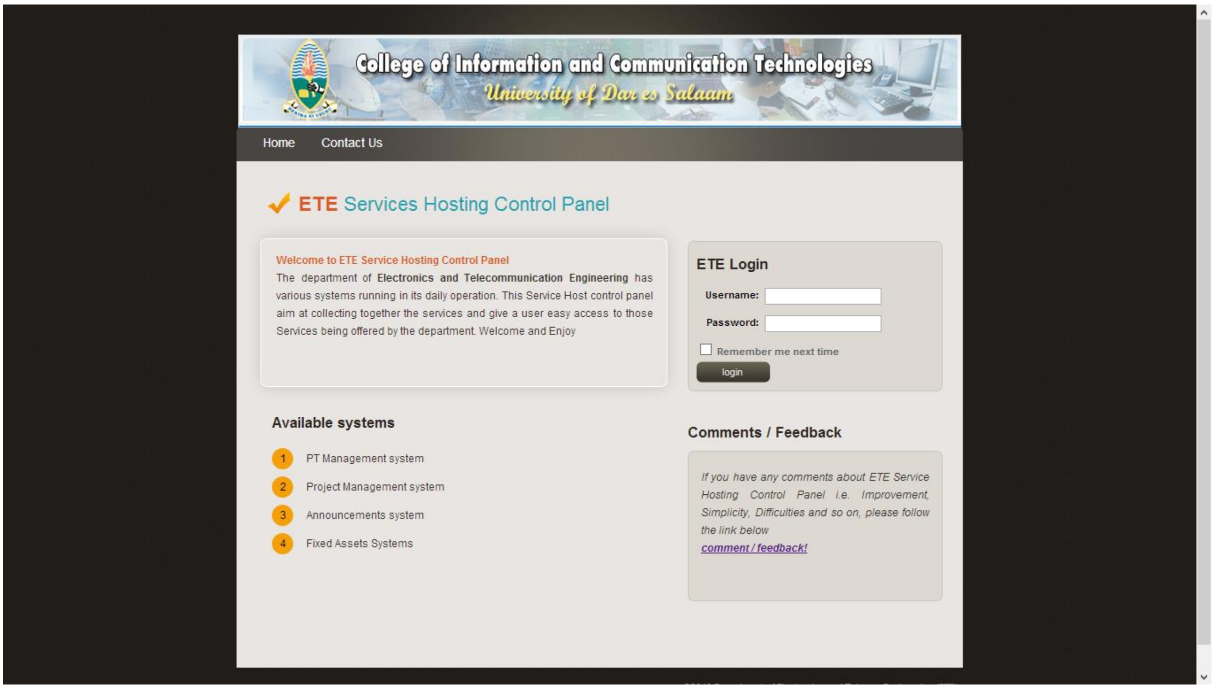
In this step the different user groups are identified and the different roles played by various users. For each role and user group the identification of the parts of the database that they must be able to access and the parts of the database that they should not be allowed to access, and take steps to ensure that they can access only the necessary parts.

5.3 USER INTERFACE DESIGN

User interface design is another important stage because it builds the interaction between users and the system. User-program interaction has two aspects. First is how information from the user is entered in the system. Second is how information from the program is presented to the user. To complete the UI of the framework and the subsystem CSS, XHTML and JavaScript have been used. Below are some of systems interfaces.

5.3.1 FRONT-END OF THE FRAMEWORK

Before accessing the sub-system, the normal users and Super administrator are provided with the front interface which has the login form on which username and password must be provided correctly in order to access system functionalities. The front page also has links for accessing the subsystems and other links for providing feedback about the service and the contact information. The figure below shows the implemented interface for the front page of the framework.


College of Information and Communication Technologies
University of Dar es Salaam
Home
Contact Us
login

ETE Services Hosting Control Panel

Welcome to ETE Service Hosting Control Panel

The department of **Electronics and Telecommunication Engineering** has various systems running in its daily operation. This Service Host control panel aim at collecting together the services and give a user easy access to those Services being offered by the department. Welcome and Enjoy

ETE Login

Username:

Password:

□ Remember me next time

Available systems

1. PT Management system
2. Project Management system
3. Announcements system
4. Fixed Assets Systems

Comments / Feedback

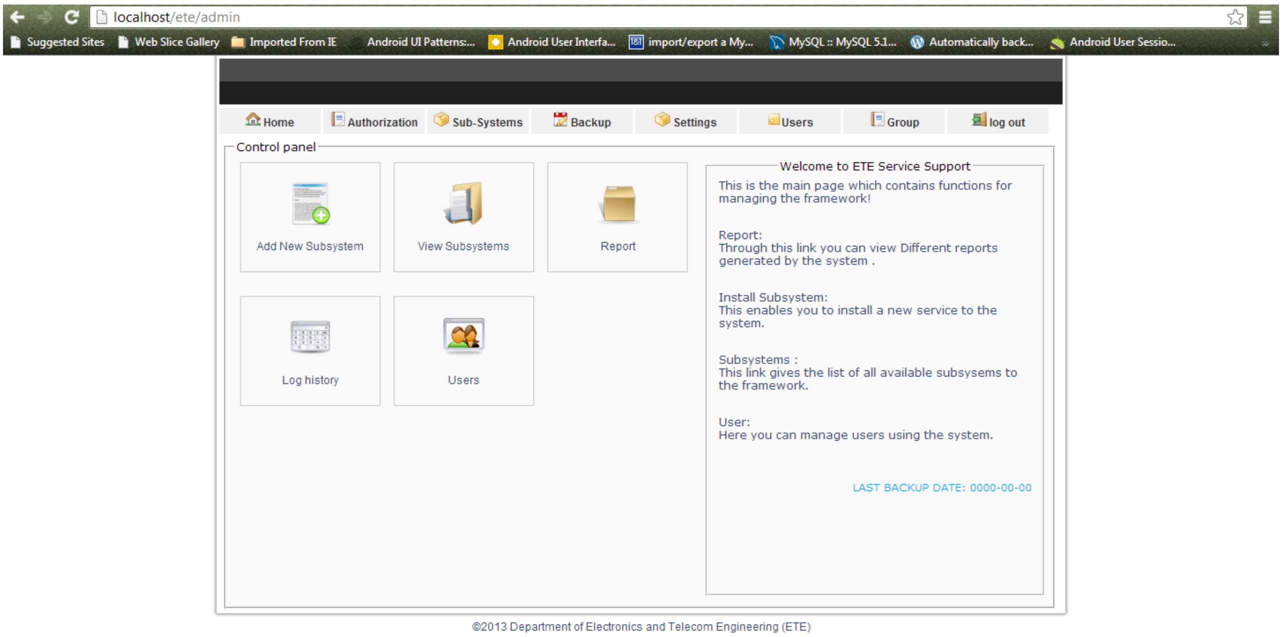
If you have any comments about ETE Service Hosting Control Panel i.e. Improvement, Simplicity, Difficulties and so on, please follow the link below

