Nama : LEE FOO YEE

No.Matriks : WEK000098

Pensyarah : PUAN RAJA JAMILAH RAJA YUSUF

Moderator : DR.OW SIEW HOCK

Tajuk Projek Ilmiah :

STUDENT ACADEMIC ALERT SYSTEM

WXES 3182

LIST OF TABLE

page

LIST OF FIGURE

page

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ABSTRACT

The main objective of this project is to develop a web-based academic alert system to identify students in University Malaya (UM) who is having serious academic difficulties due to excessive societies activities or residential college's project before it is too late to remedy these difficulties. This system allows students to propose the program or activities that they want to organize to the administrator of society, residential college and Student Affair Department of University Malaya (HEP – Hal Ehwal Pelajar) to approve their proposal before they can start their project or activities. An alert will asked to resubmit the program proposal form if the system checked that one of the project team member are not qualified to take part in the program due to he or she CGPA is less than 2.0 and involved in different program currently. An academic alert can be initiated either by an administrator of society or residential college The administrator of Student Affair Department of University Malaya.(HEP—Hal Ehwal Pelajar) will use this system to check the completeness of the proposal and decide whether to approve the proposal or not.Besides, this system able to store, track and view student's academic and activity information from into database.The project target group consist of administrator of HEP,administrator of residential college and students from all faculty in UM.Waterfall model with prototyping has been chosen for this project because this model allows all or part of system to be constructed quickly to understand or to clarify issues. This system is developed on Microsoft Visual Interdev 6.0 and using Active Server page (ASP) technologies on Microsoft Windows NT and Internet Information Server platform,utilizing Microsoft SQL Server 2000 database It is believed that this system would be beneficial to everyone inclusive of the administrator of HEP, administrator of society or residential college and students from all faculty in University Malaya in the future.

ACKNOWLEDGEMENTS

First of all, I would like to express my deepest gratitude to my supervisor, Pn Raja Jamilah Raja Yusuf , the supervisor for this project, for her invaluable guidance, insight and encouragement throughout the entire project. It was her willingness to share her experience and innovative ideas in many discussions we had that made this project a reality.

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An express of gratitude forward to my family members, Mr. Lee Teck Chong and Miss Lee Mei Yen for always provide me moral support in this project.

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Prepared by,

Lee Foo Yee

Jun 2002

TABLE OF CONTENTS page

CHAPTER 3 - METHODOLOGY AND SYSTEM ANALYSIS

1. CHAPTER 1 :INTRODUCTION

1.1 OVERVIEW

Student Academic Alert System (SAAS) is a web based application, which contains of a web server and client server .It uses the internet browser to present data and retrieve input. SAAS is an online students' program proposal submission system consists of built in alert system.

Students are able to access and view full information on program proposal guide and prerequisite that must be fulfilled in order to propose new program proposal. Through world wide web, students' program proposal are submitted to the head of club or society or administrator of residential college (JTK—Jawatankuasa Tindakan Kerja)of University Malaya for verification and the approved proposal will automatically sent to Assistant Registrar of HEP for final evaluation and approval and the approved proposal will generate a letter for sending to Deputy Vice Chancellor from Student Affair Department of University Malaya (Hal-Ehwal Pelajar University Malaya--HEPUM) to obtained his/her approval signature.

Approver of this system are categorized into three major group which is approver from all society or clubs whose usually is the head of the society or club, approver from all residential colleges (JTK) in University Malaya and finally the approver of HEPUM ,Assistant Registrar. Proposal approver from society or club and residential college deal with using SAAS to verify program proposal form

and to track students' CGPA less than 2.0 and had excessive club or society activities. They can use this system to view the program proposal form submitted by the project director or leader and check participants' academic status as well as to track whether students that had took part in any other club's or residential college's activity or project.

For security purpose, SAAS required all the users to enter their own user name and password. Usability, performance, reliability and manageability have been considered in order to develop an efficient system and fulfill the needs of the users.

1.2 PROJECT MOTIVATION

Currently, students have to travel a long distance to campus for the purpose of submitting the program proposal. In the traditional setup, the JTK and Assistant Registrar from HEPUM have to collect the program proposal from (KKD—Kertas Kerja Draf) the students, verify and checking the details and feasibility of the proposed program before approving it for the students for every new semester. The approver needs to keep tracking of all students' activities and academic performance before granting them to organize any clubs' or societies' program.

1.3 PROJECT OBJECTIVES

The main objective of this project is to develop and implement an integrated, dynamic and interactive web-based student academic alert system for HEPUM. It consists of a main, attractive homepage for authorized administrator, proposal approver and students to submit their society or residential college KKD. System will functions to keep track and warn proposed program participants that had excessive activities (within or outside a particular society or club) and with CGPA less than 2.0 and disallow the particular students participate in the particular proposed program. This system uses the Internet as its info transmission medium and the user can access the system at anytime and anywhere in a secure and convenient environment.

The objectives of develop Students' Academic and Activity Alert System (SAAS) are as follow:

1. Alert students that with poor CGPA toke part in too many club or society program and reject student 's KKD by sending email alert notification
2. Improve tracking between students' academic achievement as well as their co-curriculum performance and involvement
3. Enable students to submit their program proposal(KKD) online
4. Reduced processing time due to reduction of paper processing
5. Set up a paperless environment that automate and facilitate program proposal approval procedure that initiated by the students that wish to get approval letter from Vice Chancellor of HEP before a proposed project can be started

6. Help expedite processing, especially during peak times such as the end of semester when numerous KKD will be handed up by the students to appropriate department.
7. To allow administrator of society and residential college (JTK) and administrator of HEPUM to evaluate the students' program proposal more easily and keep track with the event occur in their proposal.
8. To design and develop attractive and interactive interfaces in the site to make the site more usable.
9. To assist students from UM to get further information about their program approval status online.
10. To allow transaction in 24 hours a day and 7 days a week.

1.4 DESCRIPTION OF THE SYSTEM

- System allows project leader to fill up the KKD form and submit for further processing
- Firstly, the KKD form will be sent to the first supervisor who is whether the JTK or the designated head of society for first level of approval.
- The first supervisor will be using SAAS to verify and track proposed project participants that are not doing well in their CGPA result which less than 2.0 between 2.0 to 3.0 or CGPA >3.0 and taking part in too many societies' or residential college's activities.

- The first supervisor will automatically send email to the participant whose CGPA result is less than 2.0 and CGPA between 2.0 to 3.0 involve excessive projects after disapprove the KKD. The project leader will be alert also while the KKD is being disapproved.
- If the KKD is being granted by the first supervisor, the KKD will be automatically sent to second supervisor whose administrator of HEPUM for final evaluation and approval.
- Second supervisor(TNC-HEPUM) will retrieve KKD form from SAAS and perform verification, proposal completeness and budget checking on the KKD.
- Supervisor will use SAAS to track and identify students or participants whether they had toke part in other society's or residential college's project. Once the students is being identified using SAAS involving more than three or four different society or residential college's activities at the same time,he or she will be prohibited from participate in others society or college project
- The project leader will be alert via email, inform his or her proposal is being rejected by the HEPUM and the participants that who had poor CGPA result and excessive activities will be prohibited to take part in the proposed project and notified through email alert.

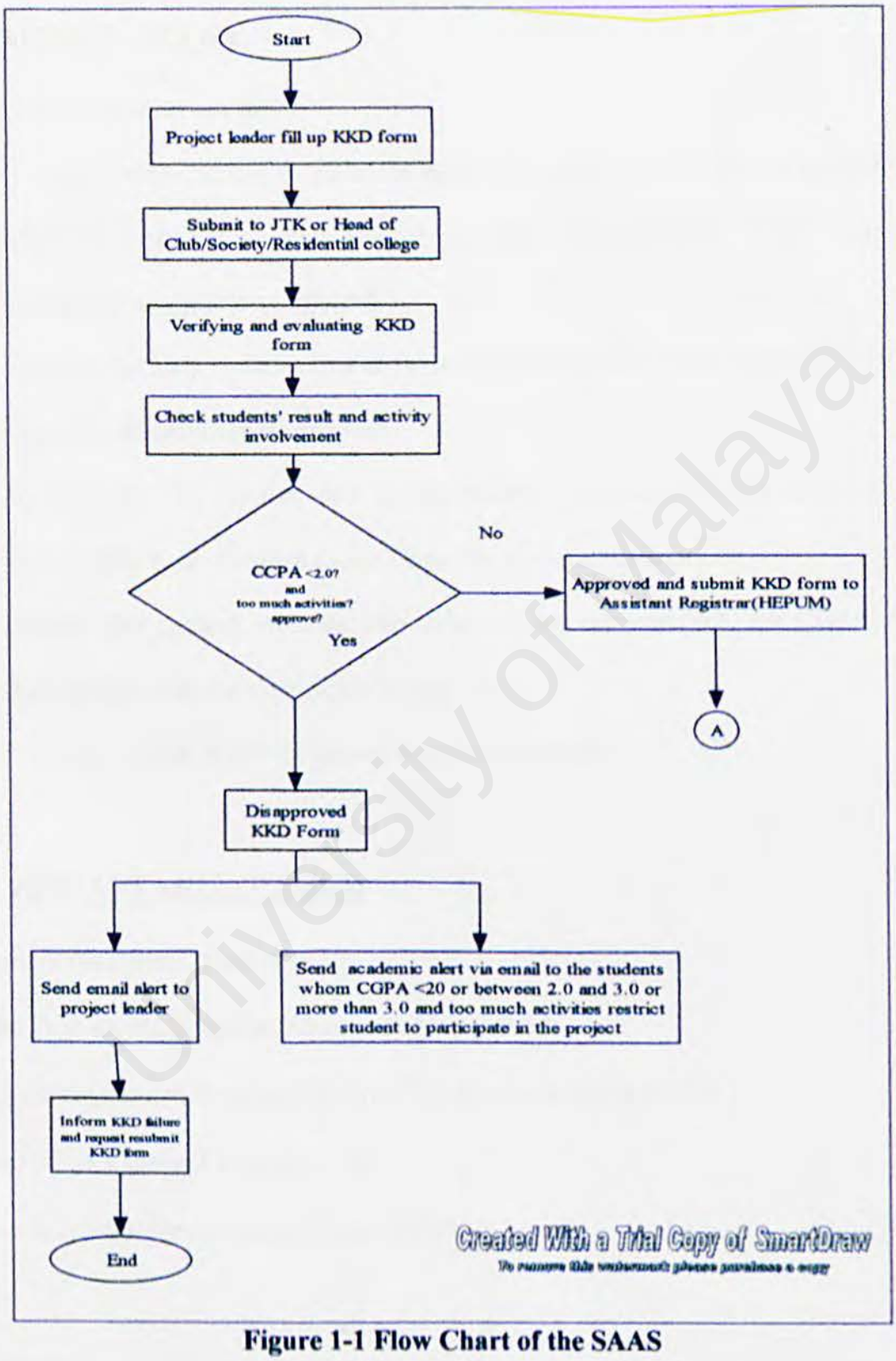


Figure 1-1 Flow Chart of the SAAS

Figure 1-1 Flow Chart of the SAAS

1.5 PROJECT SCOPE

What the system can do?

- It allows administrator of HEPUM and all societies and residential colleges in University Malaya to alert student via email automatically if the student's proposed program being rejected.
- Identify and alert students that could not manage well in their academic and also their co-curriculum performance.
- System able to retrieve and track student's academic profile and activity information from different faculty from the students 'databases
- System able to track students who is having too many project and CGPA <2.0 and disallow them to participate in new KKD
- Generate annual report for annual approved program

1.6 SYSTEM TARGET USER

The users of the system consists of :

- HEP (Hal-Ehwal Pelajar)of University Malaya(UM)
- JTK(Jawatankuasa Tindakan Kerja) of Residential College of UM
- Head of all Club and Society of UM
- Club,Society or Residential College of UM

The project is to design 2 sections that are:

- **Approver section** –This section categorized into two module which is module for head of club or society or JTK residential college and module for administrator of HEPUM. This section allows to view students' program proposal and track project participant whether they involved in other society or residential college project. This section also let administrator of club or society and JTK of residential college to approve or disapprove their KKD form before submit to the administrator of HEPUM for final approval.

- **Member section** – Allow student to fill in their KKD form submit to the society or residential college administrator for approval.

1.7 PROJECT DEVELOPMENT STRATEGY

System Development Methodology is an idea of developing an initial implementation; exposing this to user command and refining this through many versions until an adequate system has been develop. In developing this project, a sequence of steps in followed to accomplish the success of the project. These steps can be divided into five sequential phases, although in reality the phase is interrelated and often are accomplished simultaneous.

The five phases are:

- Requirements Analysis

- System Design
- Program design
- Coding
- Unit and Integration Testing
- System Testing
- Operation and Maintenance

These processes are important because they impose consistency and structure on the whole project development. There are many process models available in the software engineering. Model that has been chosen for this project is the waterfall model with prototyping, where the stages depicted as cascading from one to another. One development stage has to be complete before next begins.

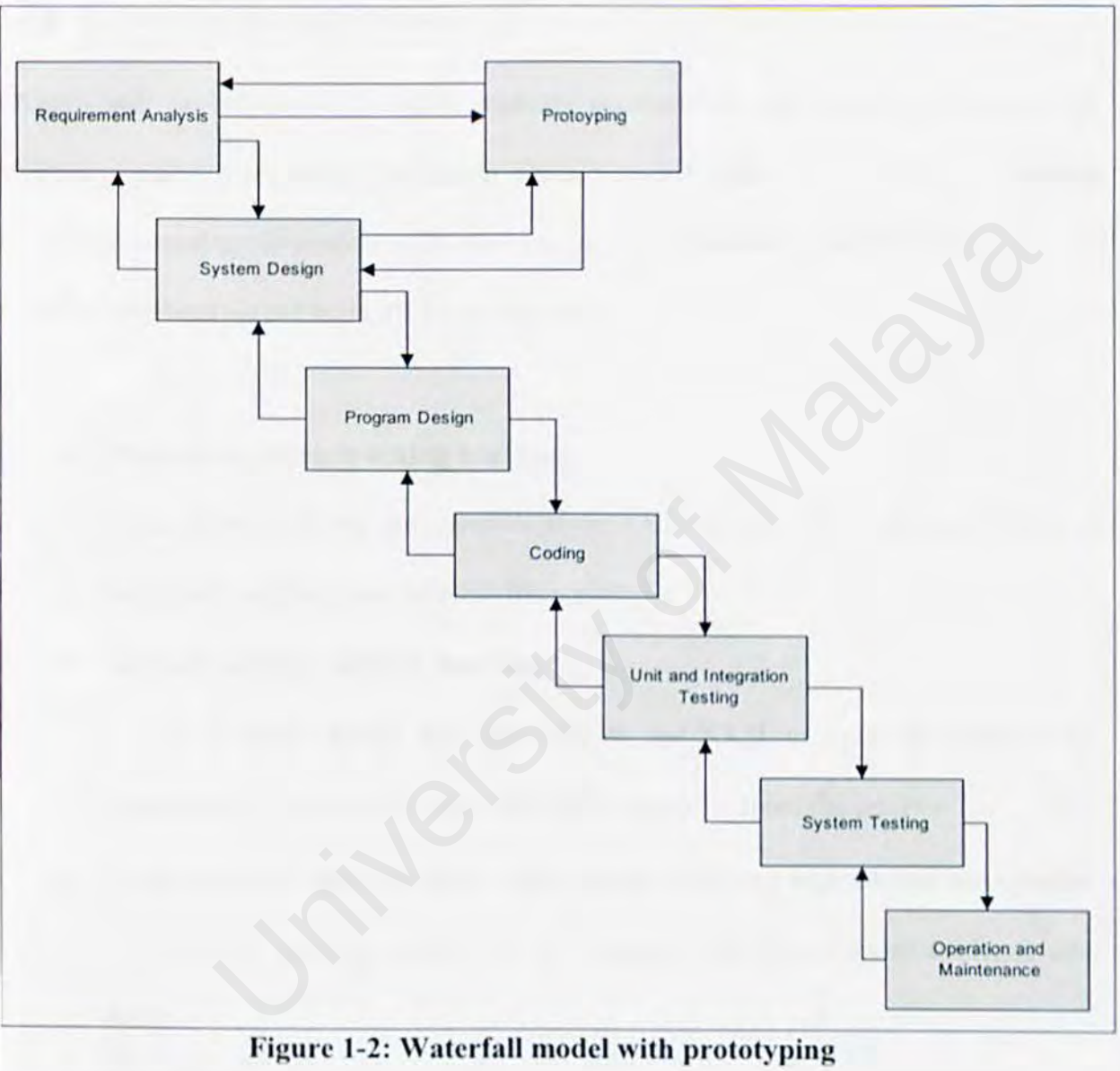


Figure 1-2: Waterfall model with prototyping

1.8 EXPECTED OUTCOME

SAAS will be helping to maintain students academic as well as their co-curriculum achievement.This project is also come out with a web based system that can manage KKD submitted by the student with more accuracy, systematically and efficiency

This system is expected to do the following tasks:

- **Student academic tracking function**

  - This function allows the approver of the KKD to view all participants' CGPA of the activity before granting them the activity

- **Student activity tracking function**

  - This function allows the approver of the KKD to view all participants' participation frequency of activities before granting them the activity

- **Send academic alert via email when participants are in academic alert status**

  - SAAS will generate email alert to those students whose under academic alert status

- **Expedite form processing procedure of HEPUM**

  -With this system, file processing work will be reduced greatly and expedite KKD approval process

- **Secure system for HEPUM**

-SAAS provides log-in service and log-off service to improve the security of the system by restricting access to database. Only authorized and authenticated users can enter the system to view or to edit the information in the database. Besides, that SAAS also allows users to change their password from time to time.

1.9 PROJECT SCHEDULE

The Gantt chart is showing a clear timeline between the starting date and the finishing date of the project. There are eight major phase in this project:

- Resource searching & reading
- Literature Reviews
- System Analysis
- Proposal writing & finalization
- System Design
- Module Implementation
- System Integration and Testing
- Report Writing

ID	Task Name	Start	Finish	Duration
1	Resource searching and reading	6/3/2002	6/21/2002	15d
2	Literature Review	6/24/2002	8/9/2002	35d
3	System Analysis	8/12/2002	8/30/2002	15d
4	Proposal Writing and Finalization	9/2/2002	9/13/2002	10d
5	System Design	9/16/2002	12/20/2002	70d
6	Module Implementation	12/23/2002	1/24/2003	25d
7	System Integration and Testing	1/27/2003	3/19/2003	38d
8	Report Writing	3/20/2003	4/2/2003	10d

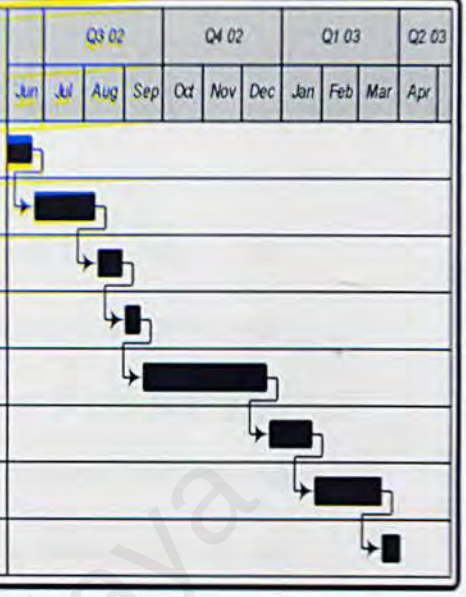


Figure 1-3 SAAS Project Schedule

2. CHAPTER 2-LITERATURE REVIEW

2.1. INTRODUCTION

A literature review is to sufficiently equip the developer with some knowledge of the strengths and limitations of several development tools. It helps the developer to know some of the existing features offered by a similar system and to get the better understanding on the development tools and techniques that can be used in the development process. This is a real challenge before a final decision can be reached to start developing the system. So that, the developer will know which are right tools should be choose to develop the system.

In the process of developing **SAAS,** this part of the research has been done to understand various new concepts, which especially focus on the information and information system. A research also has been carried out to compare the current existing system with the **SAAS**, which will be developed. New features are added in **SAAS**.