comment / feedback!

Figure 5.5 Front page for the framework with login form and links for subsystems.

5.3.2 BACK-END OF THE FRAMEWORK

This interface is only accessible for the system administrator; it has links to functionalities that affect the operation of the framework. The figure below shows the back end of the framework.



Welcome to ETE Service Support

This is the main page which contains functions for managing the framework!

Report:
Through this link you can view Different reports generated by the system .

Install Subsystem:
This enables you to install a new service to the system.

Subsystems :
This link gives the list of all available subsystems to the framework.

User:
Here you can manage users using the system.

LAST BACKUP DATE: 0000-00-00

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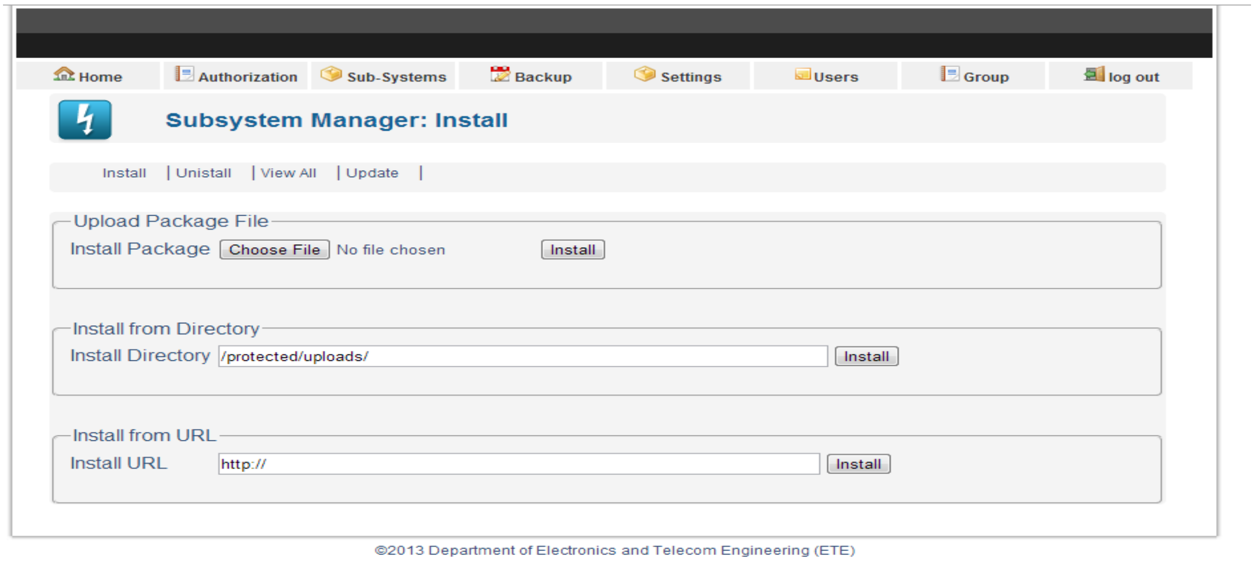
Figure 5.6 Home Page for administrative functionalities.

5.3.3 BACK END OF THE FRAMEWORK: SUB-SYSTEM INSTALLATION, SUB-SYSTEM UN-INSTALLATION

These are interfaces that allow system administrator to install a new subsystem or remove the existing one from the framework.



/protected/uploads/

http://

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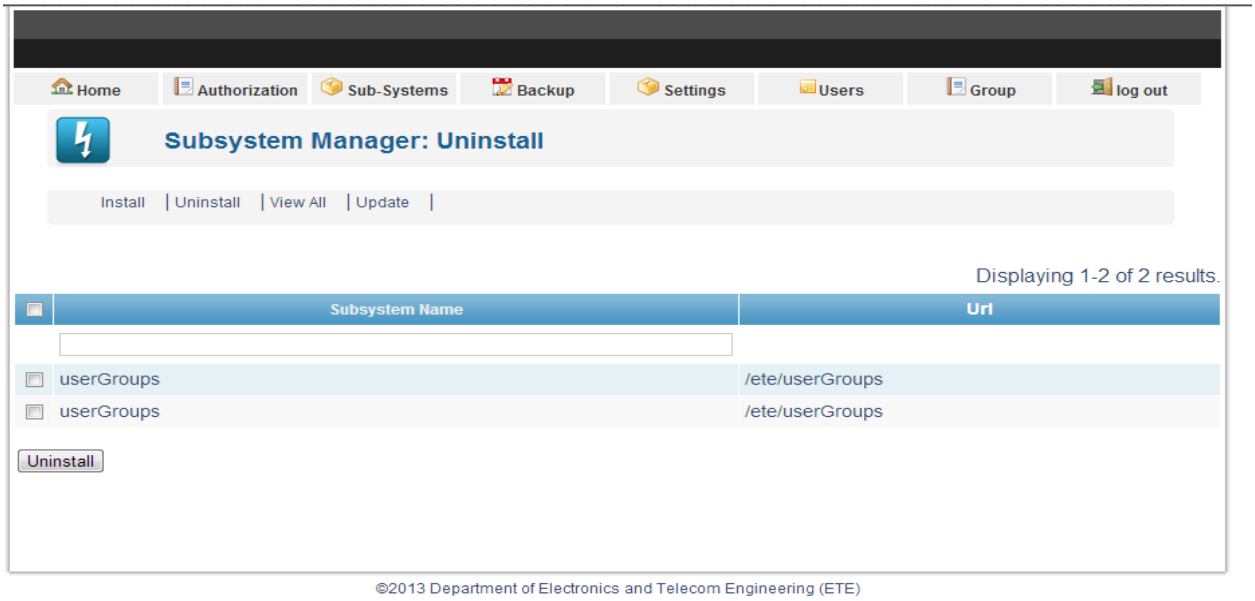
Figure 5.7 Interface for installation of subsystems into the framework.



Displaying 1-2 of 2 results.

□	Subsystem Name	Url
□	userGroups	/ete/userGroups
□	userGroups	/ete/userGroups

Uninstall
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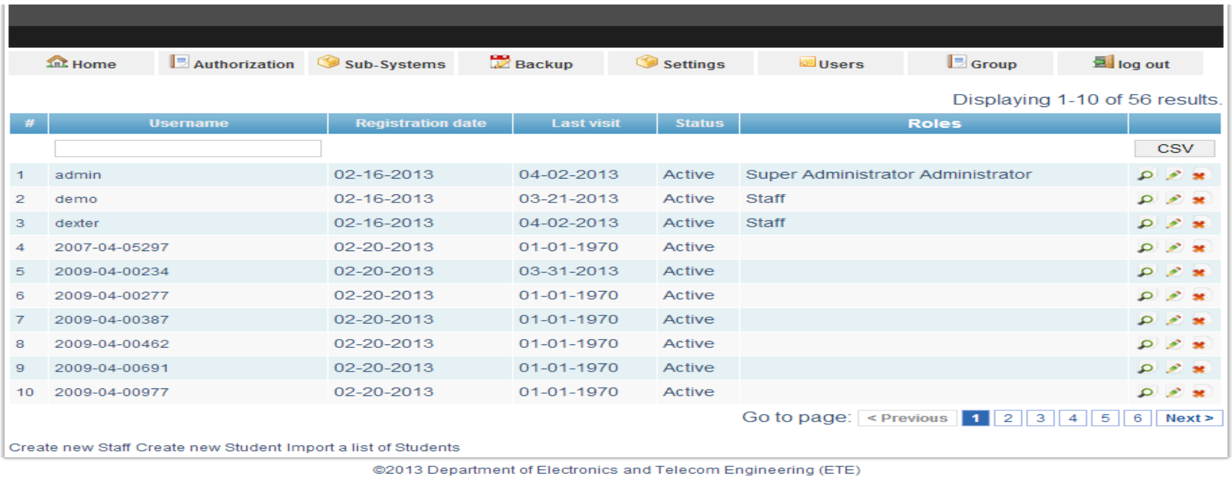
Figure 5.8 Interface for uninstalling a subsystem from the framework.

5.3.4 BACK END OF THE FRAMEWORK: ROLE MANAGEMENT, USER MANAGEMENT

These are interfaces that allow system administrator to manage roles and users that have access to the framework.



Displaying 1-10 of 56 results.

#	Username	Registration date	Last visit	Status	Roles	CSV
1	admin	02-16-2013	04-02-2013	Active	Super Administrator Administrator	
2	demo	02-16-2013	03-21-2013	Active	Staff	
3	dexter	02-16-2013	04-02-2013	Active	Staff	
4	2007-04-05297	02-20-2013	01-01-1970	Active		
5	2009-04-00234	02-20-2013	03-31-2013	Active		
6	2009-04-00277	02-20-2013	01-01-1970	Active		
7	2009-04-00387	02-20-2013	01-01-1970	Active		
8	2009-04-00462	02-20-2013	01-01-1970	Active		
9	2009-04-00691	02-20-2013	01-01-1970	Active		
10	2009-04-00977	02-20-2013	01-01-1970	Active		

Go to page: < Previous 1 2 3 4 5 6 Next >
Create new Staff Create new Student Import a list of Students
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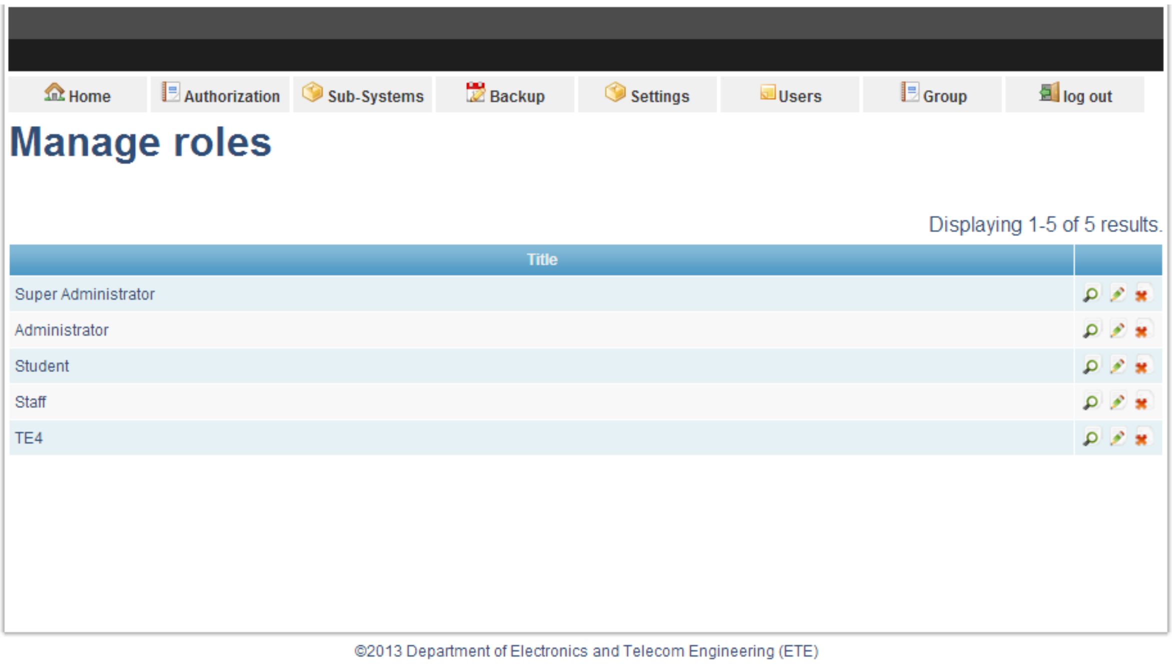
Figure 5.9 Interface for user management for the users accessing the framework.