Review of literature is a background study about the knowledge and information gained to develop this project. It enables the developer to get more knowledge on the development methodologies used in the project and have an overview of how to improve the weakness of the current system and fulfill the requirement needed.

2.1.1. REVIEW OF EXISITNG SYSTEM

a) Case studies 1 :

University Malaya Integrated Student Information System (UMISIS)

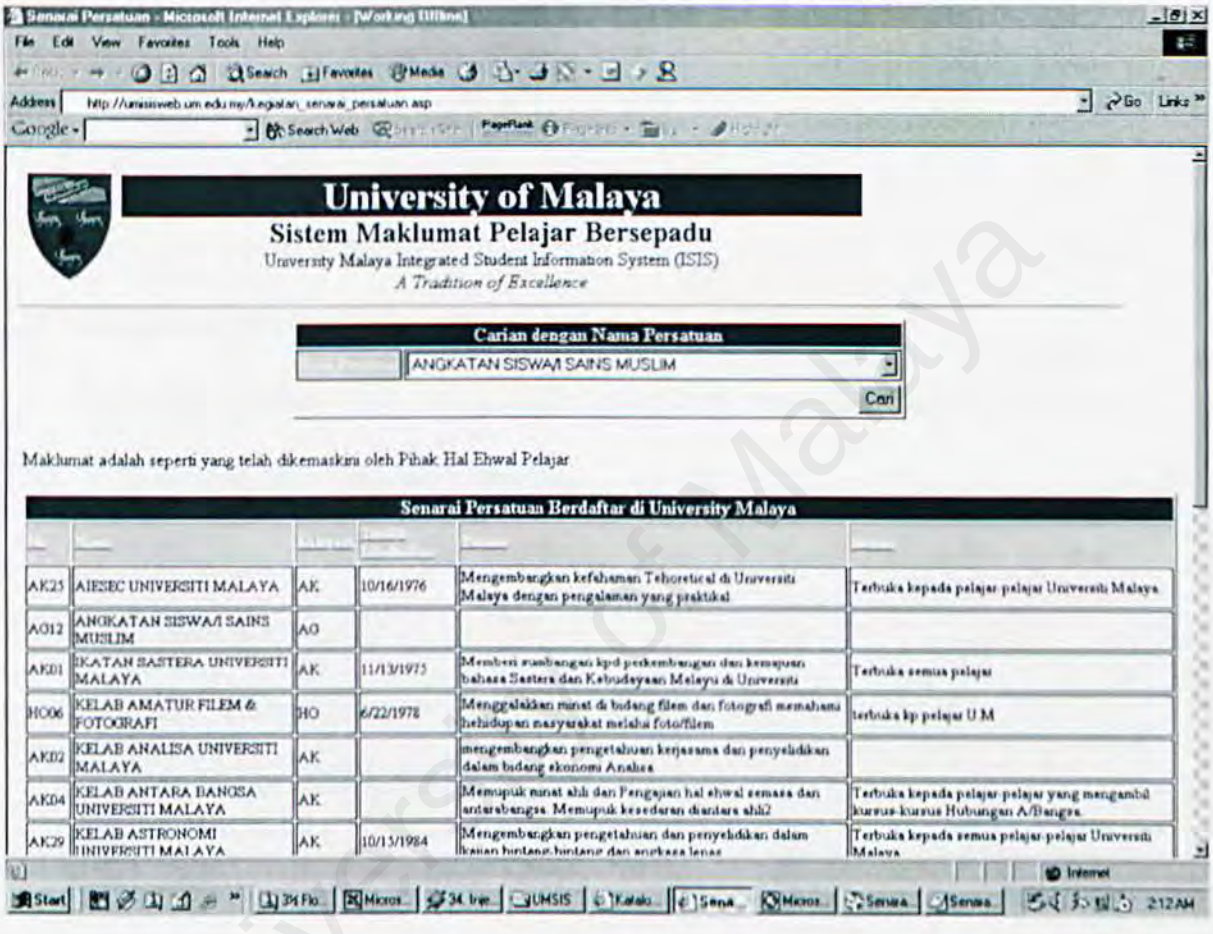


Figure 2-1 UMISIS

This is a web based system used by the students of University Malaya to register new course, view activities information held by the students, check student's account, check out timetable for the particular semester and check out new intake for the new students.

URL:http://umisisweb.um.edu.my/kegiatan_senarai_persatuan.asp

The Strengths of the system:

- ✓ Provided useful information to students about previous program held by all clubs and societies and in University Malaya
- ✓ List all clubs and society can be found in University Malaya
- ✓ Allow user to send email to the particular
- ✓ Link to other sites

The weaknesses of the system:

- × The system does not provide additional functions for students to submit their program proposal
- × No integration of other functionality such proposal submission system provided
- × The information provided not up to date
- × No email alert system provided

b) Case studies 2:

Student Affair Department of University Putra Malaysia

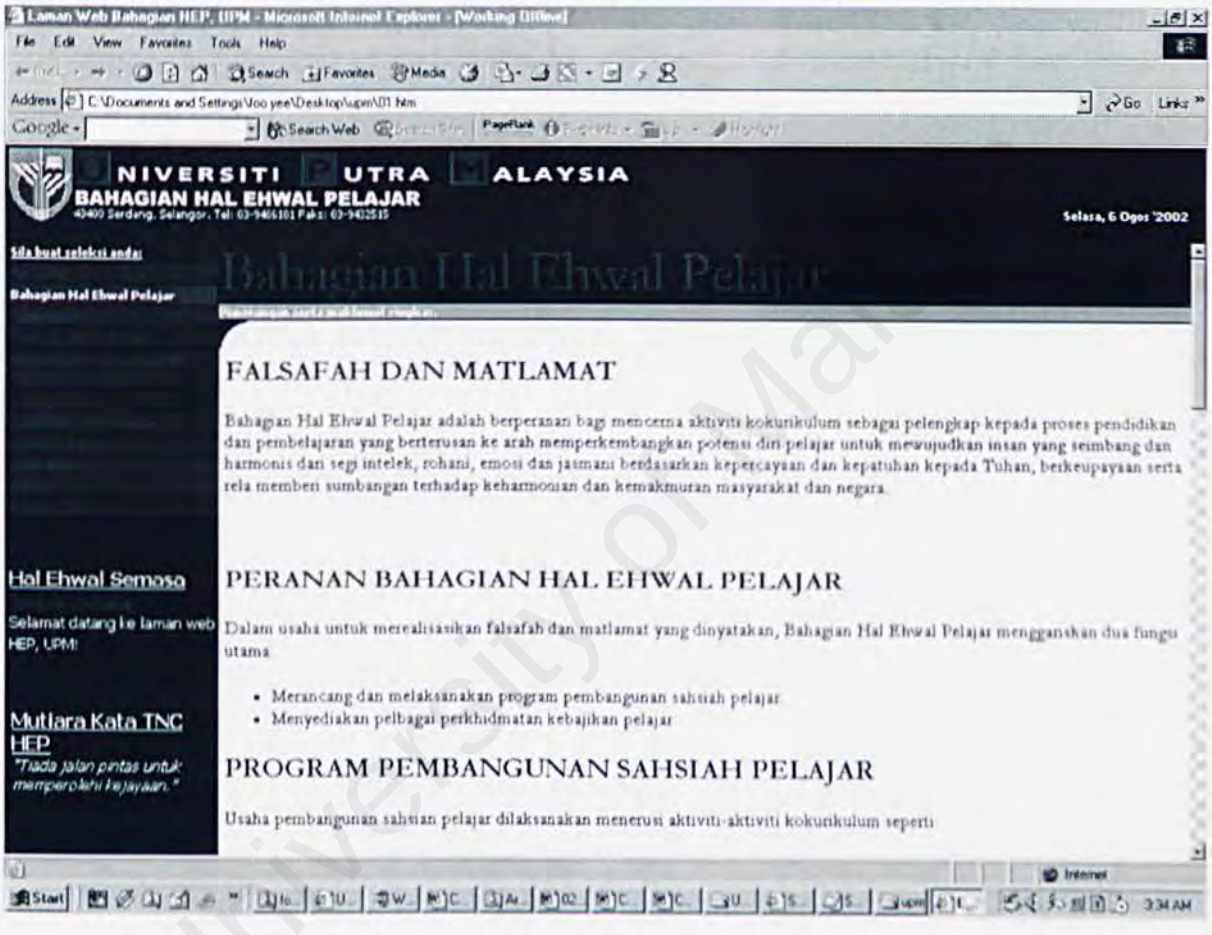


Figure 2-2 HEP of UPM

This site is the web site for the Department of Student's Affair n University Putra Malaysia.This system allows students to find out the information and history about the Student Affair Department of University Putra Malaya.

URL: http://www.upm.edu.my/bm/hep/bahagian_hep.html

The Strengths of the system :

- ✓ Useful Information about the Student Affair Department
- ✓ Elegant user interface
- ✓ Can links to others site

The Weaknesses of the system:

- × No user controlling and the system is fully open to all internet users
- × The system does not provide additional function to allow student submit their program proposal to the Student Affair Department for approval
- × Cannot consider a system, it's much more like a web page

Case Studies 3 : Luther College -- Continuous Reporting System (CRS)

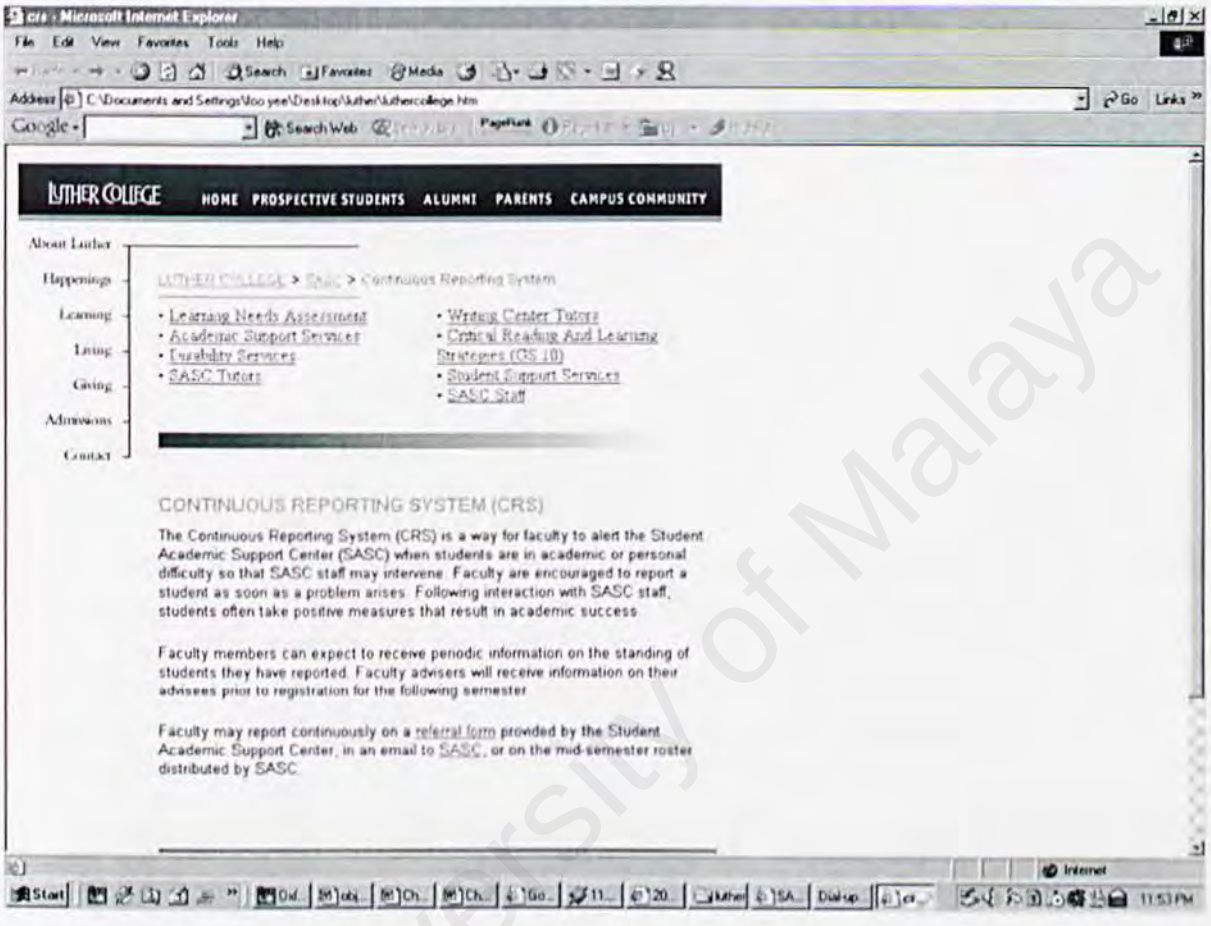


Figure 2-3 Luther College --CRS

URL : http://www.luther.edu/~sasc/crs.html

The Continuous Reporting System (CRS) is a way for faculty to alert the Student Academic Support Center (SASC) when students are in academic or personal difficulty so that SASC staff may intervene. Faculties are encouraged to report a student as soon as a problem arises. Following interaction with SASC staff, students often take positive measures that result in academic success.

The Strengths of the system:

- ✓ Faculty may report continuously on a referral form provided by the system
- ✓ Provide useful information to the user
- ✓ Elegant user interface design

The Weaknesses of the system:

- × Users are allow to access the system without any authentication or verification
- × Cannot consider as a system it is much more like a web page
- × No additional function provided to allow user to detect their academic or activities profile

Case studies 4 : Eastern Kentucky University - Early Alert System

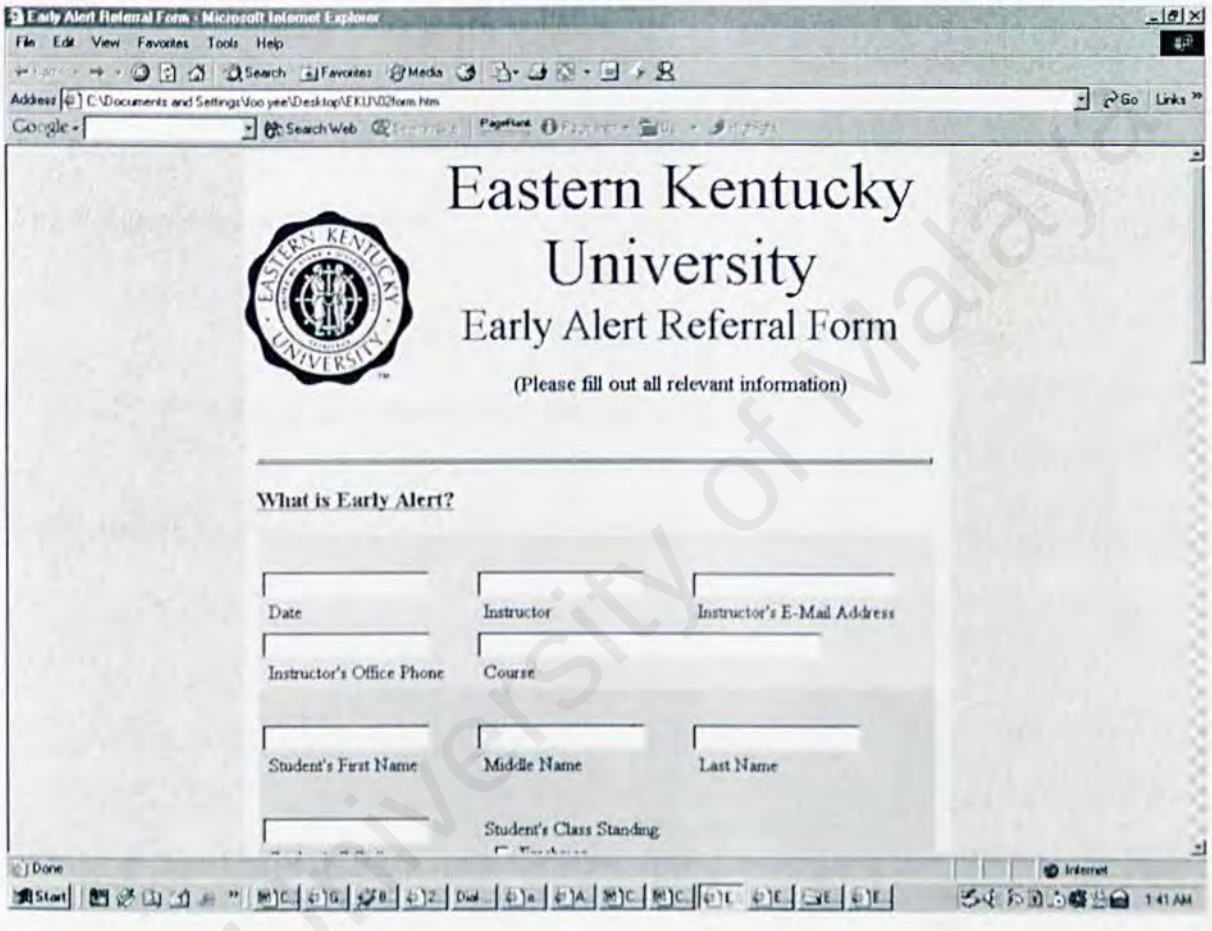


Figure 2-4 Eastern Kentucky University –Early Alert System

The purpose of the "early alert system" is to identify and effectively intervene with students who are exhibiting "at risk" behaviors.

URL : http://www.advising.eku.edu/earlyalert/

The Strength of the system

- ✓ Elegant user interface design
- ✓ Only authorized user are allowed to access the system

The Weaknesses of the system

- × No help or guidance provided by the page to use the system
- × Information provided by the system is not clear

Case studies 5 : Multimedia University – Online Application System

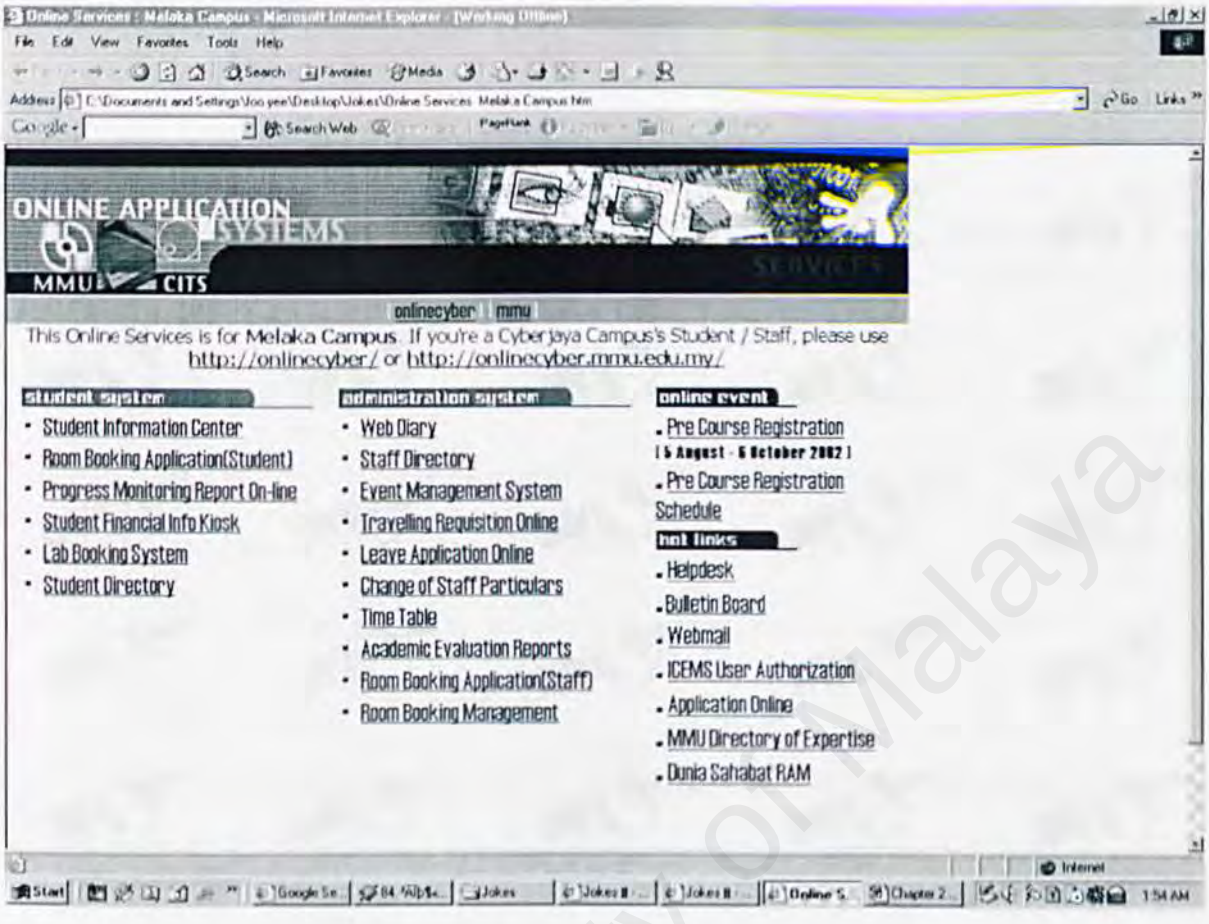


Figure 2-5 Multimedia University–Online Application System

URL :http://online.mmu.edu.my/index.html

The Strength of the system

- ✓ Attractive user interface Design
- ✓ Contains many hyperlinks that connect to the other systems

The weaknesses of the system

- × No system that allows student to propose their program proposal online
- × Take long time to load the hyperlinks after being clicked

2.1.2. PROJECT BACKGROUND STUDIES

Current Procedure used by Student in University Malaya to obtain Project or Activity Approval Letter from Student Affair Section of University Malaya (HEPUM) [2]

The students' program or activity approval letter is a document that approved and authorized by the Deputy Vice Chancellor(Timbalan Naib Canselor--TNC) of Student Affair Section University Malaya (Hal Ehwal Pelajar University Malaya--HEPUM) for students from different societies or clubs and residential colleges whose wants to organize project for their club or college.