Manage roles

Displaying 1-5 of 5 results.

Title	
Super Administrator	🔍 ✎ ✖
Administrator	🔍 ✎ ✖
Student	🔍 ✎ ✖
Staff	🔍 ✎ ✖
TE4	🔍 ✎ ✖

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Figure 5.10 Interface for Role management for users accessing the framework.

5.3.5 PT MANAGEMENT SYSTEM: STUDENT INTERFACE

The PT management system provides the following functionalities for the students when he/she has logged in successfully into the system. The following are the links which user will be interact with.

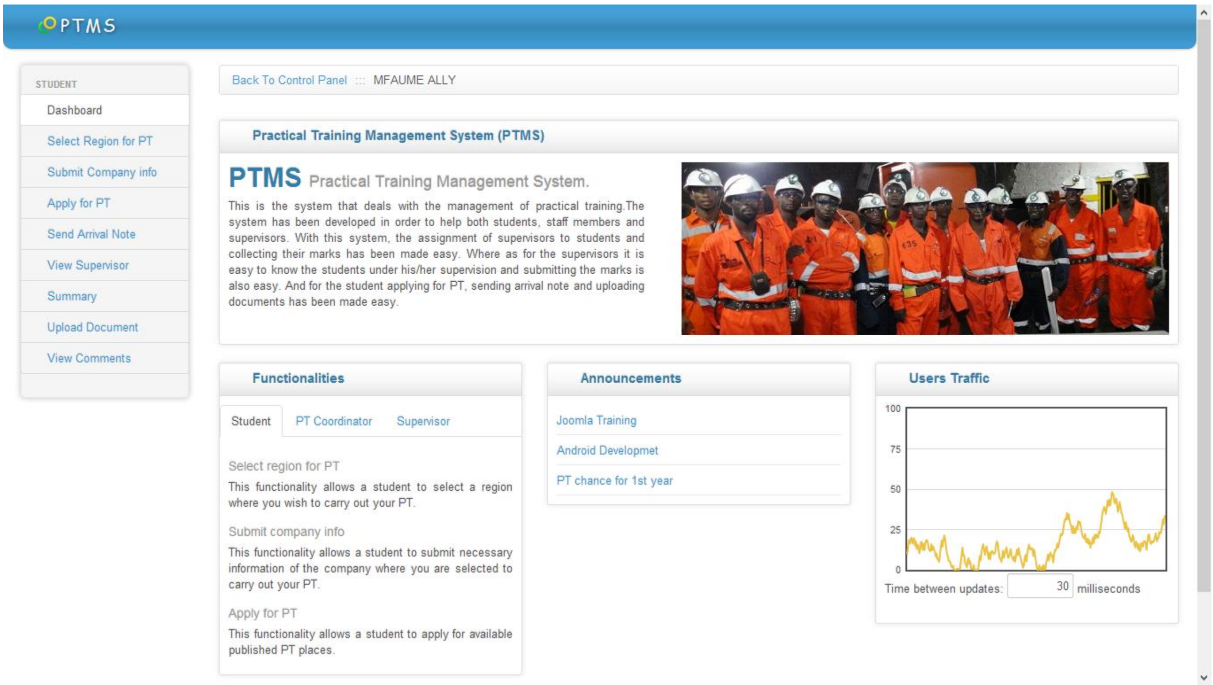
Select Region for PT: This allows the student to select the region he/she would prefer to go for PT.

Submit Company Info: Here a student can submit the required information of a company where he/she has being selected to conduct his practical training.

Apply for PT: This link allows the student to apply for the available published PT places.

Send Arrival Note: During the PT, this link will allow the student to send the arrival note form.

View Supervisor: The link gives the student an opportunity to view and communicate with his/her assigned supervisor.



Practical Training Management System (PTMS)

PTMS Practical Training Management System.

This is the system that deals with the management of practical training.The system has been developed in order to help both students, staff members and supervisors. With this system, the assignment of supervisors to students and collecting their marks has been made easy. Where as for the supervisors it is easy to know the students under his/her supervision and submitting the marks is also easy. And for the student applying for PT, sending arrival note and uploading documents has been made easy.

Functionalities

Select region for PT

This functionality allows a student to select a region where you wish to carry out your PT.

Submit company info

This functionality allows a student to submit necessary information of the company where you are selected to carry out your PT.

Apply for PT

This functionality allows a student to apply for available published PT places.