Proposal evaluation is essential in KKD, it is used to ensure the feasibility and fund needed by the students are not over budget and ensure HEP has adequate to support the student's project. KKD evaluation and approval procedure will be going several steps.

Firstly , the students will form a project team a director will be chosen by the team member to lead the team. Project leader will be in charged of making a project proposal or known as KKD(Kertas Kerja Dasar) draft.

If for residential college the KKD will be sent to JTK (Jawatankuasa Tindakan Kolej) of college which is a committee, comprising student representatives of the college to assist the administration for approval. While for the club or society project, KKD will be sent to head of club or society to approve. Once the KKD is approved, KKD will be evaluated by the head of residential college or head of club or society and the proposal will be submitted to evaluate by the assistant registrar of HEP. The director of the project

will be called for interview if the KKD submitted is not clear, KKD will return back if it's not completed or error occurs in the KKD.

After evaluated by the assistant registrar of HEP the KKD will be sent to Deputy Vice Chancellor (TNC) of final approval. If the KKD is approved by TNC of HEP approval letter will be sent to the project director to start their project.

Below is the flow chart of the current KKD evaluation procedure in University Malaya:

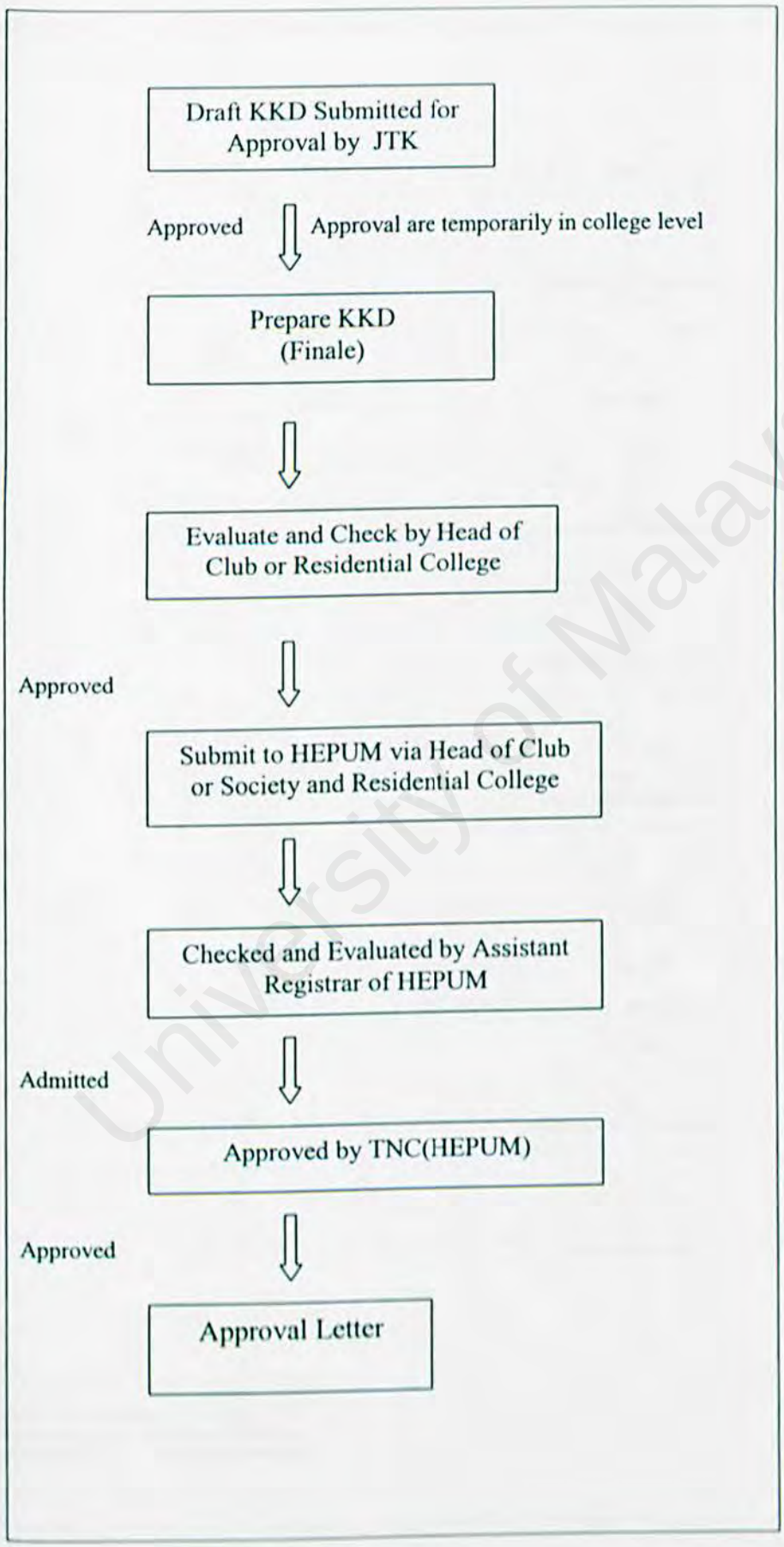


Figure 2-6 Basic Flow of Traditional Form Submission Procedure in UM

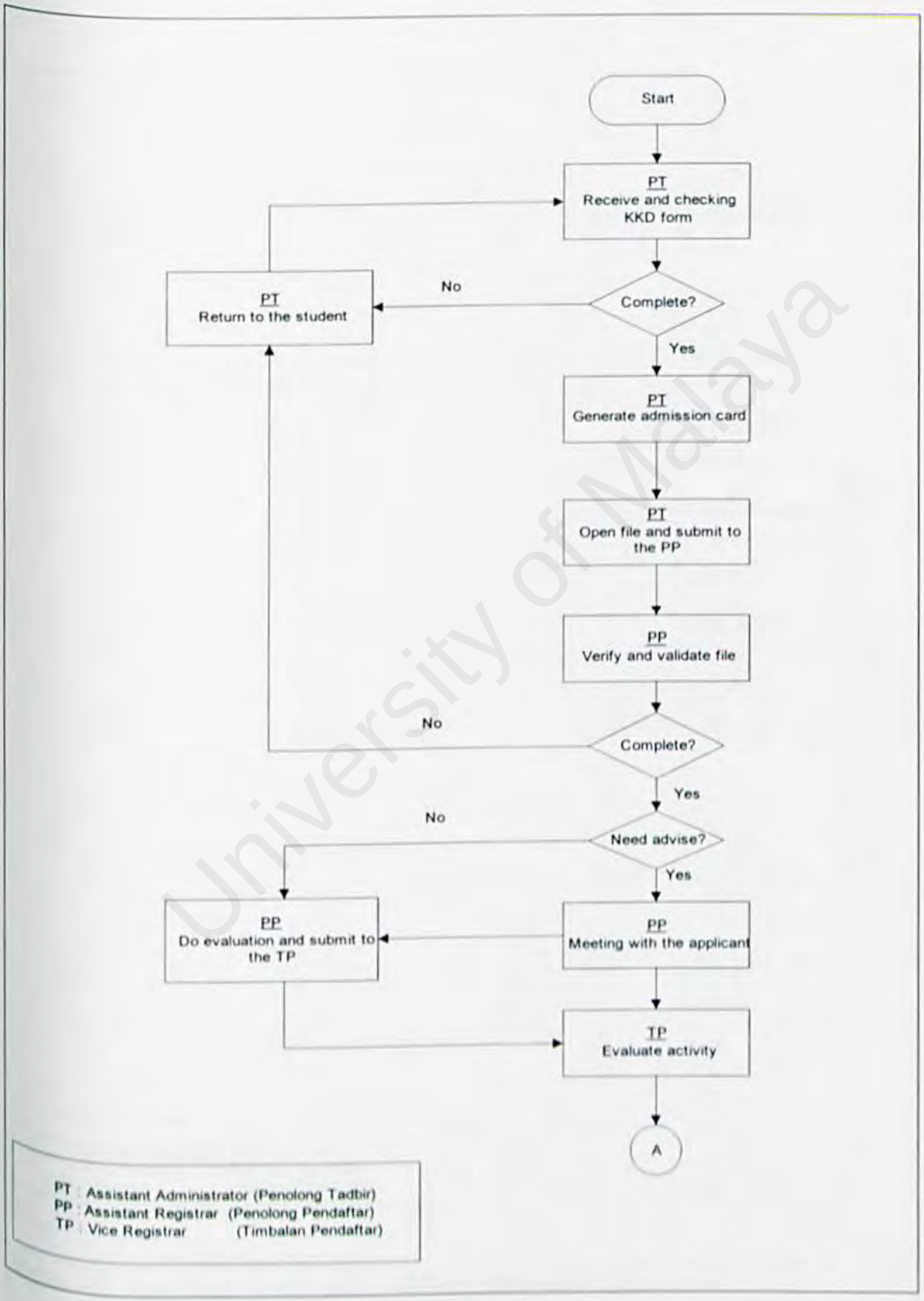


Figure 2-7 Flow chart of current KKD form submission processes

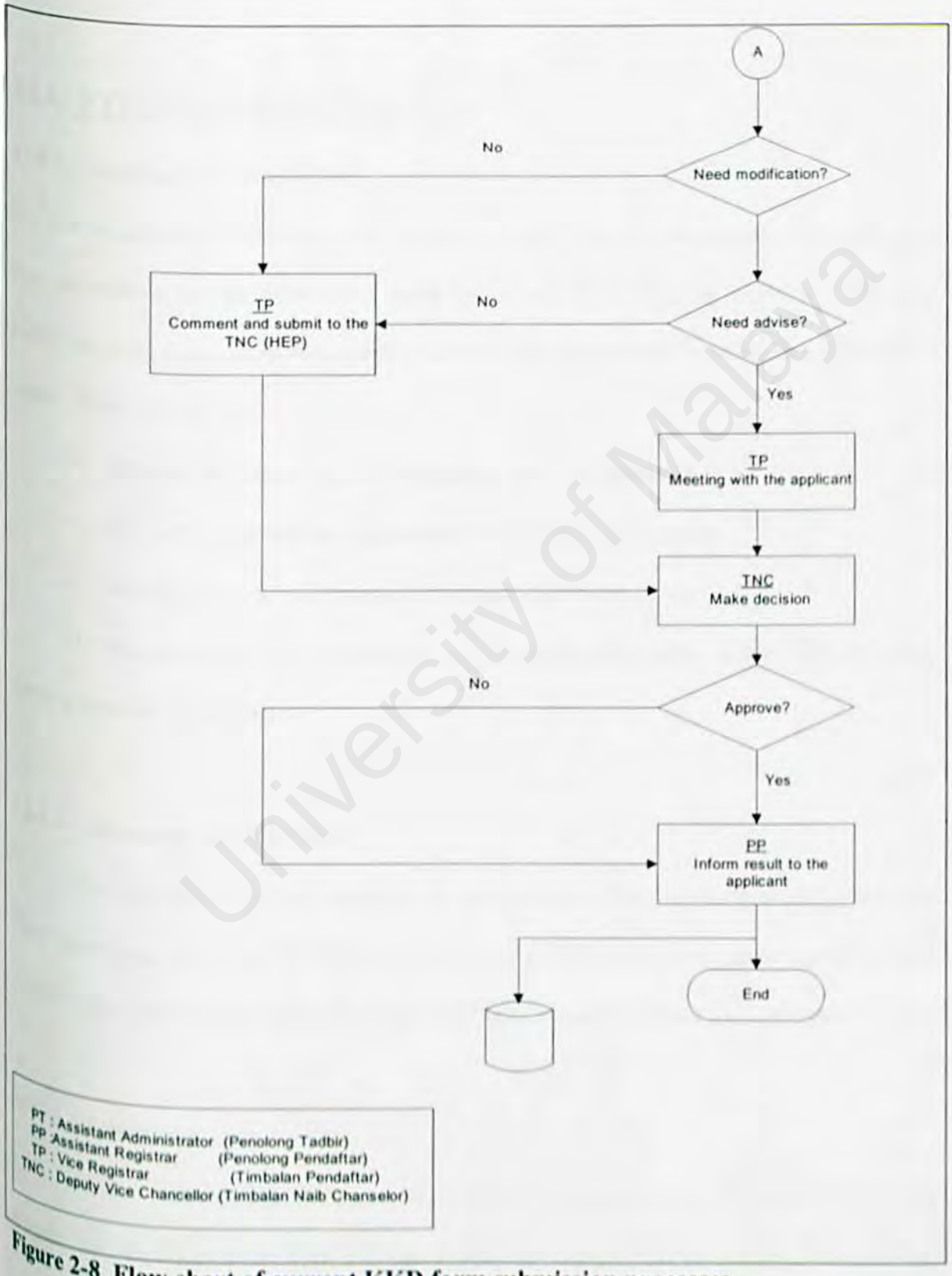


Figure 2-8 Flow chart of current KKD form submission processes

2.1.3. TYPE OF ITEM REVIEWED

2.1.3.1. Existing Documentation

The first fact-finding technique is by studying the existing documentation. This will give more information and understandable about the system that will going to design. First, is to collect and review document that is describe the problem and function of student information system. These include:

- Information systems projects requests – past and present
- Samples of manual and computerized databases and reports
- The varsity or school mission statement and strategic plan.

All this documentation can find in the Documentation Room at FSKTM, reference books or journals in the library.

2.1.3.2. Research and Site Visits

The second fact-finding technique is exploring the Internet via personal computer. There have many university, education institution or individuals sharing their experience and valuable information in the web site. There have immeasurable amounts of information. [1]

2.1.3.3. Interviews

Another fact-finding technique is interview related person. This is a technique whereby collect information from individuals through face-to-face interaction. Interviewing

can be used to achieve any of all of the following goals: find facts, verify facts, clarify facts, get the end user involves and opinions. [1]

2.1.4. TECHNOLOGY CONSIDERATION

As stated from the very beginning, this literature review also included the consideration of technology that are currently available. The purpose is to choose a suitable development environment and development tools to lead this project into success. The fields I had covered for technology consideration can be divide into the following:

1) Web Servers
2) Server Platforms / Operating Systems
3) Client/Server Architecture
4) Databases
5) Programming Environment and Languages
6) Development Tools
7) Others

2.1.4.1. Web Server

a) Internet Information Server (IIS)

Microsoft Internet Information Server (IIS) has the reputation for being one of the best web servers on the market. Although it is only available for Windows 2000/ Windows NT, IIS has transformed their platform into a viable solution for deliver web-based

applications. IIS is considered by experts to be just as powerful and much easier to set up and maintain than many of its UNIX-based competitors.

The three major goals of Internet Information Server are that it is focused on the server side of the Internet world, to have the capability of supporting in intranet as well as the Internet and to form the basis that will enable future product development. Internet Information Server provides three basic services to users, which are World Wide Web server, File Transfer Protocol server and Gopher server. Some of its features are:

- Free download

  It is available for free download.

- Superior administration control

  Site administration for IIS is performed using the Microsoft Management Console (MMC). Via this interface the users can manage access and security restrictions at the site, directory and file level. If the users are using virtual sites, then they can specify the estimated daily traffic for each site (which controls how much memory IIS allocates for each web site) and limit the amount of server bandwidth a particular site can use. Most settings can also be configured remotely using Microsoft Internet Explorer. Active Server Pages (ASP) improvements in the latest release of IIS include additional support for transaction processing and memory isolation.

- Excellent collection of server tools

It offers a variety of tools including a Transaction Server (for building distributed applications, Certificate Server (managing digital certificates), Site Analyst (site management and usage), Internet Connection Services for Microsoft Remote Access Service (creation of Virtual Private Networks), Mail Server and Network News Transfer Protocol (NNTP) News Server.

- Indexing tool also handles Microsoft Office documents

  It also includes an indexing tool called Index Server. The Index Server is used for indexing HTML pages and can also handle Microsoft Office documents.

- Integrated search engine

  Internet Information Server provide the integrated search engine capabilities, which the users can create custom search forms with Active Server pages, ActiveX Data Objects and SQL queries.

The weaknesses of Internet Information Server (IIS) are as follows:

- Only runs on Server edition of Windows NT/Windows 2000
- Complicated to configure
- SMTP does not support POP mailboxes
- Mediocre documentation

2.1.4.2. Server Platforms/Operating System

a) Windows 98

One of the products in Microsoft's evolution of the Windows operating system for personal computer is Windows 98. An important of the user interface of Windows 98 is the Web technology and it was released with its tightly integrated browser. Microsoft Internet Explorer is an integral part of the operating system in the Windows 98. Users can view and access desktop objects that reside on the World Wide Web as well as local files and application using the Active Desktop of Windows 98. In fact, Windows 98 desktop is a Web page with HTML links and features that exploit Microsoft's ActiveX controls.

It also provides a 32-bit file allocation table (FAT32) that allowing a single-partition disk drive larger than 2Gbytes. The other features in Windows 98 includes supports for Universal Serial Bus (USB), which make it easy to plug in new devices support for Digital Versatile Disc (DVD), support for a new industry standard form of power management called Advanced Configuration and Power Interface (ACPI).

Windows 98 enables the news and other content to be set up and pushed to the user from specified Web sites. When using it as Web server, Personal Web Server (PWS) need to be installed in order for the Windows system to serve Web pages through Internet.

b) **Windows NT**

Windows NT is the operating system for personal computer created for users and business requiring advanced capability. It is actually comprise of two products: Microsoft NT Workstation and Microsoft NT Server. The workstation is a little safer than Windows 98 and Windows 95. It is designed for users especially business users, who need faster performance. The server is designed for business machines that need to provide services for LAN-attached computers. Together with an Internet server such as Microsoft's Internet Information Server (IIS), it is required for a Windows system that plans to serve Web pages. The latest version, the Windows NT Server version 5.0 is now available, called Windows 2000.

Whereas, system requirements for Windows NT 4.0 Option Pack are the system need to be installed both Windows NT Service Pack 3 and Service Pack 4 and Microsoft Internet Explorer 4.01. In order to run Internet Information Server 4.0 (IIS) and any other features on the Windows NT 4.0 Option Pack.

In term of networking, Microsoft Windows NT Server 4.0 works with Microsoft LAN Manager, Microsoft Windows for Workgroups operating system, AppleTalk, DECPATH WORKS, IBMLAN Server, IBMSNA networks, the Internet, NFSnetworks, Novell NetWare, Remote Access Services by way of ISDN, X.25, and standard phone lines and TCL/IP networks.

c) Windows 2000

The latest version of Microsoft's evolving Windows operating system is Windows 2000. Before that, it is called Windows NT 5.0. Microsoft emphasizes that Windows 2000 is evolutionary and is built on NT technology. Most users of Windows 98 and Windows NT will in time move to Windows 2000. It is designed especially for small business and professional users as well as to more technical and larger business market for which the NT was designed.