Announcements

Joomla Training

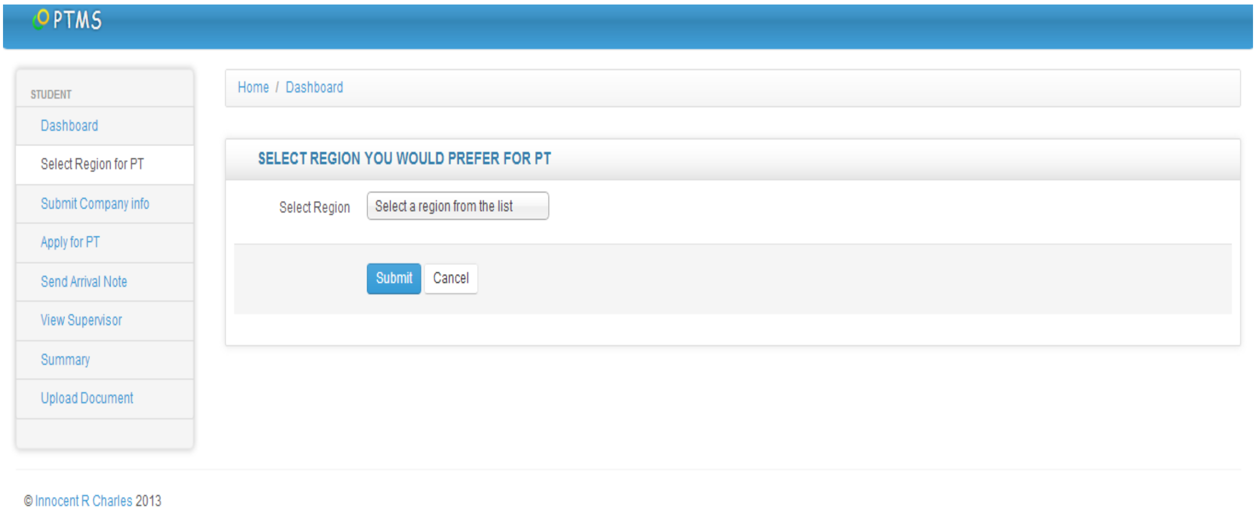
Android Developmet

PT chance for 1st year

Users Traffic

Time between updates: 30 milliseconds

Figure 5.11 Index (Default) Page for PT Management system.



SELECT REGION YOU WOULD PREFER FOR PT

Select Region: Select a region from the list

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Figure 5.12 Student Page for selecting PT region preference.

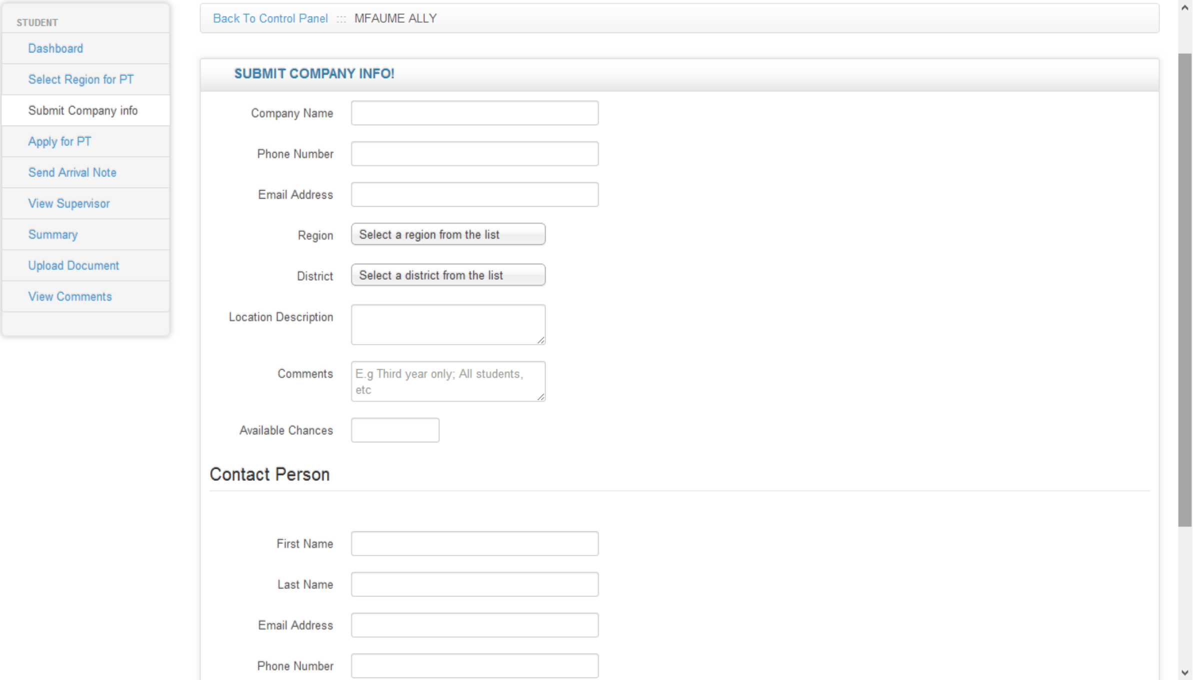
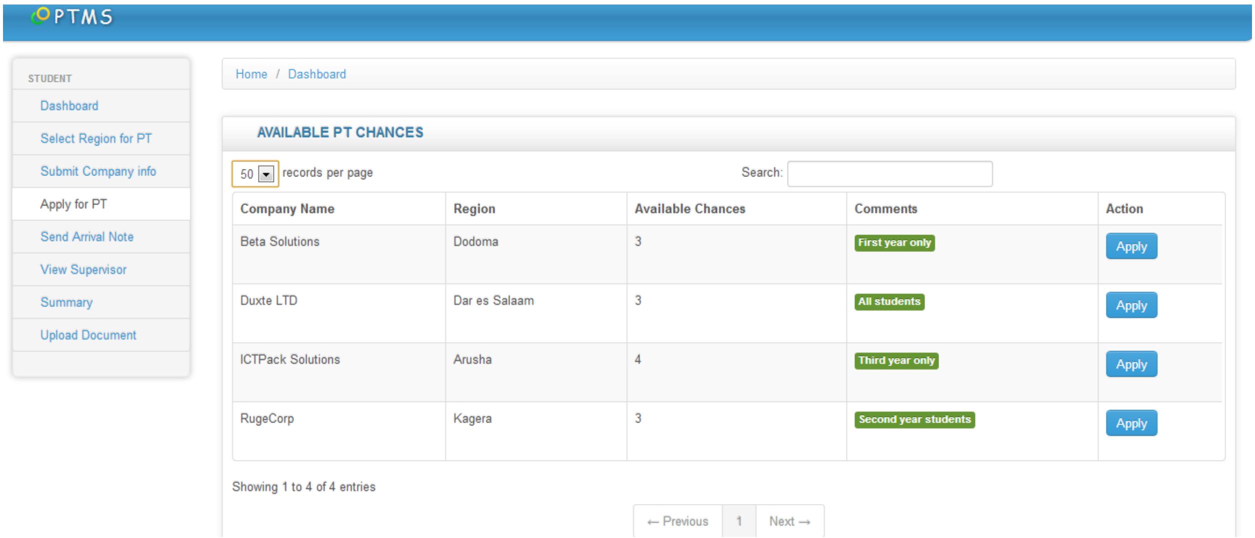