It was reported in earlier reviews that Windows 2000 is more stable that Windows 98/NT systems. It is less likely to clash. A significant new feature is Microsoft's Active Directory that enables virtual private networks to be set up by a company, data locally or on the network to be encrypted, and to give users access to share files in a consistent way any network computer.

The other features of the Windows 2000 are it has a fully customizable administrative console that can be based on tasks rather than files, applications, or users. Also Dynamic Domain Name Server (DNS), which replicates changes in the network using the Active Directory Services, the Dynamic Host Configuration Protocol (DHCP), and the Windows Internet Naming Service (WINS) whenever a client is reconfigured.

2.1.4.3.Client / Server Architecture

The client/server model is an approach to software in which one application (the client) asks for and receives services from another application (the server). Client/server is a concept of computing as seen from the enc user's viewpoint- not that of the system or the application. In a client/server environment, data are manipulated at the user level. Client/server computing can be considered totally user-driven, and the client/server environment can be envisioned as a multi-vendor, multi-product, multi-application implementation. Essentially, client/server computing is a software-based architecture that enables distributed computing resources on a network to share common resources among groups of users at intelligent workstations. The client requests services form the server; the server processes the request and returns the result to the client. Though client/server architecture can be very complex, there are generally speaking, two kinds of client/server infrastructures to choose from. That is the Two-tier architecture and the Three-tier architecture.

a) 2-Tier Client/Server Architecture

The two-tiered architecture (see Figure 2-3) contains two computers -- a client, and a server- with areas of logic combined on the client. The three components of an application- presentation, processing, and data are divided between the two tiers: client application code and database server. A robust client application development language and a versatile mechanism for transmitting client requests to other server are essential for

a two-tier implementation. Presentation is handled exclusively by the client, processing is split between client, and server, and data is stored on and accessed through the server.

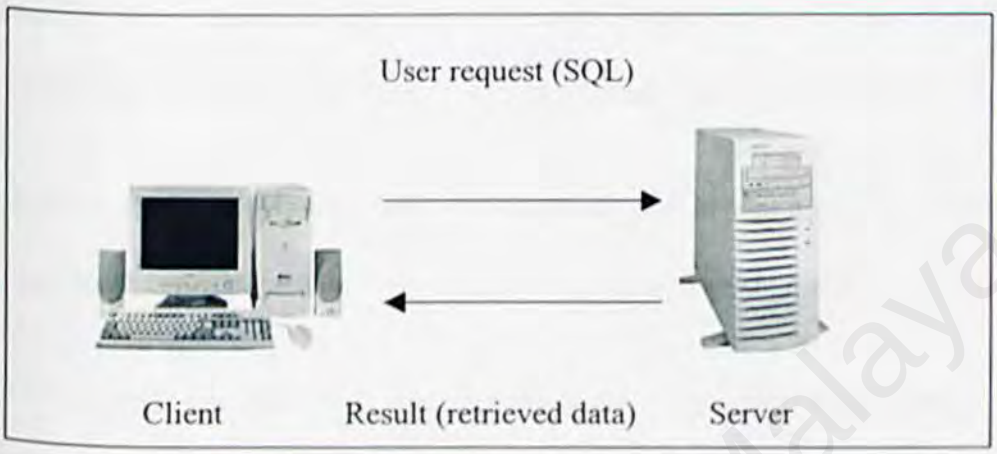


Figure 2-9 Data Access Topology for a two-tier architecture

Advantages of Two- Tier Client-Server

- Application development speed. In most cases, a two-tier system can be developed in a small fraction of the time it would take to code a comparable but less- flexible legacy system.
- Most tools for two-tier are very robust and lend themselves well to iterative prototyping and rapid application development (RAD) techniques.
- Two-tier architectures work well in relatively homogeneous environments with fairly static business rules.

Disadvantages of Two-Tier Client-Server

- The two-tier architecture faces several potential version control and application redistribution problems, a change in business rules would require a change to the client logic in each application in a corporation's portfolio affected by the change.

- System security in the two-tier environment can be complicated because a user may require a separate password for each SQL server accessed.

- Client tools and the SQL middleware used in two-tier environments are also highly proprietary and the PC tools market is extremely volatile. The volatility of the client/server tool market raises questions about the long-term viability of any proprietary tool and organization may commit to and complicates implementation of two-tier systems.

b) 3-Tier Client/Server Architecture

A three-tier architecture is a multi-tier application also known as n-tier architecture. It introduces a server (or an 'agent') between the client and the server, the business logic. The role of the agent is manifold.

It can provide translation services (as in adapting a legacy application on a mainframe to a Client / Server environment), metering services (as in acting as a transaction monitor to limit the number of simultaneous request to a given server), or intelligent agent services (as in mapping a request to a number of different servers, gather the results, and returning a single response to the client).

Most system will perform the following three main tasks, which correspond to three or layer of the n-tier model (see Table 2-1):

TASK	DESCRIPTION
User interface and navigation	Labeled Tier 1 in the following graphic, this layer comprises the entire user experience. Not only does this layer provide a graphical interface so that users can interact with the application, input data and view the result once the client receive it. In web application, the browser performs the task of this layer.
Business logic	Tier 2, between the interface and data services layers, is the domain of the distributed application developer. Business logic, which captures the rules that govern application processing, connects the user at one end with the data at the other. The functions that the rules govern closely mimic everybody business tasks, and can be a single task or a series of tasks.
Data service	Shown as Tier 3 in the following graphic, data services are provided by a structured (SQL, Oracle database) or unstructured (Microsoft Exchange, Microsoft Message Queuing) data store, which manages and provides access to the application data. A single application may enlist the

	services of one or more data stores.

Table 2-1: Three-tier architecture tasks

The Figure 2-2 depicts the Microsoft technologies that service the various tiers in the new system design. [3]

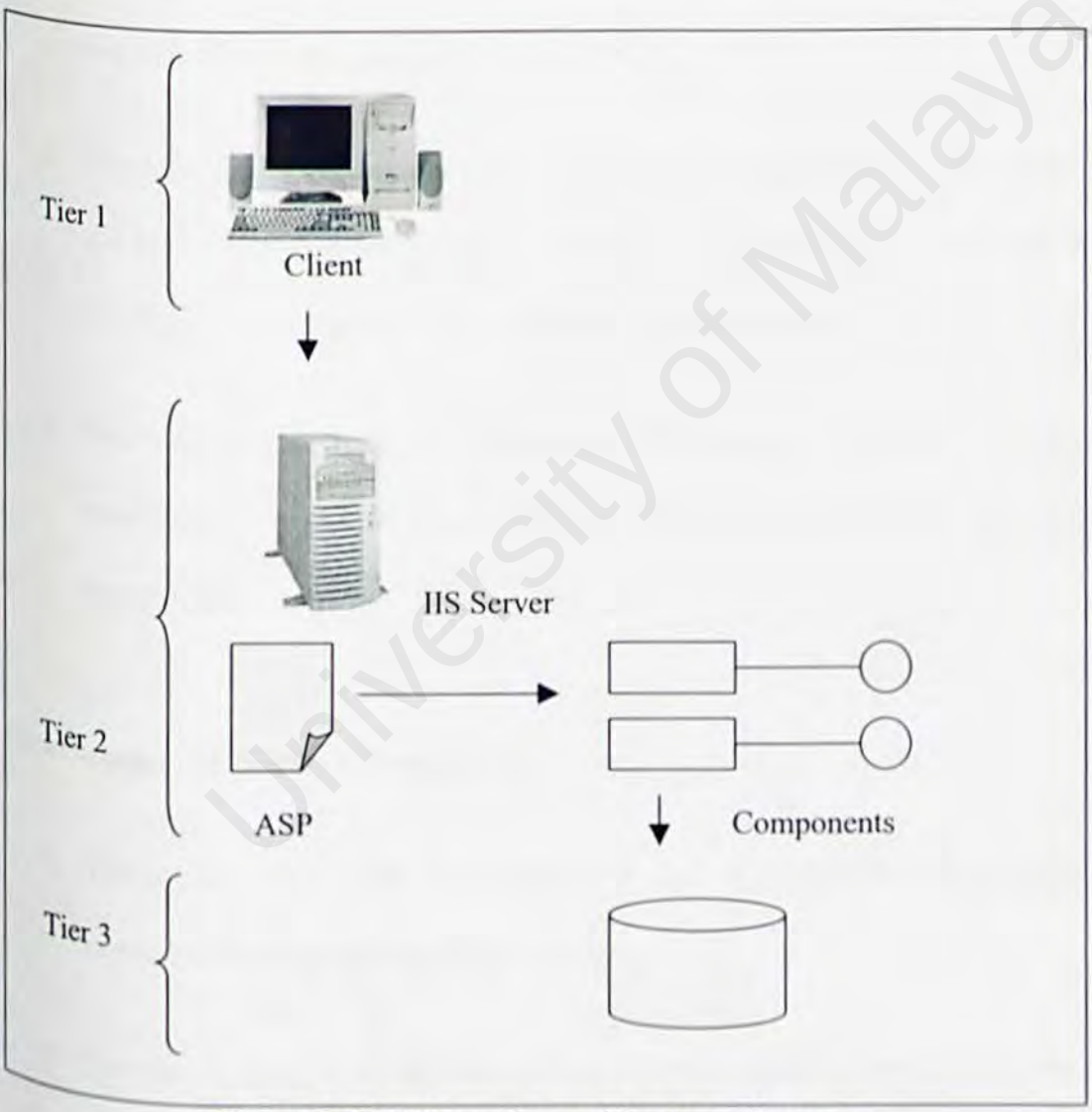


Figure 2-10: Three-tier architecture diagram

Advantages of 3-Tier Client-Server

- Unlike in most two-tier implementations, the three-tier presentation client is not required to understand SQL. This added flexibility allows a firm to access legacy data and simplifies the introduction of new data base technologies.

- Having separate software entities allows for the parallel development of individual tiers by application specialists.

- Provides for more flexible resource allocation. Middle-tier functionality servers are highly portable and can be dynamically allocated and shifted as the needs of the organization change. Network traffic may be reduced.

- Reusable logic reduces subsequent development efforts, minimizes the maintenance workload, and decreases migration costs when switching client applications.

Disadvantages of 3-Tier Client-Server

- Three-Tier brings with it an increased need for network traffic management, server load balancing, and fault tolerance.

- Current tools are relatively immature and require more complex 3GLs for middle-tier server generation.

2.1.4.4. Databases

a) Microsoft SQL Server 2000

Microsoft SQL Server 2000 is the most robust database for the Windows family. SQL Server is a client/server relational database management system (RDBMS) that is highly integrated with the Windows NT operating system. By using SQL Server, modern application can be developed that separate the client application and the database service. SQL Server Transact-SQL supports the ANSI-92 standard and provides extensions to the SQL language.

Microsoft SQL Server ™ supports a set of features that result in the following benefits:

- Ease of installation, deployment and use

  SQL Server includes a set of administrative and development tools that improve your ability to install, deploy, manage and use SQL Server across several sites.

- Scalability

  The same database engine can be used across platforms ranging from laptop computers running Microsoft Windows 95/98 to large, multiprocessor server running Microsoft Windows NT, Enterprise Editor.

- Data warehousing

  SQL Server includes tools foe extracting and analyzing summary data for Online Analytical Processing (OLAP). SQL Server also includes tools for visually designing database and analyzing data using English-based questions.

- System integration with other server software

  SQL Server integrates with e-mail, the Internet and Windows. **[5]**

b) Microsoft SQL 2000

Microsoft SQL 2000 is an enterprise-level database and is the latest version of Microsoft SQL 7. It is enhanced with Extensible Markup Language (XML) support that enables data return in XML and also enables XML be used to insert, update, and delete values in the database. SQL Server 2000 supports enhancements to distributed partitioned views that allow users to partition tables horizontally across multiple servers. Its full-text search includes change tracking and image filtering.

In the security point of view, SQL Server 2000 uses Kerberos to support mutual authentication between the client and the server, as well as the ability to pass the security credentials of a client between computers. Moreover, SQL Server 2000 introduces a new, more easily understood model for specifying backup and restores options. In term of scalability, it scales up to 32 CPUs and 64 GB RAM. **[5]**

c) Microsoft Access

Microsoft Access 2000 is a Windows-based database management system, which runs under the Windows 95/98/2000/NT operating system. Access offers an easy-to-use database for managing and sharing data. It also adds increased integration with the Web

for easier sharing of data across a variety of platforms and user levels. It enables sharing of database among the co-workers over the Internet, searching and retrieving the information quickly, and taking advantage of automated, pre-packaged solutions to quickly create databases.

Also, Stat/Transfer can be used to convert data between Microsoft Access and your favorite spreadsheet, database or statistical package. Besides that, data in Microsoft Access can be migrated to the Microsoft SQL Server.

Benefits of Microsoft Access:

- An easy-to-use tool for easily finding information that provides consistency and integration with the other applications in the office suite.
- Access 2000 allows easily sharing information via the corporate Intranet and the ability to easily host a database within the browser.
- User may create solutions that combine the easy-to-use of the Access interface (client) with the scalability and reliability of SQL server.

d) Oracle 9i Database

Oracle 9i Database is the latest database product from Oracle Corporation. It provides transparent application scalability by sharing cluster-wide caches for coordinated data access. It also includes business intelligence capabilities, and provides programmatic

access, centralized management, and multi-channel delivery of Internet services. A key feature of the database is the facility to recover from disaster situations.

Besides that, Oracle 9i database is designed with integrated manageability that creates a complete business view of all components powering e-business processing. As any other database software in the market, Oracle 9i provides multiple layers of security to prevent any unauthorized access to the database. Oracle 9i is compatible with UNIX and Windows NT.

2.1.4.5. Programming Environment and Languages

a) Active Server Pages 3.0 (ASP 3.0)

Active Server Pages 3.0(ASP 3.0) is a programming environment that gives the ability to generate dynamic html pages with the help of server side scripting. With ASP, you can combine HTML pages, script commands, and ActiveX components to create interactive Web pages or powerful Web-based applications. ASP is a server-side scripting environment that you can use to create and run dynamic, interactive, high-performance Web server applications. VBScript is the default scripting language for ASP, but if you like you can use VBScript, JScript, Perl or any other scripting language for server side scripting in an ASP page. An ASP page is almost the same as a HTM or HTML page... the only difference is that an ASP page has the '.asp' extension. Active Server Page can include both client side and server side scripts. In an ASP page VBScript is usually used as the server side and Java Script as the client side scripting language. **[4]**

ASP includes the several modern technologies. The details for each technology are as follows: [4]

- **Advanced Data Connector (ADC)**

  It provides client-side database access. This means that the entire set of database data (such as query results) is send to the browser, which the user can then continue to manipulate. This will reduce the amount of traffic on the network connection and also the load on the server. A simple example of a client-side database task is sorting a set of data with some criteria. If the results of the query are already in the web browser, it seems wasteful to contact the server to re-sort the results by phone number instead of last name when all of that information is already in the browser.

- **ActiveX Database Objects (ADO)**

  It is the server-side components that dynamically connect data in a database to web pages. These objects can be used to both client and server information for building dynamic content web pages. The server takes the database data (such as a query) and integrates it into a web page template, which produces a custom-generated HTML page. This page will be display in the client's browser.

- **VBScript**

  The glue that binds ADO and ADC into the Active Server Pages model is VBScript. This web scripting language is subset of Microsoft Visual Basic programming language. It applies Event-driven technique that makes it easy to learn and implement in the project. VBScript is comparable to server-side JavaScript implementations like Netscape LiveWire. Unfortunately, some browser such as Netscape does not support VBScript unless installing some kind of plugins

b) **Java Server Pages (JSP)**

Java Server Pages allows web developers and designers to rapidly develop and easily maintain, information-rich, dynamic web pages that leverage existing business systems. As part of the Java family, Java Server Pages enables rapid development of web-based applications that are platform independent. Java Server Pages technology separates the user interface from content generation enabling designers to change the overall page layout without altering the underlying dynamic content.

Java Server Pages technology uses XML-like tags and scriptlets written in the Java programming language to encapsulate the logic that generates the content for the page. Additionally, the application logic can reside in server-based resources that the page accesses with these tags and scriptlets. Any and all formatting (HTML or XML) tags are

passed directly back to the response page. This makes Java Server Pages technology makes it faster and easier than ever to build web-based applications. Together, JSP technology and servlets provide an attractive alternative to other types of dynamic web scripting/programming that offers platform independence, enhanced performance, separation of logic from display, ease of administration, extensibility into the enterprise and most importantly, ease of use.

c) PERL (V5)

Perl is a high-level programming language and derived from the C programming language Perl's process, file, and text manipulation facilities make it particularly well-suited for tasks involving quick prototyping, system utilities, software tools, system management tasks, database access, graphical programming, networking, and world wide web programming. Perl is flexible and extensible to use on virtually any task, from one-line file-processing tasks to large, elaborate systems. For many people, Perl serves as a great replacement for shell scripting. For others, it serves as a convenient, high-level replacement for most of what they'd program in low-level languages like C or C++. But Perl has some drawbacks. Firstly, it has somewhat of a reputation for being unreadable and this can leads to difficulties in maintaining the problem. Secondly, as Perl does has any formal support, it sometimes difficult to get any support when needed. Lastly, there would be a penalty in the execution time of Perl Language as it is a interpreted language.

d) Java Script

Java Script is a lightweight scripting language developed by Netscape Communications Corporation in such a way that it allows users to create dynamic Web pages. However, Java Script is not Java. It is merely a scripting language that is parsed and executed by the parser. Java Script is a simple scripting language that is very similar to C programming.

Java Script is an object-based scripting language that is designed for developing Internet applications. Java Script is used as a means to tell an application what to do, unlike languages that are used to create applications; it cannot do anything without the application.

User can develop server applications or client applications with Java Script. The term "server" is referring to the computer where the Web page resides. The term "client" is referring to the browser application that loads and displays Web page. Java Script is an extension to HTML that lets users create more sophisticated Web pages than they ever could with HTML alone.

Using Java Script, even less-experienced developers will be able to direct response from a variety of events, objects and actions. It provides anyone who can compose HTML with the ability to change image and play different sounds in response to specified events, such as a users' mouse click or screen exit and entry. **[6]**

e) **VBScript**

VBScript, the newest member of the Visual Basic family of programming languages, brings active scripting to wide variety of environments, including Web client scripting in Microsoft Internet Explorer version 3.0 and Web server scripting in Microsoft Internet Information Server version 3.0.

For people who are already know Visual Basic or Visual Basic For Applications, VBScript will be very familiar. Even if they don't know Visual Basic, once they learn VBScript, they are on their way to programming with the whole family of Visual Basic language.

VBScript talks to host applications using ActiveX Scripting. With ActiveX Scripting, browsers and other host applications don't require special integration code for each scripting component. ActiveX Scripting enables a host to compile scripts, obtain and call entry points and manage the namespace available to the developer.

With ActiveX Scripting, language vendors can create standard language run times for scripting. Microsoft is working with various Internet groups to define the ActiveX Scripting standard so that scripting engines can be interchangeable [7]

2.1.4.6. Development Tools

a) Microsoft Visual Interdev 6.0 ref :http://msdn.microsoft.com/mshelp

Visual InterDev is a tool specifically designed for developers who want to build sophisticated, dynamic Web applications, as opposed to non-programmers.Visual InterDev is based on the following key design goals:

- **Integrated visual development environment.** Visual InterDev includes a comprehensive development environment that integrates all the tools necessary to build and deploy Web applications.
- **Support for building Active Server applications.** Active Server applications are based on *Active Server Pages*, a new feature of Microsoft Internet Information Server 3.0. As a server-side application framework, Active Server Pages make it easy to build dynamic Web applications with sophisticated server-side processing such as database access, state management, server-side scripting, and reusable server components. Visual InterDev is the best way to build Active Server applications.
- **Powerful, integrated database tools.** Visual InterDev offers the most complete and advanced database development features available in any Web development tool. Visual InterDev provides scalable Internet and intranet-based access to databases supporting Open Database Connectivity (ODBC). This includes high-end database management systems such as Microsoft SQL Server™, Oracle, Informix and IBM DB/2, as well as desktop databases such as Microsoft Access and Microsoft Visual FoxPro.

- **Site management and content development tools.** Visual InterDev includes complete Web site management that is compatible with Microsoft FrontPage, including a unique site-visualization tool to aid in ongoing site management tasks. In addition, Visual InterDev includes a version of the FrontPage WYSIWYG HTML editor as well as tools for developing Web-based images and sound effects. **[8]**

b) **Macromedia Dreamweaver Ultradev 4**

Macromedia Dreamweaver UltraDev is a professional environment for building Web applications. A Web application is a collection of pages that interact with each other and with various resources on a Web server, including databases.

UltraDev is also a professional editor for creating and managing Web sites and pages. Because it incorporates all of Dreamweaver's page design and site management tools, UltraDev makes it easy to create, manage, and edit cross-platform, cross-browser Web pages.

UltraDev is fully customizable. You can create your own objects, commands, and server behaviors, modify menus and keyboard shortcuts, and even write scripts to extend UltraDev with new actions, behaviors, and property inspectors

2.1.3 SUMMARY

All these researches were done mainly to gain information for this project. The information gathered includes information regarding the Internet,reviews on the existing Student Information System of University Malaya ,Student Academic System of University Putra Malaysia and, development methodologies, and development tools.Research on existing this particular system is to study the strengths and values from their business aspect. Meanwhile the study on the procedure of student applying organize whether an outdoor activities or project is to help the developer to have a better understanding on the requirements of this project. Assessing current existing systems/applications allows identification of the weaknesses that are to be overcome in this project.

As for the development methodologies, this review focuses on two development models, the Waterfall Model and Prototyping Model, each having its own distinct features. The development model that has been chosen for this project will be mentioned in the next chapter.

Various development tools for the project were analyzed, using the information gathered from the Internet and reference books. Information on three different server platforms were gathered, they are Windows 98/NT and 2000 The strengths and weaknesses of these operating systems are summarized into a comparison table and will be shown in the following chapter.

Besides, the Web Servers such as Internet Information Server (IIS) are also studied. Other information such as system architecture, databases, programming environment and languages are also analyzed, including Client-Server Architecture, SQL server, Java, Active Server Pages (ASP), Java Server Pages (JSP), Perl and etc.

Finally, there is research on suitable development software, where in this project, I have made consideration between Microsoft Visual Interdev 6.0, and Macromedia Ultradev. In Chapter 3, we shall mention about all the chosen tools.

3. CHAPTER 3 -

METHODOLOGY AND SYSTEM ANALYSIS

3.1 INTRODUCTION

After the literature survey, the next step is to perform a detailed analysis. System analysis is an attempt to understand how the system can help to solve the problem. A complete understanding of software requirements is essential to the success of a software development effort. The overall emphasis is to gather data and requirements for the new system and to consider all alternative solutions to the problem within these constraints and the feasibility of these solutions.

3.2 METHODOLOGY

Methodology represents a particular approach or philosophy for building system.One is not better than other,each has its advantages and disadvantages and there may be situation when one is more appropriate than other [9]There are several process models such as waterfall model, V model, prototyping model,spiral model and the like which prescribe the software development a activities in a variety of contexts.

For this project,waterfall model has been used .In waterfall model,the development stages are depicted as cascading from one to another,which implies one development stage should be completed before the next goes on during and it suggests to developers the sequence events they should expect to encounter. Associated with

each process activity, were deliverables, thus it can bused to gauge how close the project was to completion at a given point in time. The waterfall model is helpful in keeping out the development processes. Its simplicity makes it easy to explain to customers (HEPUM) who are not familiar with software development. However ,there are some disadvantages of this model as listed as below :

- There are no insights into how each activity transforms one artifact to another, such as requirement to design.
- Provides no guidance to developer on how to handle changes to products and activities that are likely to occur during development .This will cause the thrashing of development activities.
- Failure to threat software as a problem-solving process as it is derived from the hardware world, which presenting a manufacturing view of software development.

The web based SAAS is expected to replace the current system, thus the proposed system has to be developed with a great deal of iteration n order to determine what the users wants and what are the additional characteristic that are desired. In this perspectives, the waterfall models unsuitable to be used in developing the proposed system as it doesn't provides on how to handle.

Prototyping is such a sub-process to develop a prototype, a partially developed product to enable the user to examine some aspect of the proposed system and decide if it is appropriate for the final product. The waterfall model with prototyping approach was used because the system consists of separate process phases, which cascades one phase to another, except the prototyping stage .If the process were

uncontrolled, developer may thrash from one activity to the next and back again, as they strive to gather knowledge about the problem and how the proposed solutions addresses it. Besides, it also offers a mean of making the development process more visible compare to other models.

The system consists of several phases such as requirement analysis, system design, program design, coding, unit and integration testing, system testing, and operation and maintenance. Each stage is signed-off when it is defined and development goes on to the following stage. There is a cycle among the stages of requirements, system design and program design. These three steps are keep looping in the system prototype and is to be changed , as it's not ideal as what had been expected.

As mentioned either in the chapter 1 introduction, waterfall models **(see Figure 1-1)** has been introduced in a developing the whole project. This methodology is very important in order to make sure that the project has been well planned from the beginning stage until the end of this project. To guarantee the success of this project, research has been done on the related fields and system planning based on the approaches provided. The steps are explained in the following subsections. **[9]**

3.2.1 REQUIREMENT ANALYSIS

The web-based SAAS' s constraints and goals are established by consultation with the system users (staff of HEPUM ,Club,Society and Residential College)These requirements are then being defined in manners that are understandable by both the users and developers.

This first phase is to identity the problems and objectives of this project. This step is very important because addressing the wrong objectives would waste subsequent time and lead to the failure at last. The objective of SAAS is to build a wed based application that allows staff of HEPUM to submit their program proposal form(KKD) and system will track proposed program participants, participant who has excessive activities and CGPA less than 2.5 on that current semester SAAS will send email to alert that student and inform him or her program proposal is being cancelled and rejected by HEP. It brings several advantages to the users. It alerts student their program proposal form approval status, student do not have to frequently rush to HEP to keep checking their proposal approval status and this system will help student to concentrate more on their studies instead of taking part too many program or activities for that particular semester. Users would have easy access to the SAAS as long as they get hook up on the Internet.

3.2.3 SYSTEM DESIGN

Once the requirements are defined, a system design has to be created. It established overall system architecture. System design involves description of the software system appearance and functionality from the user's perspective. The user then reviews it. In this phase of the systems development life cycle, the information collected is needed to accomplish the logical design of the system. Accurate data flow procedures are planned so that the processes within the system are correct. **[10]**

3.2.4 PROGRAM DESIGN

When users and customer approved the system design, the overall system design is used to generate the designs of the individual program involved.

3.2.5 SYSTEM PROTOTYPING

In this stage system prototyping allows of the real system to be constructed quickly or clarify issues. The requirements or design required repeated investigation to ensure that the developer ,user and customer have a common understanding both of what is needed and proposed.Besides,prototyping system information is worthwhile for gathering specific user's information requirements.Then,initial reactions from the users to the prototype were sought. Then the user suggestions about changing or clearing up the prototyped system, possible innovations for it and revision plans details which parts of the system need to be done first or to prototype next were search to. **[10]**

3.2.6 CODING

The programmer will write the programs based on the approved design. System testing is very important to assure the quality of the system. The goal of testing is to find the faults in the codes.

3.2.7 UNIT AND INTEGRATION TESTING

When the programmers have been written, they are tested as individual pieces of code, which called unit testing. Once the pieces work as desired, the system was built by adding on piece to the next until the entire SAAS is operational, which called integration testing.

3.2.8 SYSTEM TESTING

This phase is to create a prototype according specification that are specify in the system design phase. With a prototype model, users will more understanding how the system works.

3.2.9 OPERATION AND MAINTENANCE

The process of changing a system after it has been delivered and is in use is called software maintenance. The changes may involve simple changes to correct existing errors, more extensive to correct design error or significant enhancements to correct specification. [9]

3.3 REQUIREMENT ANALYSIS

Requirement analysis covers the area of functional and non-functional requirements of **SAAS**. The functional requirements can be divided into 4 sections which are General section, Member section, KKD Approver section and . Each of the section will have its own module that performs different functions and task.

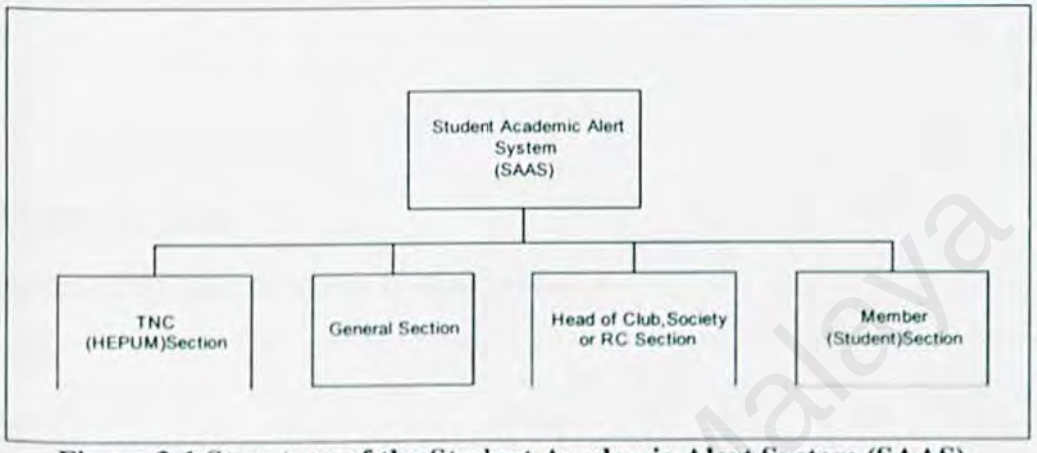


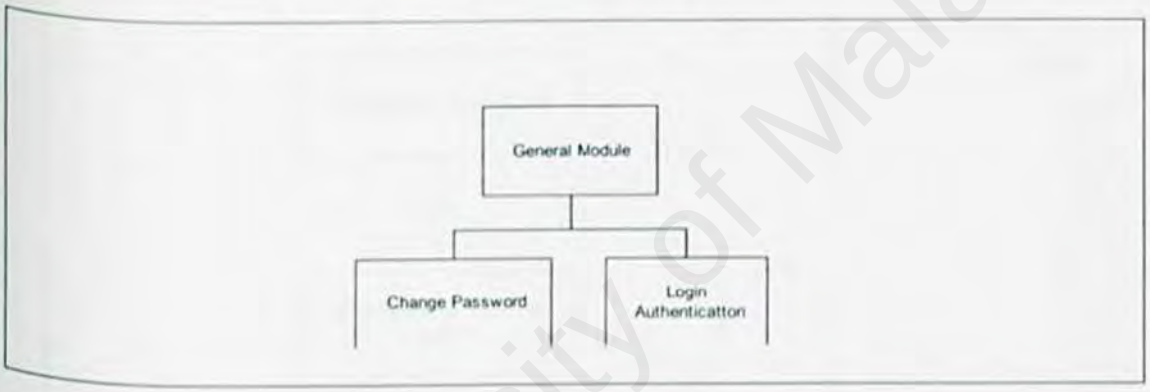
Figure 3-1 Structure of the Student Academic Alert System (SAAS)

The member section is where the student can access the KKD form, fill in the form and submit it. After students have submitted the form, the supervisor section (TNC and Head of Clubs) will be the process of retrieving the KKD form and doing form verification and evaluation and finally the general section will be discuss later.

3.4.1 FUNCTIONAL REQUIREMENTS

3.4.1.1 General Section

The structure of the general section is shown as below :



a. Change Password Module

This section grants user to change their purpose for security purpose

b. Login Authentication Module

This section allows user to login by providing Login ID and password.

3.4.1.2 Student Section

The structure of the student section is shown as below:

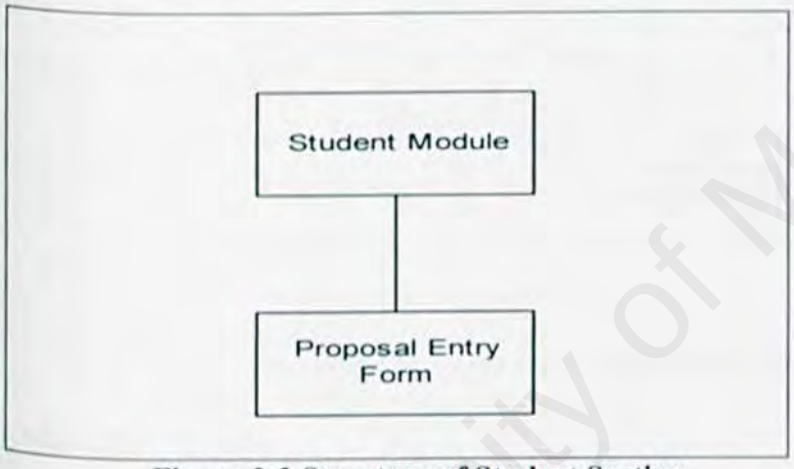


Figure 3-3 Structure of Student Section

a. Proposal Form Entry Module

This module allows the project director to fill in the details about the program and submit to the approver

3.4.1.3 KKD Approver Section

The KKD approver consists of first approver and second approver. The first approver is either the Head of society or club and administrator of residential college (JTK) that responsible to supervise student's KKD, tracking student's CGPA as well as their activity within that society of clubs or residential college and finally submit KKD to

the second approver. Meanwhile the second approver is the assistant registrar of HEPUM whose in charged to do final evaluation and approval for the KKD and send email alert to the student to inform their activity approval status .

The structure of the approver section is shown as below:

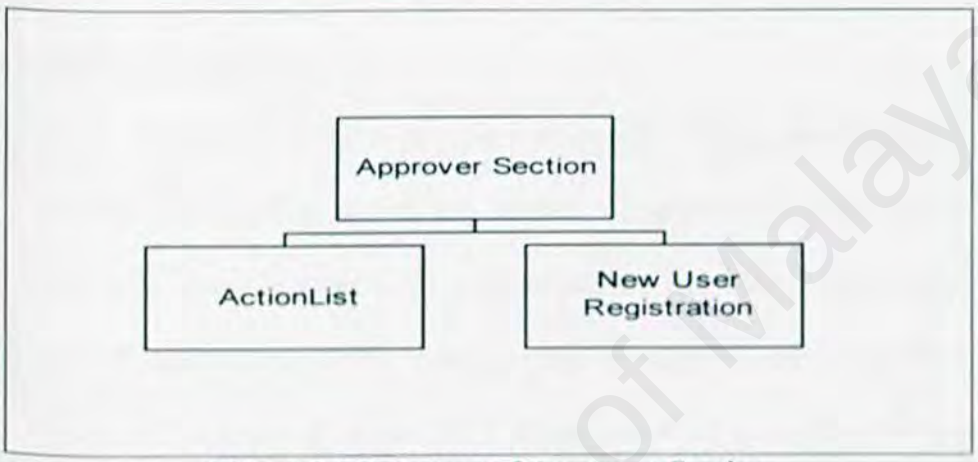


Figure 3.4 Structure of Approver Section

a. Action List Module

This module give access to first approver to verify the program proposal form that is pending and track participants that of already taken part in other project within that society, club or residential college and with CGPA less than 2.0 whose in the academic alert state. This module also used by second approver to evaluate student's performance in academic and club, society or residential college activities within university and approve the proposal according the tracking result of the system.

b.New User Registration Module

This module allows personnel of TNC(HEPUM) to register new user that are members of whether club,society or residential colleges in University of Malaya that wish to organise program or project.

3.4.2 NON FUNCTIONAL REQUIREMENTS

Non-functional requirements are as important as functional requirements. It is defined as constraints under which the system must operate and the standards, which must be met by the delivered system.

3.4.2.1 USER INTERFACE

The system is required to have an interface that is specifically intended to allow the user to access the internal components of that system in a relatively easy fashion and without having to know specifically how everything is put together or how it works together. Common interface must be created in order to reduce the learning curves of the users. For example, saving and retrieving in are windows program is the same basic process as in all other window-based application.

3.4.2.2 REALIABILITY

This system should be reliability, which means that it does not produce dangerous or costly failures when it is used in a reasonable manner. That is in a manner that a typical user experts is normal. This definition recognizes that a system may not always use in the ways that the designer experts.

3.4.2.3 EFFICIENCY

Efficiency means a process or a procedure that can be called or accessed in an unlimited number of times to produce similar outcomes or outputs at a creditable pace or speed.

3.4.2.4 SMPLICITY

Simplicity refers to keeping forms and screen properly uncluttered in a manner that focuses the user attention.

3.4.2.5 MAINTANABILITY

A product is maintainable if the programs are easily modified and tested in the case of updating a process to meet a new requirement, correcting errors, or move to a different computer system. **[9]**

3.4.2.6 UNDERSTANDABILITY

Understandability in terms of the coding method used, allows other programmers to understand the logic of program flows, thus changes can be made easily upon the necessary program segments without modifying other users can use this system with out difficultly.

3.5 DATA FLOW DIAGRAM (DFD)

A data flow diagram (DFD) is a graphical technique that enables analysts to depict information flow in an information system. It allows user knows how the data flow into the system, how they are transformed and how they leave the system. DFD provides a mechanism for functional modeling as well as information flow modeling. The components of the DFD consist of the following items shown in the Table 3.1.

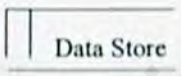
SYMBOL	COMPONENT
	Entity
	Process
	Data store
	Data flow

Table 3.1: Components of DFD

3.6 DEVELOPMENT AND PROGRAMMING TECHNOLOGY

This section will identify the suitable programming languages, development tools, server, database system and implementation platform that are used to develop the system. An analysis has been done in making the decision. The ideal solution for this project is easy to develop and deploy and also easy integration with the latest emerging technologies.

3.6.1 WINDOW 2000 SERVER

The Window 2000 Server was chosen to form the implementation platform. It was chosen primarily caused by some reason. Firstly, Window 2000 Server workstations allow users to control over access to files and other resources on their machines. The user can take advantage of various features of the NT logon process to control who can access the computers and set file permissions so that valuable data is protected from intruders even if the hard drive is physically removed. It is important because security is high risk for a company. Secondly, the Graphical User Interface for Window 2000 Server was user-friendly and easy to use. This means the user can shorten the learning time and save the cost to follow the course.

3.6.2 INTERNET INFORMATION SERVER (IIS) 5.0

This is the web server chosen for this project. IIS is chosen because users and groups from IIS were integrated with NT users and groups. It is important because Window 2000 Server was chosen as the network operating system for the new system.

Further more, IIS is easy to develop and a powerful application that can be created through ISAPI and Active Server Page (ASP). ASP is supported by various languages such as VBScript, PERL, and JavaScript. IIS includes great sample application and full access to library, and sample code that can be easily cut and paste. [11]

3.6.3 MIRCOSOFT ACTIVE SERVER PAGES (ASP) 3.0

ASP was chosen as the programming language technology because it is possible to use all the power of a real computer language right in the Web page. The user doesn't need to write complicated C code to interface with the Web Server and then compile it into an executable or DLL file. All they need to do is creates HTML page and then put programming code along side the HTML for then to work together.

ASP solves all the problems associated with CGI and server APIs. ASP is simple to learn and easy to use. ASP makes it much quicker and easier to create highly interactive Web sites. It also makes the pages easier to maintain and update in the future. **[11]**

3.6.4 HYPERTEXT MARKUP LANGUAGE (HTML)

This is the basic language required to display text, images and so forth on the web page. It is a simple system for defining the appearance and functionality of hypertext document published via the World Wide Web. **[12]**

3.6.5 MICROSOFT SQL SERVER 2000

Microsoft SQL Server is chosen as the database server it is the best database solution to be used with Window 2000 Server. SQL Server is able to handle a large amount of student's data.