Figure 5.13 Student page for submitting company information.



Company Name	Region	Available Chances	Comments	Action
Beta Solutions	Dodoma	3	First year only	Apply
Duxte LTD	Dar es Salaam	3	All students	Apply
ICTPack Solutions	Arusha	4	Third year only	Apply
RugeCorp	Kagera	3	Second year students	Apply

Showing 1 to 4 of 4 entries

Figure 5.14 Student page for applying for Available PT chances at a certain company.

5.3.6 PT MANAGEMENT SYSTEM: PT-COORDINATOR INTERFACE

The PT management system provides the following functionalities for the pt-coordinator when he/she has logged in successfully into the system. The following are the links which user will be interact with.

Evaluate Regions: Here the link helps the PT Coordinator to view which regions has been selected and by how many students and which regions have not been selected.

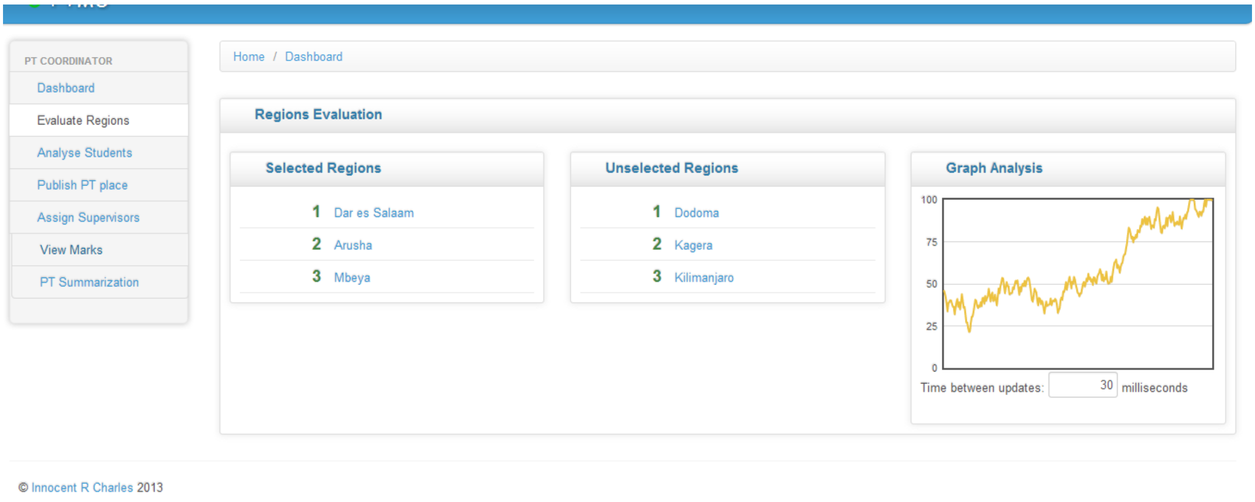
Analyze Students: This link shows how many students get chances for Practical Training and how many did not.

Publish PT Place: The link allow the PT Coordinator to publish available PT places including information such as company name, where it is located and available vacancies.

Assign Supervisors: allows the PT Coordinator during the practical training to assign supervisors to the students.

View Marks: the link will allow the PT Coordinator to view marks assigned to each student.

PT Summarization: here short summary about PT will be achieved including number of companies registered to the system.