Microsoft SQL Server 2000 provides operating system and platform services such as storage management, security, Web services, messaging, and network services. SQL Server allows the developer to define up to 32767 databases. A total of 2 million tables can be defined with each of 32676 databases. A table is allowed to define up to 250 columns. This means that SQL Server can manage to store a vast amount of data, which is important especially for all student's data in University Malaya **[5]**

3.6.6 JAVASCRIPT / VBSCRIPT

After consider several languages that are available in the market, JavaScript and VBScript was chosen as the main scripting language. It is because VBScript is the default scripting language of Active Server Pages and JavaScript also supported by Active Server Pages. This approach is chosen because it is simple to implement and no additional software is required besides Window 2000 Server and Internet Information Server 5.0. **[13]**

3.6.7 MICROSOFT VISUAL INTERDEV 6

After surveying the development tools, it is decided that Microsoft Visual InterDev will be used to develop the Web application as it provides a friendly development environment to develop Web application. Visual InterDev is used to create and edit content, and the content is automatically uploaded to the Web Server. When the system includes a database connection, Visual InterDev allows viewing and interacting with the data on the database server. The Microsoft Internet Explorer 5.0 Web Browser is integrated with Visual InterDev to view Web pages during development. Beside that, Microsoft Visual Basic 5 will used to develop Active Server Pages component. **[14]**

3.7 SYSTEM REQUIREMENTS

3.7.1 SERVER SYSTEM REQUIREMENTS

- A server with at lest Pentium 133 MHz processor or above
- At least 32MB of RAM
- At least 400MB of free space in hard disk
- Network connection with recommended bandwidth at 10Mbps or more
- Other standard computer peripherals

3.7.2 CLIENT SYSTEM REQUIREMENTS

- A computer with at least Pentium 100MHz processor or above
- At least 16MB of RAM
- Network connection through existing network configuration or modem (recommended at least 14.4 Kbps)
- Other standard computer peripherals

3.8 CHAPTER SUMMARY

After review very tools, techniques and technologies, I had made comparison between these tools, techniques and technologies. I had made decision to choose all the tools, techniques, and technologies that are suitable for my system to perform a good system. Tools, techniques and technologies that will be used are:

Operating system	Window 2000 Server
Web server	IIS 5.0
Browser	Internet Explorer
Database	Microsoft SQL Server 2000
Programming	JavaScript,VBScirpt, ASP

Table 3-2: Development tools

4. CHAPTER 4– SYSTEM DESIGN

4.1. INTRODUCTION

System design is critical part for the whole project. So good design is the key to successful software project. This is the stage in the system development process where the requirements for the system are translated into the system characteristics

There are many stages in the design process as follow

The stages in the design process are:

- **Architectural Design**

The subsystem making up the system and their relationship is identified and documented. In this model, users interact through the use of server side programs that provide for an enhanced experience

- **Database Design**

The data structures used in the system implementation are designed in detail and specified. In a relational database, a table or relation is a collection of unique instances of similar data

- **User Interface Design**

Services are allocated to different components of the system and the interfaces of those components are designed. This enabled user interact with the system

- **Process Design**

Structured design is a process oriented for breaking up a large program into hierarchy chart of modules that result in a computer program which is easier to implement and maintain.

4.2 ARCHITECTURAL DESIGN

The Student Academic Alert System is based on the three-tier client/server architecture. Three-tier is the new growth area for client/server computing because it meets the requirements of large-scale Internet and intranet client/server applications.

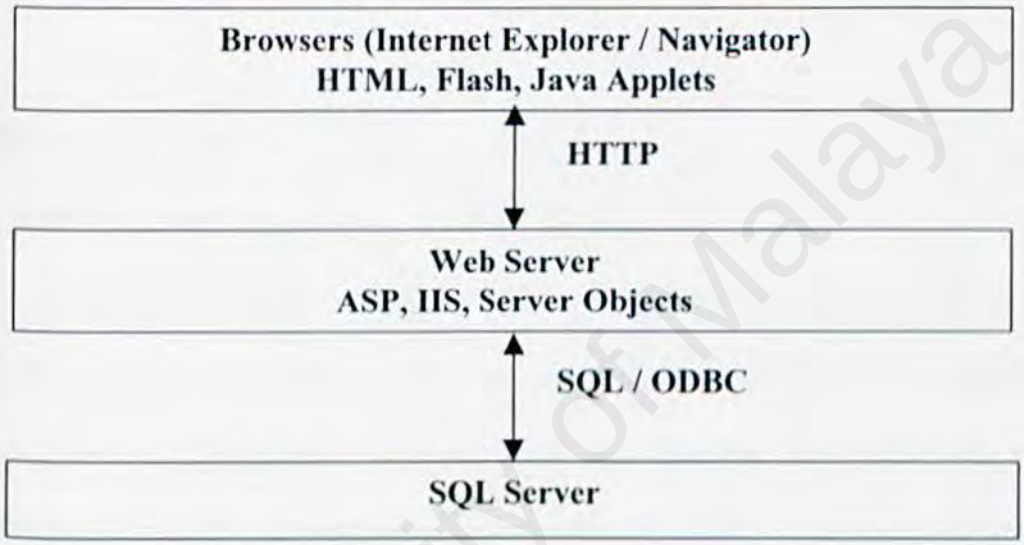


Figure 4-1 Architectural Design of SAAS

In three-tier architecture, the business rules are removed from the client and are executed on a system in between the user interface and the data storage system. The client application provides user interface for the system. The business rules server ensures that all of the business processing is done correctly. It serves as an intermediary between the client and the data storage. In this type of architecture, the client would never access the data storage system directly. This type of system allows for any part of the system to be modified without having to change the other two parts. Since the parts of the application communicate through interfaces, then as long as the interface remains the same, the internal working can be changed without affecting the rest of the system.

Three-tier applications are easier to manage and deploy on the network – most of the code runs on the servers, especially with zero-footprint technologies like Java applets.

In addition, three-tier applications minimize network interchanges by creating abstract levels of service. Three-tier substitutes a few server calls for many SQL queries and updates, so it performs much better than two-tier. It also provides better security by not exposing the database schema to the client and by enabling more fine-grained authorization on the server.

4.3 DATABASE DESIGN

4.3.1 Logical Database Design

The logical design phase begins with the creation of a conceptual data model of the system which is totally independent of the data model the system such as programming languages, Database Management System, hardware platform and other physical consideration. Steps involved in creating a logical database design for relational database.

- Build local conceptual data model from user's view
- Build and validate local data model
- Build and validate global data model

4.3.1.1 Entity Relation Diagram

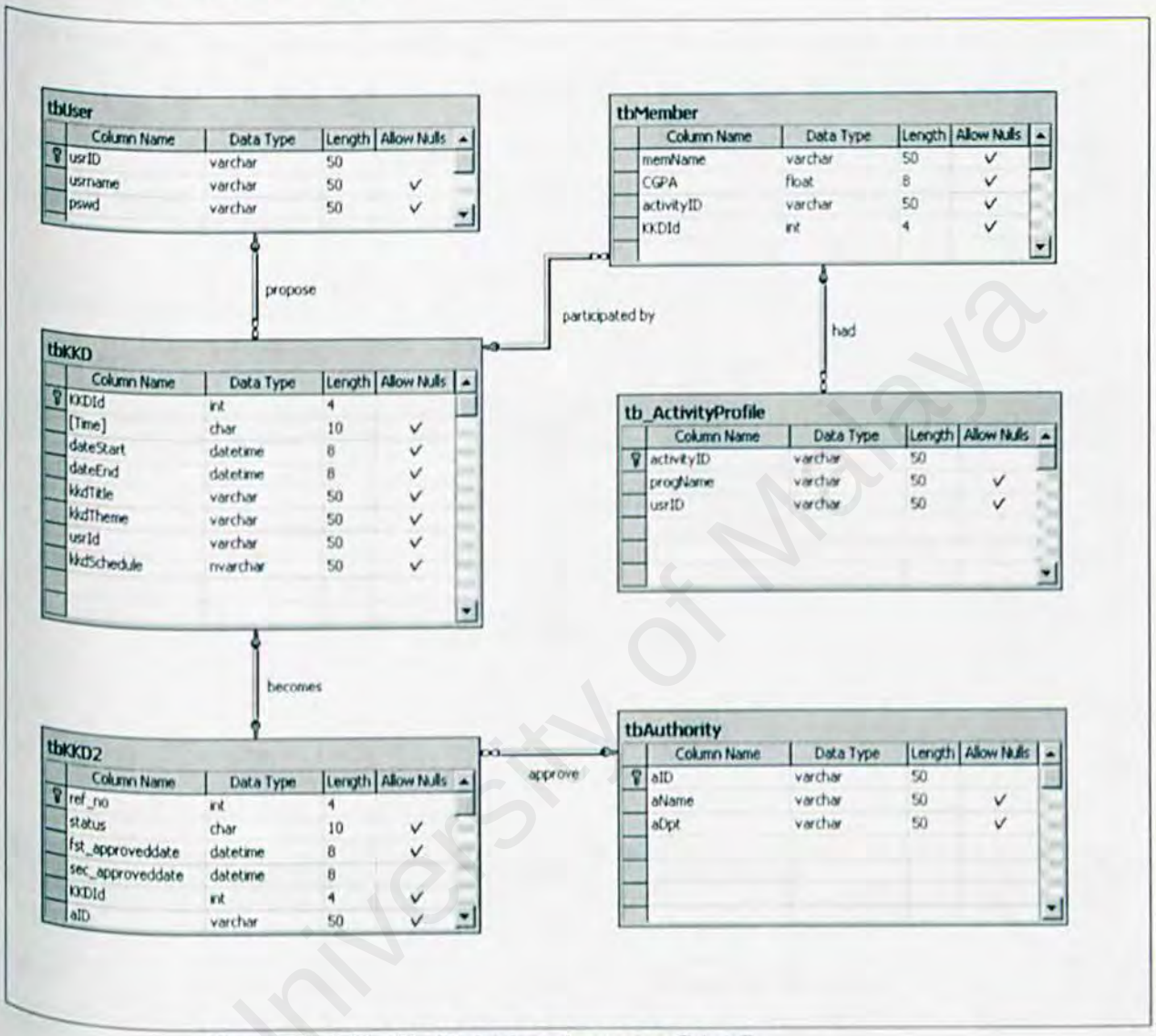


Figure 4-2 Entity Relational among SAAS

4.3.2 Physical Database Design

Physical database design involves the design of the tables or database. This database has 6 tables. The description of the tables will be mentioned in the following section. All the attributes of the database are listed as follow. The primary key of the database is represented by bold text (e.g. : **aID**)

4.3.2.1 Data Dictionary

Data dictionary is a specialized application of the kinds of dictionaries used as reference in everyday life. It is a reference work of data about data (metadata), one that is compiled by system analysts to guide them through analysis and design.**[Kendall & Kendall, 1999]**

The 6 tables involved are :

i) tbUser

Field name	Data Type	Length	Description
usrId	varchar	50	User Login ID
usrname	varchar	10	User name
pswd	varchar	15	User login password

Table 4-1: User Table

ii) tbKKD

Field name	**Data Type**	**Length**	**Description**
KKDId	int	4	Program proposal ID
time	char	10	Program start time
dateStart	datetime	8	Program start date
dateEnd	datetime	8	Program end date
kkdTitle	varchar	50	Program title
kkdTheme	varchar	50	Program theme
kkdSchedule	varchar	50	Program schedule
kkdLocation	varchar	50	Program location
kkdDescp	varchar	50	Program descriptions
usrId	varchar	50	User ID
kkdTotmember	int	4	Program total member

Table 4-2: KKD Table(Program Proposal Table)

iii) tbKKD2

Field name	Data Type	Length	Description
ref_no	Int	4	First level approved KKD reference number
status	Char	10	Program approval status
fst_approveddate	datetime	8	Program first approved date
sec_approveddate	datetime	8	Program final approved date
KKDId	Int	4	Program proposal ID
aID	nvarchar	50	Authority (KKD approver)ID

Table 4-3: First Approved KKD Table

iv) tbMember

Field name	Data Type	Length	Description
memName	varchar	50	Proposed program member's name
CGPA	float	8	CGPA of the proposal program member
activityID	varchar	50	Member's activity profile
KKDId	int	4	Program proposal ID
Email1	nvarchar	50	Member primary email
Email2	navarchar	50	Member secondary email

Table 4-4: Member Table

v)tb_ActivityProfile

Field name	Data Type	Length	Description
activityID	varchar	50	Member's Activity ID
activityName	varchar	50	Member's Activity Name
usrID	varchar	50	User ID

Table 4-5: Member's Activity Profile Table

Vi) tbAuthority

Field name	Data Type	Length	Description
aID	varchar	50	Member's Activity ID
aName	varchar	50	Member's Activity Name
aDpt	varchar	50	Department of the authorities that responsible to approved the KKD

Table 4-6: Authourity Table

4.4 USER INTERFACE DESIGN

Normally developers will face with 2 key issues when designing the UI for a computer system.

- How can information from the user be provided to the computer system?
- How can information from the computer system to be presented to the user?

This system is designed to have Graphical User Interfaces (GUIs).GUIs support high resolution color screen and interaction using a mouse as well as a keyboard. The advantages of GUIs are **[12]** :

- They are relatively easy to learn and use, users with no computing experience can learn to use the interface after a brief training session
- The users has multiple screens (windows) for system interaction
- Fast, full screen interaction is possible with immediate access to anywhere on the screen

4.4.1 Design Principles

The following general principles were applied in the user interface design for the system:

- **User Familiarity**

  Users should not be forced to adapt to an unfamiliar interface. For example, a system is designed by using familiar words such as "edit", "add", "delete" and so on.

- **Consistency**

  System commands and menus should have the same format.Parameters should be asked to confirm that this is really what is intended before any information is destroyed. For instance, deletion of KKD information>in administrator module will be asked to confirm the deletion.

- **Meaningful Error Messages**

  The error messages should describe the problem in a language that the user can understand easily

- **Robustness**

  The system should be able to protect itself from the users errors that might cause it to fail. For example, the system is able to recover and display an error message when the user specifies a non-numeric value for the numeric input field.

4.4.2 Characteristics of User Interfaces

Some of the characteristics of user interface design for this system are :-

Buttons

? Picking a button causes a single action to be initiated

Text Field

? The user inputs a specific piece of data or information within a form

Radio Button/Drop-Down List

? Provides some choices for the user to select

Below are some of the user interface design for the Student's Academic Alert System (SAAS):

4.4.3 Example of User Interface Design

4.4.3.1 General User Interface

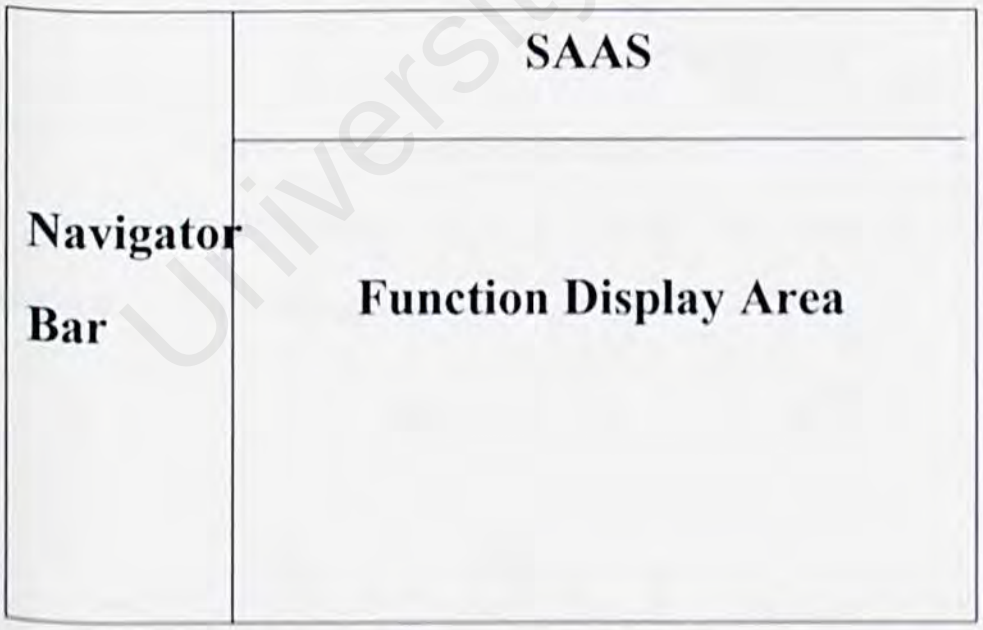


Figure 4-3 General User Interface of SAAS

Figure 18 shows the general expected outcome of the SAAS. The upper bar illustrates the system title. The left site bar is the navigation bar. It provides the navigation buttons and hyperlinks to other available functions in the system.

4.4.3.2 Proposal Submission Form (KKD)

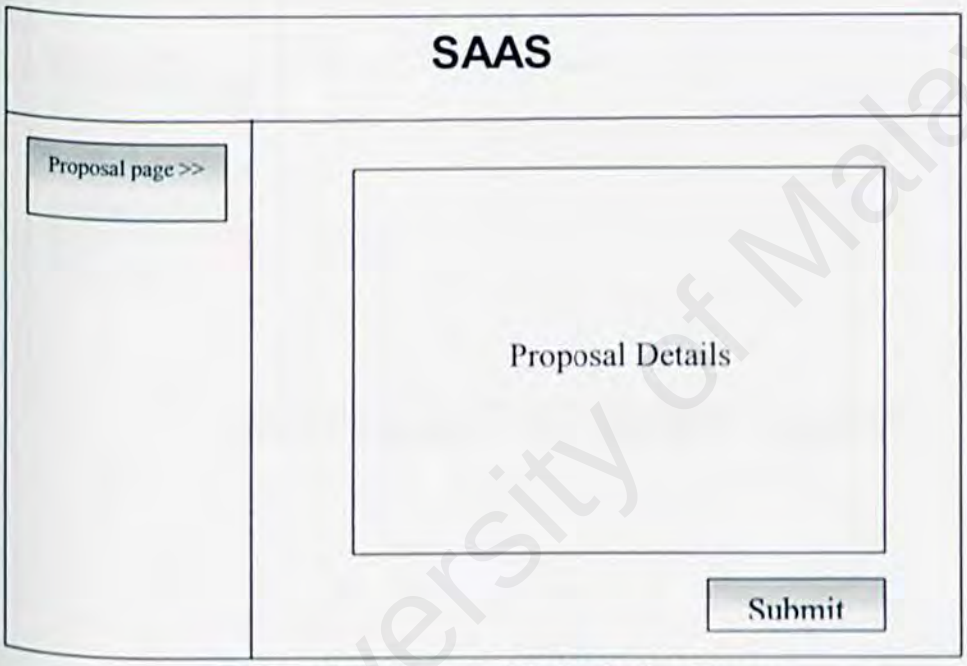


Figure 4-4 Proposal Submission Form

This page allows activity applicant to fill up the activity or program details and submit to the approver for approval.

4.4.3.3 Administrator – Approver Information Management

This page allow the administrator to view their own record, add a new approver, update record as well as delete a approver's record.

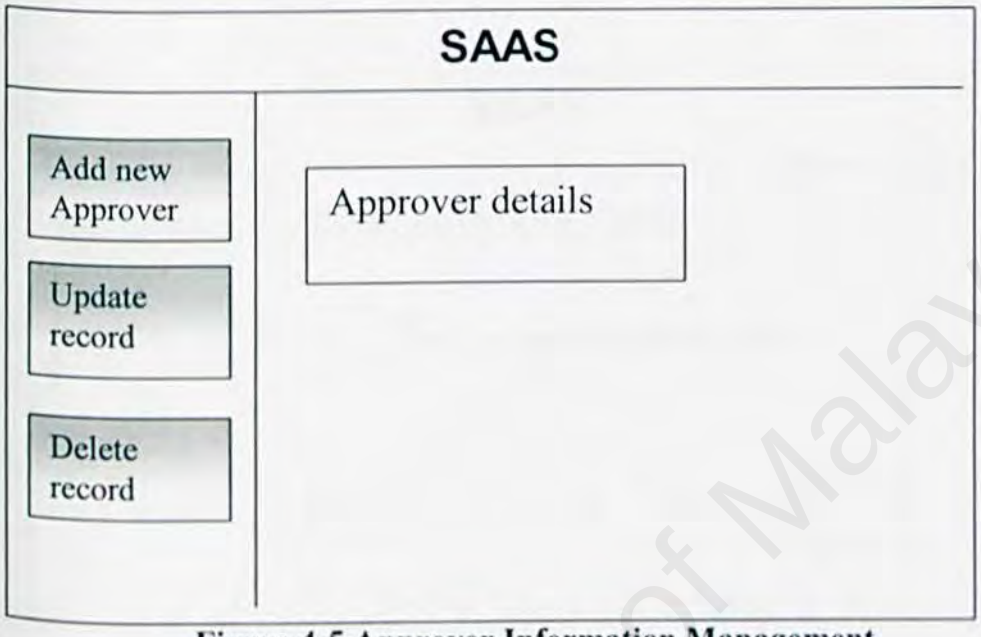


Figure 4-5 Approver Information Management

4.4.3.4 Logout Screen

When the user click on the 'logout' button, the page will display the time logout and date of the day. There is a button link to login page automatically.

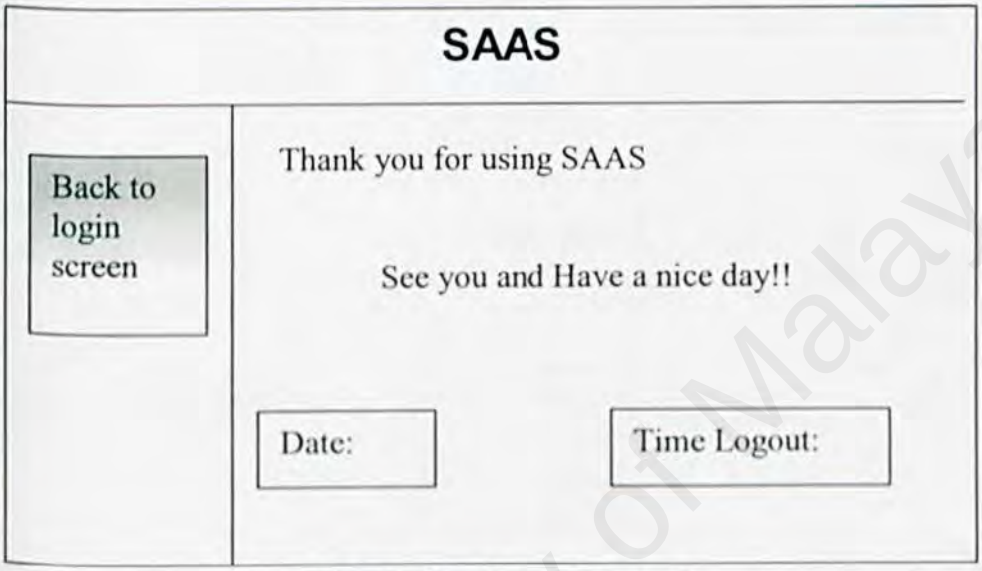


Figure 4-6 Logout screen

4.5 PROCESS DESIGN

The system is structured into a number of principal sub-system whereas sub-system is an independent unit. Communication between sub-system are identified

4.5.1 Structure Chart

Decomposing a system into a set of interactive sub-system is an important phase. Structure chart is used to depict the high level extraction of a specified system. The usage of structured chart is to describe the interaction between independent sub-systems

SAAS is divided into 3 major components: Student section, Approver section, HEP section and administrator section. The details of each section are represented in the structured chart below.

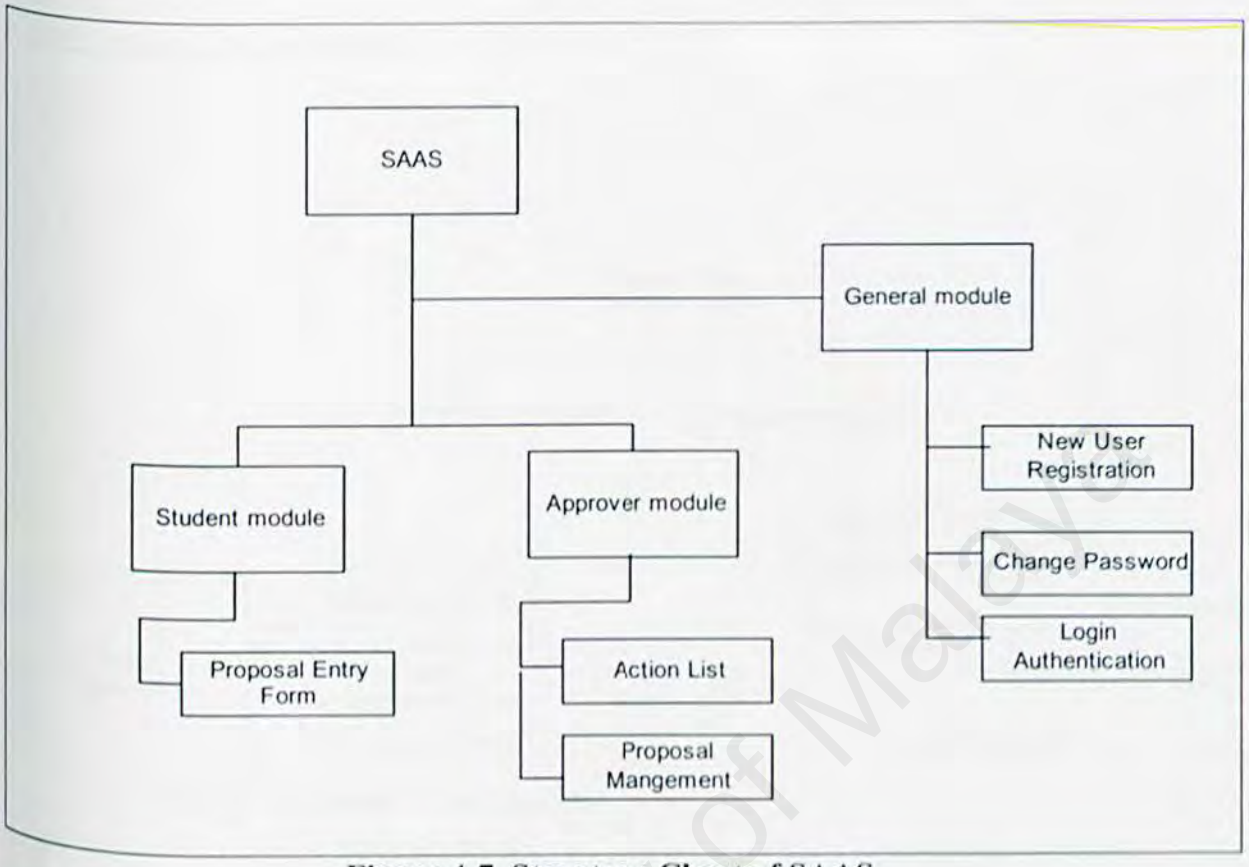


Figure 4-7 Structure Chart of SAAS

4.5.2 Data Flow Design

The following section shows the DFD design for the SAAS :

4.5.2.1 Context Level DFD

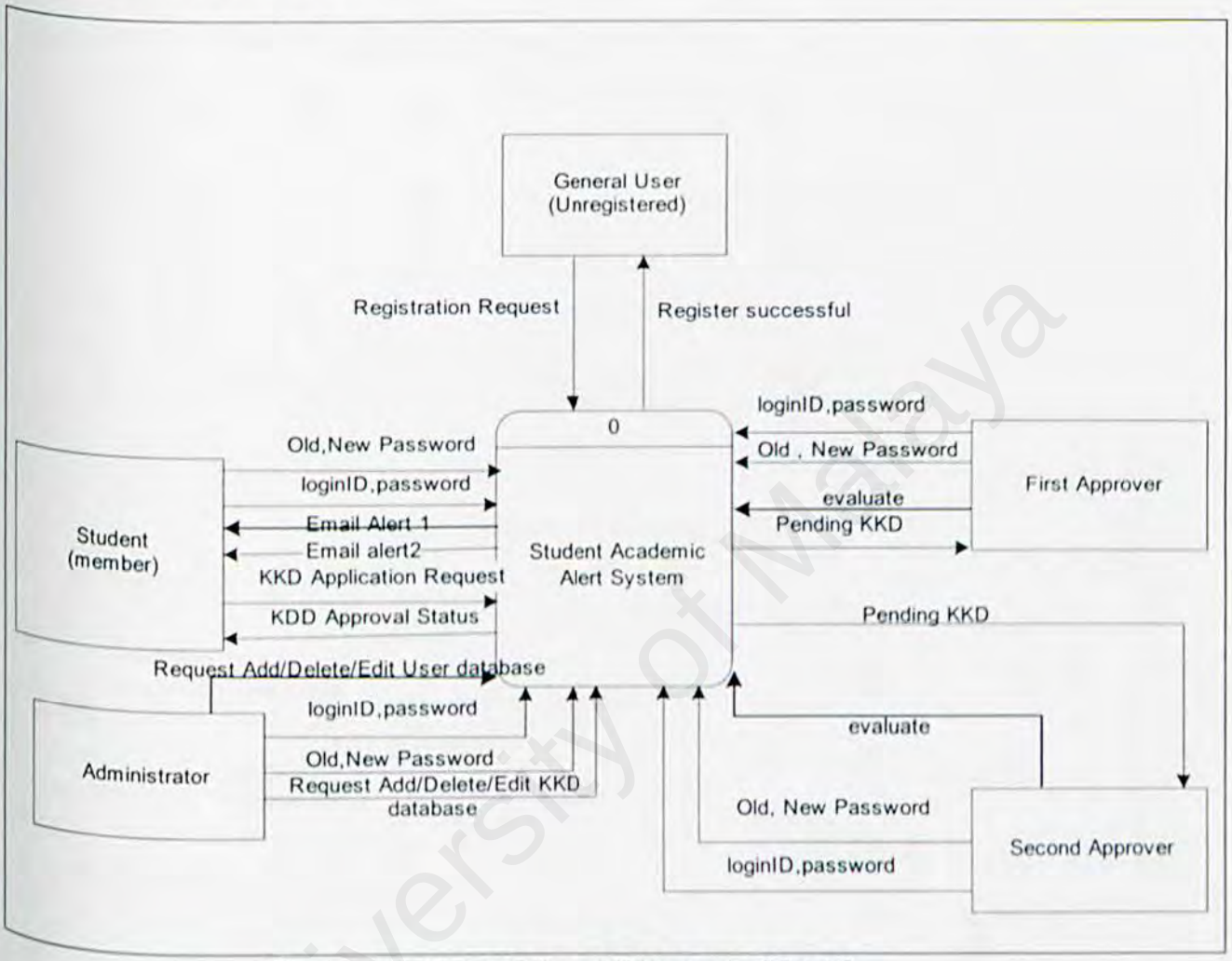


Figure 4-8 Context Level Diagram of SAAS

4.5.2.2 Diagram 0 of General Module

Diagram 0 DFD shows the overall processes for this system

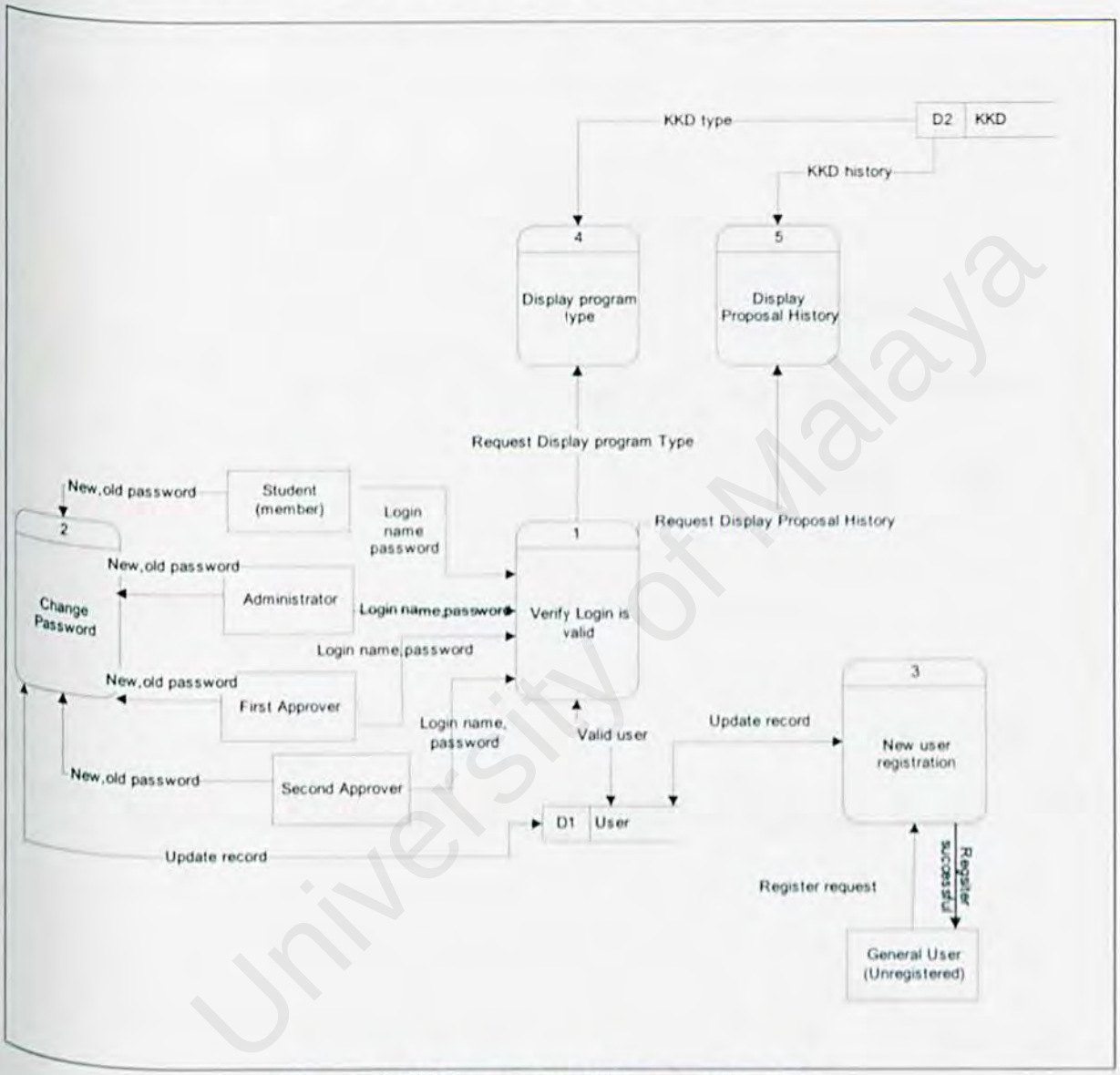


Figure 4-9 Diagram 0 of General Module

4.5.2.3 Diagram 0 of Student Module and Approver Module

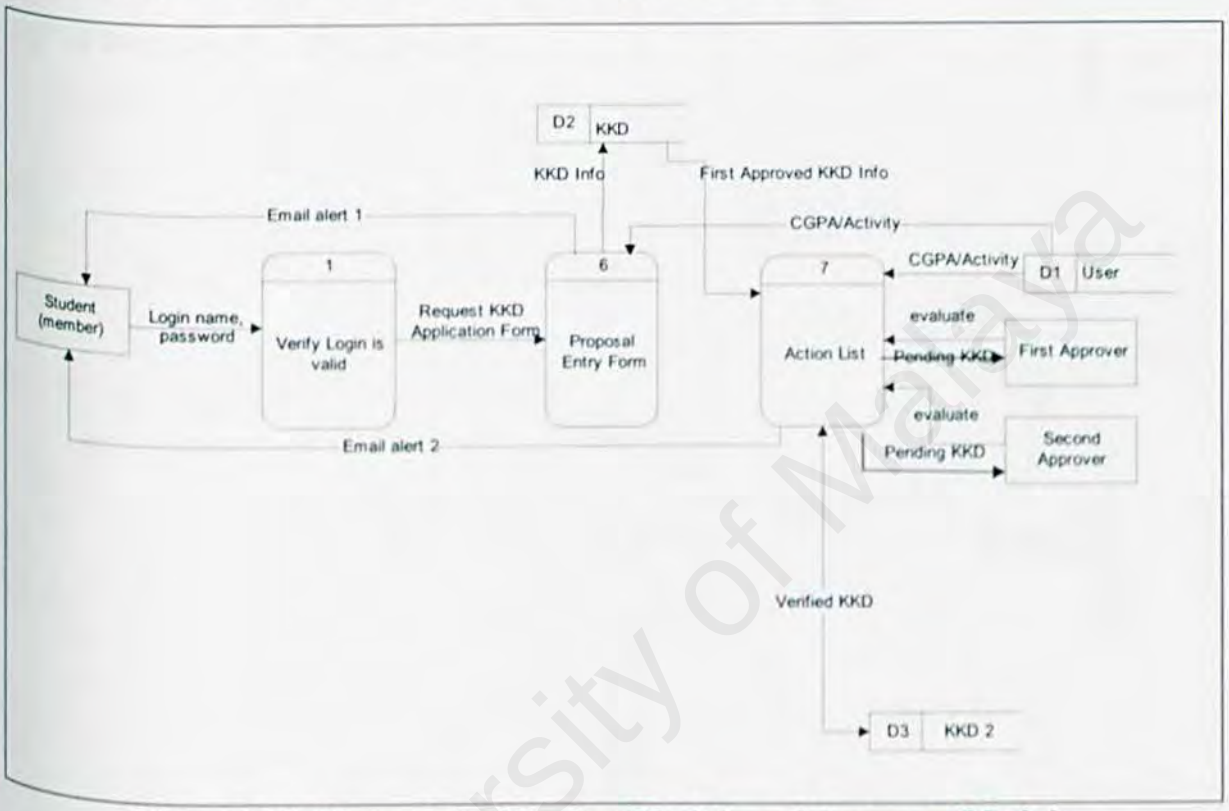


Figure 4-10 Diagram 0 of Student Module and Approver Module

4.5.2.4 Diagram 0 of TNC Module

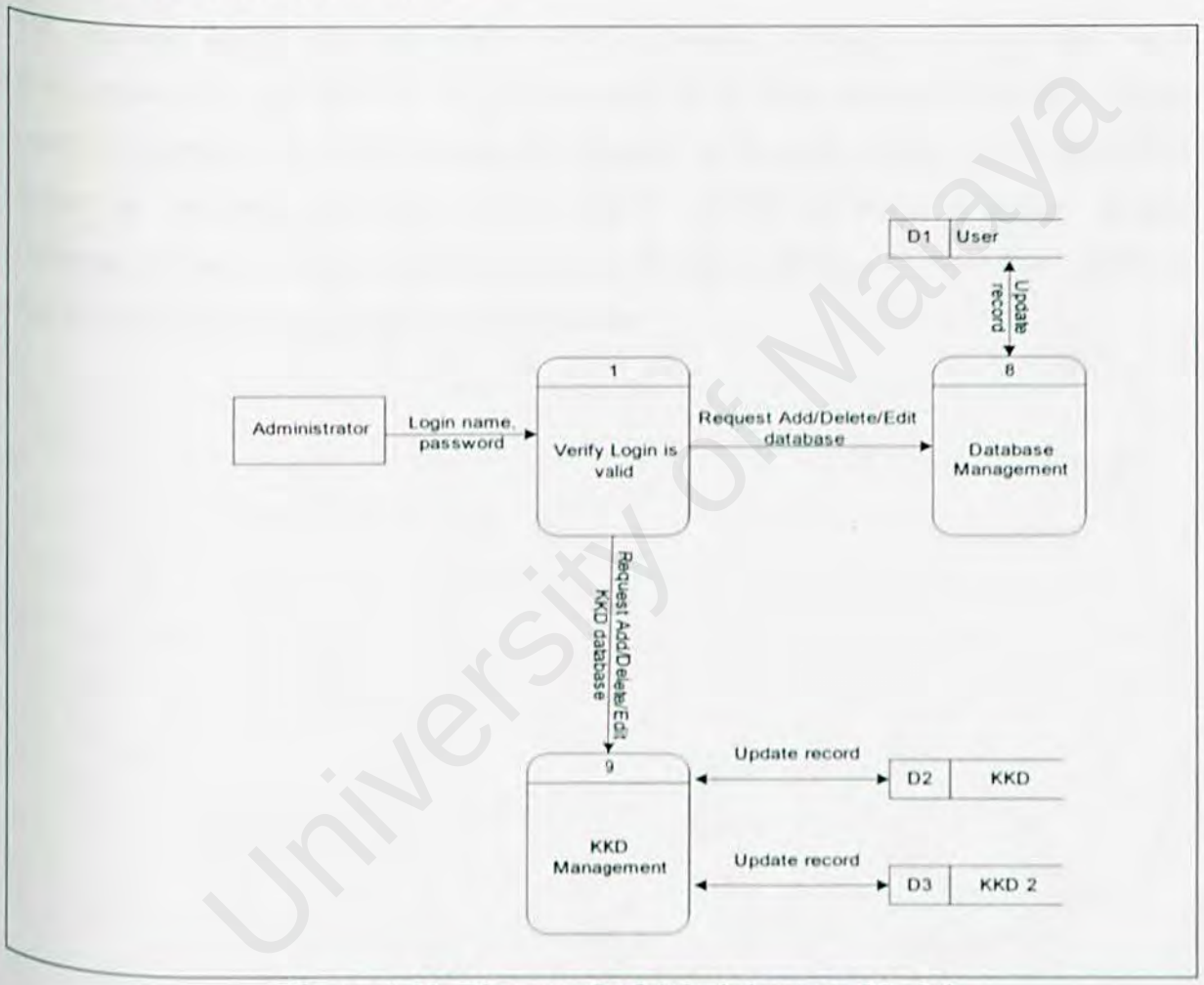


Figure 4-11 Diagram 0 of Administrator Module

4.6 SUMMARY

System design is an important aspect in system development cycle. Things that need to be taking care are program design, which comprises of many modules defined by their functionality such as login module and user module. Graphical user interface design and database design are two other parts in system design, which required extra examination. The data flow of the system needs to be determined and the database is carefully designed out of the framework designed in the early stage. Outcomes of the system are important and need to be predicted during this stage of system design. However, all these designs might need minor or major changes, as there is no promise that all the primary designs are good and perfect.