Selected Regions

1	Dar es Salaam
2	Arusha
3	Mbeya

Unselected Regions

1	Dodoma
2	Kagera
3	Kilimanjaro

Time between updates: 30 milliseconds

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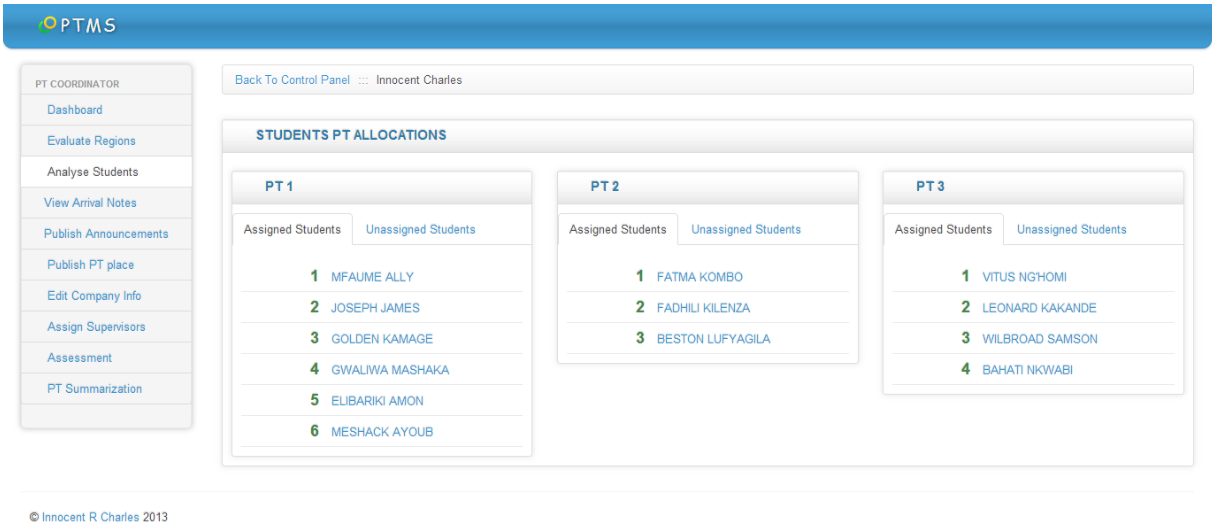
Figure 5.15 PT coordinator page for evaluating regions that have been selected by students



STUDENTS PT ALLOCATIONS

PT 1

1 MFAUME ALLY
2 JOSEPH JAMES
3 GOLDEN KAMAGE
4 GWALIWA MASHAKA
5 ELIBARIKI AMON
6 MESHACK AYOUB

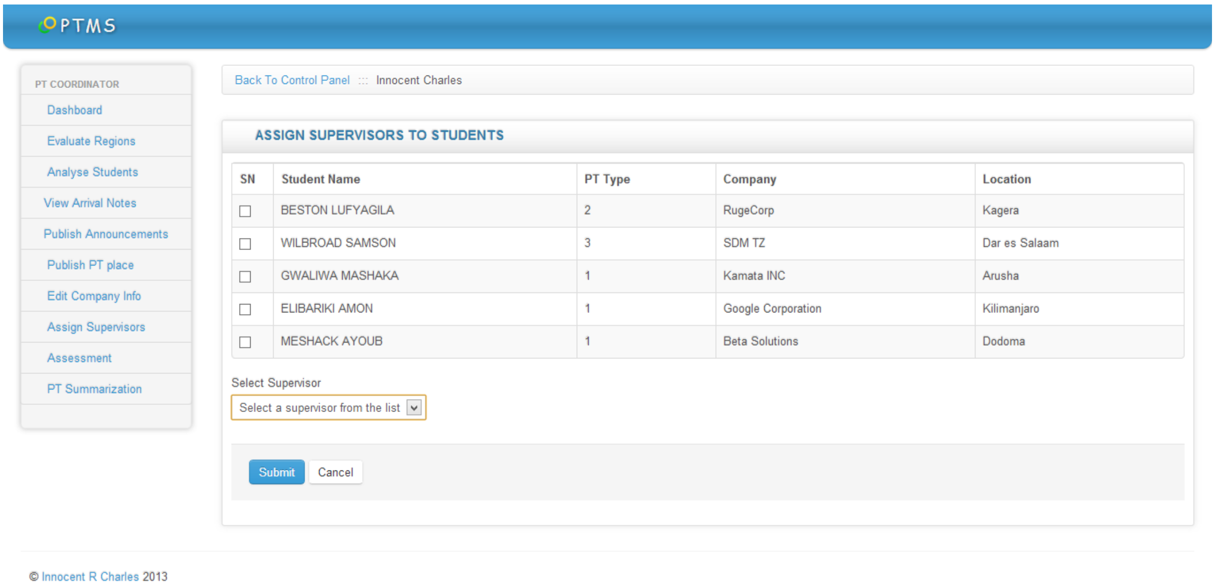
PT 2

1 FATMA KOMBO
2 FADHILI KILENZA
3 BESTON LUFYAGILA

PT 3

1 VITUS NG'HOMI
2 LEONARD KAKANDE
3 WILBROAD SAMSON
4 BAHATI NKWABI

Figure 5.16 PT coordinator page for analysing students that have been allocated PT places and who have not.



ASSIGN SUPERVISORS TO STUDENTS

SN	Student Name	PT Type	Company	Location
□	BESTON LUFYAGILA	2	RugeCorp	Kagera
□	WILBROAD SAMSON	3	SDM TZ	Dar es Salaam
□	GWALIWA MASHAKA	1	Kamata INC	Arusha
□	ELIBARIKI AMON	1	Google Corporation	Kilimanjaro
□	MESHACK AYOUB	1	Beta Solutions	Dodoma

Select Supervisor

Select a supervisor from the list

Figure 5.17 PT coordinator page for assigning supervisors to students

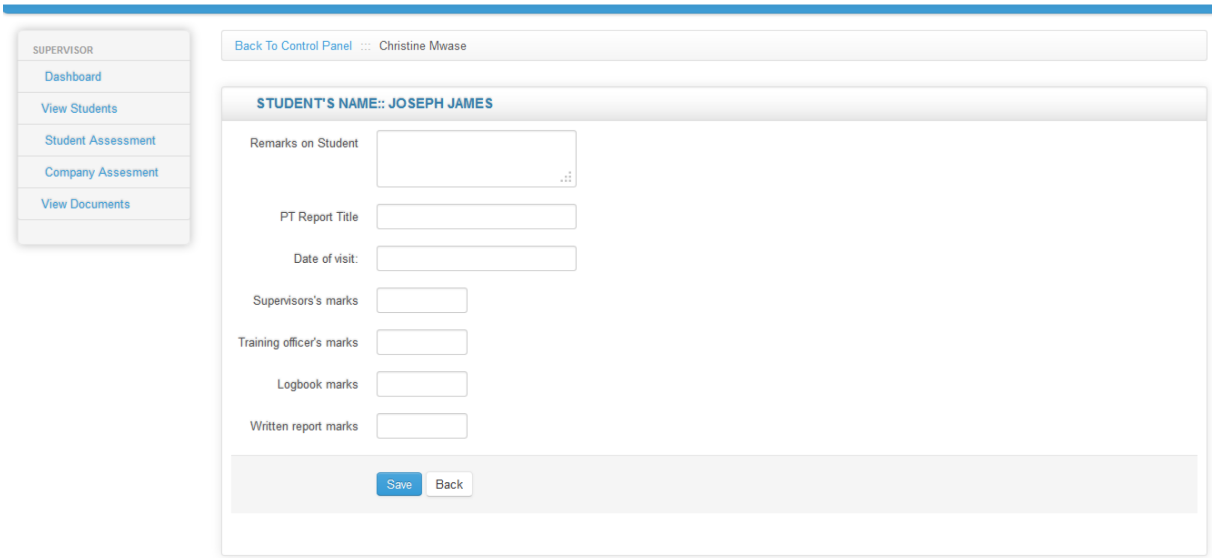


Figure 5.18 PT supervisor page for filling marks obtained during PT period

5.4 SYSTEM SECURITY

The system security is based on Roles that the user is playing in the system, password policy and session expiration. Since the user credentials (i.e. user name and password) are core to the access of the system, all users' passwords have been encrypted.

Before one starts to use the system he/she must provide their credentials to prove that they are who they claim to be. The system then checks the validity of the provided information to the one which are in the database. This process is called Authentication.

When the user name and password are valid then according to the role, the system will give access to what that user is supposed to do under his/her role. This process is called Authorization (MacDonald, 2006).

Currently the system provides three levels of authorization, namely administrator, staff and student. The administrator is in charge of all administrative activities such as maintenance of the framework and installation and uninstallation of subsystems. Staffs and students will be able perform tasks and functions only assigned to them.

Generally Role Based Access Control (RBAC) system has been used in Authorization and Authentication process in the framework as the user will only login once to access all subsystem provided by the framework, and any inactivity of a logged in user for more than fifteen minutes will cause the system to log that user out.

5.5 TESTING

After completing the implementation of various system units, I have done unit and system testing using testing methods such as black box testing.

Each module was tested individually making sure that each module is working properly. Therefore the following modules were tested independently to make sure that they perform the required task correctly:

5.5.1 MODULE TESTING

Login Module: This module was successfully tested where administrator, staffs and Students were able to login into the system and logout when required. When they provide invalid user name or password the proper message was displayed asking for proper user name and password. This test also included trying to access the pages without authentication using their URL, when that was done the system responded accordingly by dropping such request and redirect to the login page.

Manage students options Module: This module was tested by allowing students to navigate through their options in the Practical Management System. This module responds successful.

Editing and Posting Modules: This module was tested by allowing system administrator, students and staffs to edit and post new information into the database. The module work correctly and the information was updated accordingly.

Query and View Modules: This module allows querying and viewing of information from the database. Both administrators, staffs and students were tested in this module by allowing them to query and view their information with authentication being involved while accessing the data and respective reports where generated

5.5.2 SYSTEM TESTING

After testing the of individual modules, all the above modules were integrated and tested as a whole to identify any malfunctioning of the integrated units as well as any errors that could have been generated. All errors were corrected. This justify that the system is effectively delivering what it is supposed to deliver as specified in the requirements. At this point the system is ready to be used as intended i.e. Deploying

CHAPTER SIX
CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

The developed system is reliable and robust; it is cross platform and across browsers. The framework and its subsystems will help in avoiding time wasting, poor data management, and secure the information as well as insuring centralized of information and instant communication on sending information.

It is time now to automate the existing manual system so as to achieve the higher performances during the operation of day to day activities in the department. This will also reduce the load work done by individual personnel, thus increasing efficiency.

6.2 RECOMMENDATION

For our department environment such a framework is much needed and will help in reducing man load as well as increasing performance in daily activities that are being conducted.

Since it is a web based system security issues must be given a priority. Issues like security attacks, breach information confidentiality as well as degrading system performance. Some security policies have been implemented in the system design, such as database security, filtering user’s information and user validation. But also the department should take more care during the hosting as more security features have to be taken into account to make sure we have stable and secure system that helps in increasing the performance of the department’s activities.

REFERENCE

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APPENDIX A

PROJECT SCHEDULE AND BUDGET

PROJECT SCHEDULE

no	activities	Week number														
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	Title refinement	🟦	🟦													
2	Literature review	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
3	Requirement gathering		🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
4	Requirement analysis and specification					🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
5	System design						🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦
6	Progress report submission						🟦									
7	1st Oral presentation							🟦								
8	Compiling final report and submission											🟦	🟦	🟦	🟦	🟦
9	2nd oral presentation	Depend on university time table														

no	activity	Week number															SECOND SEMESTER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1.	Literature review	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
2.	System implementation		■	■	■	■	■	■	■	■	■	■	■				
4.	Preparing and submitting progressive report				■	■	■	■									
5.	First oral presentation							■									
6.	System testing						■	■	■	■	■	■	■	■			
7.	Preparing and submitting final report for TE499													■	■		
8.	Second oral presentation	Depends on UE timetable.															

PROJECT BUDGET

S/No	Description	Quantity	Unity Price(Tsh)	Tot. Price(Tsh)
1	Flash disk	1(2GB)	35,000	35,000
2	Papers	1 rim	8,000	8,000
3	Printing	250 pages	100	25,000
4	Report binding	4 reports	2,000	8,000
5	Internet Surfing	200 hours	500	100,000
6	Photocopying	150 pages	50	7,500
7	Trips to kijitonyama	10 trips	2000	20,000
8	Communications	-	-	40,000
9	miscellaneous	-	-	20,000
			Total	263,500