Chapter 5 -- System Implementation

After the system designing phase on how the system should be functioning, the next process will involves the implementation phase. System implementation is a process that converts the system requirements and designs into program codes. In a software project, the requirements analysis, system design and implementation phases do not have a clear boundary. Each phase tends to overlap one another. This phase at times involves some modifications to the previous design. The implementation phase is an important element especially when it involves a project developed by a team of people where integration of system, works by different people takes a huge effort.

The design phase earlier in the system life cycle is directed towards a final objective which is to translate the concept of the system into a software representation that is understood by the computer. The coding process involves transforming of the design into a programming language. The effort spent in this phase will actually determines the success of the system and ease the processes of modification, debugging, testing, verification, system integration and for future enhancement.

5.1 Development Environment

Development environment plays a major role in determining the speed of developing the system. Using the suitable hardware and software will not only help to speed up the system development but also determine the success of the project. After implementing the system, the requirement of hardware and software that was stated in the previous two chapter (Chapter 3 System Analysis) can be finalized. The final list of the hardware and software tools used to develop the entire Student Academic Alert System(SAAS) is listed below.

5.1.1 Actual Hardware Requirements

The hardware used to develop the system are as listed below:

- 200MHz Pentium Processor
- 128MB RAM
- 52x CD-ROM Drive
- 10.4 GB Hard Disk Drive
- Other standard desktop PC accessories such as keyboard, mouse, monitor, SVGA card and network cards.

5.1.2 Actual Software Tools Requirements

During the SAAS development, a vast array of software tools was used. Table below depicts the software used to develop the system.

Software	Purpose	Description
Windows 2000 Professional	System Requirement	Operating System (OS)
Microsoft Internet Information Server 5.0	System Requirement	Web Server Host
Microsoft SQL Server 2000	Database	Database Server Build the database to store and manipulate data
Microsoft Visual InterDev 6.0	System Development	Development Tools for coding the web pages
Active Server Pages (ASP)	System Development	Programming Language to coding web pages
VBScript	System Development	Scripting Language
JavaScript	System Development	Scripting Language
Hyper Text Markup Language	System Development	Coding the web pages

Internet Explore 5.0	System Development	Web Browser for viewing the web pages
Macromedia Dreamweaver 4.0	User Interface Design	Designing the web pages
Adobe Photoshop 6.0	User Interface Design	Image design and creation
Microsoft Photo Editor	User Interface Design	Image design and creation
Microsoft Word 2000	Documentation	Design and writing Report Documentation

Table 5.1 Actual Software Tools Requirements

5.2 Program Development and Coding

Program development is the process of creating the programs needed to satisfy an information system's processing requirements. Developing and Coding is the phase which takes the longest time in the development life cycle. Therefore, using the right tool and the right way to develop the system are crucial in determining the success of a project. For SAAS , it involves developing using different programming languages from Active Server Pages (ASP), VBScript, JavaScript and Hyper Text Markup Language (HTML). Before starting on the coding process or any other detailed works on the program, a review on the program documentation needs to be done followed by design of the program and finally going into the program coding process.

5.2.1 Review the Program Documentation

The first and foremost step to be taken in program development phase is to review the program documentation that was prepared during the earlier phases. The program documentation prepared in the system design phase of SAAS consists of architectural view, concepts and controls, module flow diagram, data dictionary and also the sample layout of the interface. The documentation provides a guide and an understanding of the works that need to be done in the coding phase.

5.2.2 Designing the Program

After reviewing the program documentation, designing the program is the next following process after that. For this phase, determining how the program can accomplish the features and functions that are described in the program documentation and developing a logical solution to the programming problem is done. The logical solution, or the logic of the program is a step-by-step solution to the programming problems.

5.2.3 Coding Approaches

There are two approaches in coding, namely top-down and bottom-up. The bottom-up coding is based on coding some complete lower level modules and leaving the high-level modules merely as skeletons that are used to call the lower modules, whereas the top-down approach is the reverse.

SAAS was developed modularly using both the top-down and bottom-up approaches. Developing SAAS with top-down approach involves building the high-level software modules that are refined into functions and procedures. The advantages of using bottom-up approach in SAAS are:

1. Testing can begin on some of the modules while others are still being coded.
2. Critical functions can be coded first to test their efficiency.

5.2.4 Coding Style

Coding style is an important attribute of source code. An easy to read source code makes the system easier to maintain and enhance. Elements taken into considerations while coding a easy to maintain and enhance system are internal documentation, standard naming convention and standard graphical user interface.

Internal documentation is achieved by using comments while coding, providing a clear guide to programmers for future enhancement. Statements of purpose indicating the

functions of modules and descriptive comment are embedded into source code to describe the processing functions.

A standard naming convention and also a standard usage of graphical user interface components is employed in developing the system making. Standard naming convention provides programmers with easy identification of variables. While a standard in usage of graphical user interface components provides the users an environment that will not generate much surprise to them. Usages of these standards perform as a mean towards coding consistency and standardisation.

5.3.1 Web Pages Coding

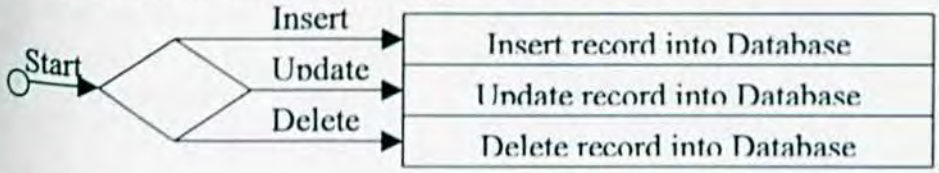
An Active Server Page is primarily a scripting environment. Languages used to develop an ASP are HTML and VBScript or JavaScript. The challenge of coding in ASP is of determining and separating the HTML source code from the scripting counterpart.

The scripting language used by the ASP application is specified by using the statement <%@ LANGUAGE="VBSCRIPT"%>. This statement is placed at the beginning of the ASP application. The LANGUAGE keyword can be set equal to any supported scripting language, such as JavaScript. For client-side scripting, they must be delimited by the <SCRIPT LANGUAGE ="VBSCRIPT">……</SCRIPT> tags.

On the other hand, server-side scripting requires the RUNAT attribute set to Server so that the script should be executed on the server rather than the client (browser). An example is as below:

Server Script Coding Example

<SCRIPT LANGUAGE="VBScript" RUNAT="server">



</SCRIPT>

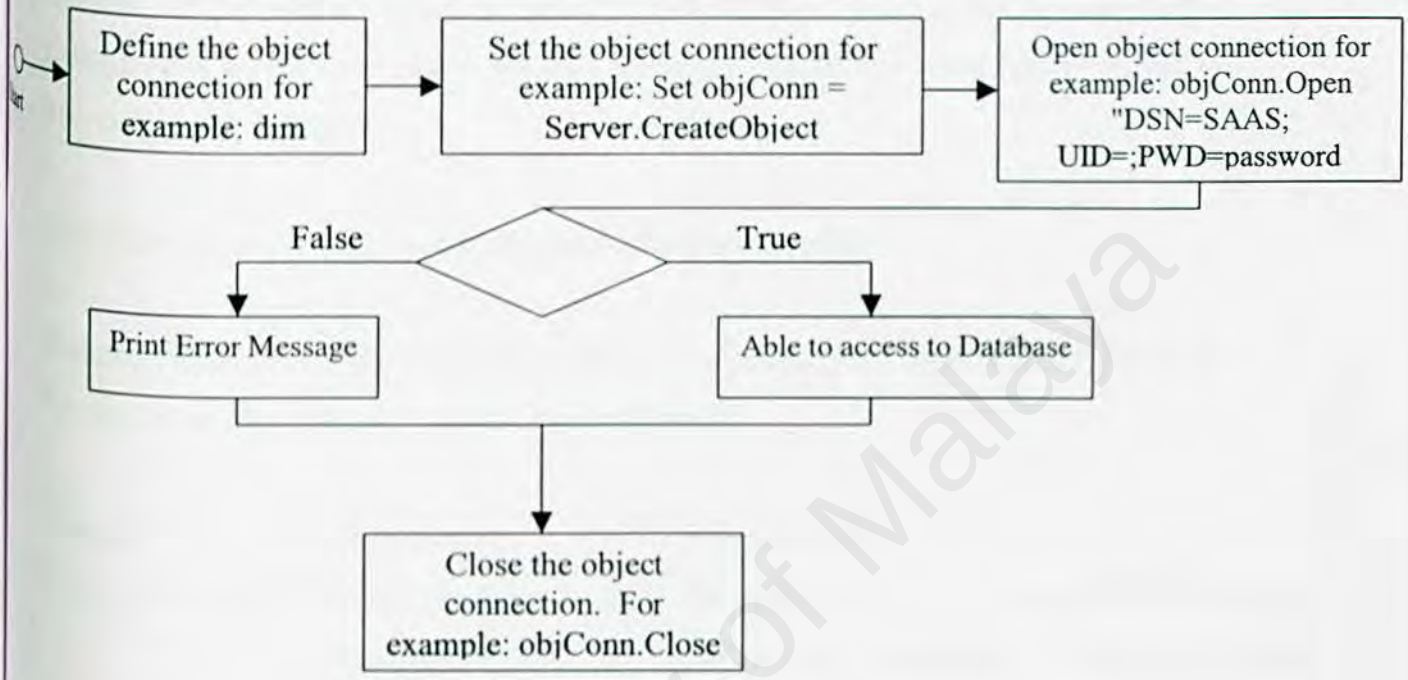
5.3.2 Database Connection

ActiveX Data Object (ADO) is used to store and retrieve data from a database. ADO is a group of objects designed to provide a simple programming interface to databases. To make the database available to Active Server Pages, database must be placed on the Web server and create an ODBC DSN that points to its location.

All communication with a database takes place through an open connection. Before any information can be inserted into or retrieved from a database, a connection with the database must be opened. The ADO Connection object serves the purpose. Below are a few steps to follow in order to open a database connection.

1. Create an instance of the Connection object to open a connection with the database.
2. Call the Open method of the Connection object to actually open the connection.

Below is an example for SAAS Database Connection:



5.3.3 Development Tool - Microsoft Visual InterDev

This tool enables easy performance of the many complex programming and database tasks required in the creation of a web site, as well as the incorporation of HTML formatting and layouts, graphics and other multimedia components.

When working on a web site with Visual InterDev and performing tasks like adding files to the site or editing any of the existing files, this tool creates a second copy of the files on the local computer. This is called the working copy. Whenever these working copies are saved, Visual InterDev updates the file on the web server as well.

5.3.4 Debugging

Debugging was carried out when the particular functions or codes did not perform what is intended or the worse is that it prompt error when is run or during compilation. Debugging of codes are made easier with the usage of IDE tool when coding in HTML with embedded ASP tags.

5.3.5 Description of The System Modules and Functionality

Basically SAAS can be categorized into 3 sections. The table below shows the description on each module and also its functionality.

Module	Description	Functionality
Member Section	Member can login to the system for submit proposal using password that was given by the user on the SAAS.	Member whose from different club submit the proposal regarding to the SAAS after login to the system.
TNC (HEPUM)Section	TNC(HEPUM) personnel Login to the system using password that are given by the system administrator	Enable personnel of TNC (HEPUM) to view proposal submitted by head of all clubs and society.Personnel can whether approve or reject proposal and monitoring student academic performance.Beside,personnel can register a new system user.
Head of Club,Society and Residential College Section	Head of club,society and residential college can login to the system using password that are given by the system administrator	Allow head from all department to view proposal that entitled to their club,society or even college and whether approve or reject the student's submitted proposal online.

Table 5.2 Module Function Description

5.4 Chapter Summary

The implementation assures that the system being developed is operational and then allowing the users to take over its operation for use. After the detail explanation of the implementation phase, the next chapter will discuss about the testing phase. This is also a very important stage whereby testing is essential to assure quality of the system.

6. Chapter 6 -- TESTING

6.1 Introduction

After the development and coding in implementation phases, this is followed by the system testing stage. Here is a testing principle which can help to guide system testing.

- All tests should be traceable to system requirements.
- Test should be planned long before testing begins. Testing planning can begin as soon as the requirement model is complete.
- Test should begin "in the small" and progress towards testing "in the large". The first test planned and executed generally focus on individual components. As testing progress, focus shifts in an attempt to find errors in integrated clusters of components and ultimately in the entire system.

Testing is an essential series of steps that helps assure quality of the system. It is done on many different levels at various intervals as work progresses. The testing strategies that will be used include unit testing, integrated testing and system testing. Each of these strategies will be discuss in the further detail in the following sections.

6.2 Unit Testing

After a program is completely coded, it will be tested under unit testing. Individual components are tested to ensure that they operate correctly. Each component is tested independently, without other system components. Test cases are developed to show

that the input is properly converted to the desired output. The following are examples of the unit testing that have been done previously.

6.2.1 SAAS Application

6.2.1.1 General Module

1. Unit test case for login.

Whenever the user wants to login or entering into the restricted area, the system is able to perform authentication and give different access view for different type of users. For example, the normal user will be restricted from viewing the TNC(HEPUM) module. Whenever a user has signed in, the system is able to keep track the authorized user's identity.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Insert the valid TNC(HEPUM)'s user name and password.	Able to log in successfully.	The TNC(HEPUM)'s module will be displayed which is different than the user's module.
2.	Insert valid member name and password.	Able to log in successfully.	The user's module will be displayed which is different than the TNC(HEPUM) or Head Club module.
3.	Insert invalid member/ TNC(HEPUM) or Head Club name and	Access is denied.	Error message is prompt to inform user invalid login,please try again.

	password.		
4.	Insert an invalid user name and a valid password.	Access is denied.	Error message is prompt to inform user invalid login.
5.	Insert valid username and an invalid password.	Access is denied.	Error message is prompt to inform user invalid login

Table 6.1 : Unit test case for login.

2. Unit test case for user logout process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Click on the logout hyperlinks	Able to logout successfully.	The login page module will be displayed and user unable to return to the previous page.

Table 6.2 : Unit test case for logout.

3. Unit test case for user Change password process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Insert the valid password and reenter valid password	Able to update user password successfully.	Password is updated and user can use new password to login again
2.	Insert invalid	Access is denied	Error message is displayed to

	password and valid confirm password		inform user password does not match each other in,please try again.
3.	Insert valid password and invalid confirm password.	Access is denied.	Error message is prompt to inform user password does not match each other and try again.
4.	Leave both password field blank and click submit	Access is denied.	Error message is prompt to inform user one of the password is blank.

Table 6.3 : Unit test case for change password.

6.2.1.2 Member Module

1. Unit test case for Submit a new proposal process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Submit button is clicked without inserting all the required data such as program organiser, name,title,objective,location and date	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty field
2.	Submit button is clicked after inserting all the required data such as program organiser, name,title,objective,location and date	No errors found.	When the user click on the "save and continue with next section" data successfully add to the database and redirect to next page

Table 6.4 : Unit test case for submit new proposal.

2. Unit test case for member add in program's participant process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Leave the all field's blank	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty field
2.	Fill up all required and click "Save and Next"button	No errors found.	Participant's name and matrics is successfully added into the participants list
3.	Click on the remove button beside the participant matrics number	No errors found	Participant that added just now is successfully remove from the participants list.
4.	Click on "save and next" button	No errors found	User will be confirmed to add the particular participant in the list and click 'OK' will successfully proceed to another page which is program tentative page.

Table 6.5 : Unit test case for submit new proposal.

6.2.1.3 Head of Club,Society or Residential College Module

1. Unit test case for retrieve pending proposal

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Clicking the Proposal management will link user to View Proposal page	No errors found.	All member applied proposal that is not being approved by TNC is pending and displayed on the proposal pending list
2.	Click on the action icon in the action column	No errors found.	The particular proposal is retrieve from the database and participants with CGPA < or (2<=CGPA<=3) and clubamount >3 or CGPA>3.0 and with club amount more than 4 is display in red color
3.	Submit the form without select the status drop down menu	No errors found.	Alert messga"Please select an option"prompt out

Table 6.6 : Unit test case for Pending Proposal List.

2. Unit test case for Propsal Evaluation Section

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	After clicking action icon on pending proposal list	No errors found.	The particular proposal is retrieve from the database and participants with CGPA < or (2<=CGPA<=3) and clubamount >3 or CGPA>3.0 and with club amount more than 4 is display in red color
2.	Submit the form without select the status drop down menu	No errors found.	Alert message"Please select an option"prompt out,request user to choose an option.
3.	Submit the form after choose an option from the drop down menu	No errors found.	A message displayed that the proposal is submitted and request user to back to the previous page.

Table 6.7 : Unit test case for Proposal Evaluation Section.

6.2.1.4 TNC(HEPUM) Module

1. Unit test case for user registration process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Submit button is clicked without inserting all the required data such as matrics number ,username,password, email address confirm password.	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty text or password box.
2.	The non-alphanumeric value is entered to the username entry box.	No errors found.	An alert box will be displayed. When the user clicks the OK button, the cursor will point to the relevant text box.
3.	Insert all the required and valid value.	Errors found are corrected.	An alert box will be displayed. If the user clicks the OK button, the system proceeds to the next page and otherwise if the user clicks the CANCEL button.
4.	Insert different passwords value in both password entry	No errors found.	The system will check the value of both password and re-enter password..

	boxes.		
4.	Insert an existing or already used user name.	Errors found are corrected.	Error message is prompt to inform user.Chances are given for the user to input another user name.
5.	Insert all the required and valid value with the non-existing user name.	Errors found are corrected.	The registration successful message is displayed.The system must be able to store all the information correctly to the database,so checking to the database is a necessary step for verification.

Table 6.8 : Unit test case for user registration process.

6.3 Integration Testing

Integration testing is performed after all objects, components and individual sub modules have passed local unit tests. Its objective is to take components and build a program structure, which has been dictated by design. It is where combined modules dependent on each other are tested to determine whether they function together as one system. The testing is necessary because problems might occur only when the modules are integrated together, although the modules have been individually tested to be functioning properly. Integration testing aims to expose the problem resulted from the combination of modules.

Performing integration testing will ensure that there is valid linking and dynamic relationship established between sub modules and modules of the whole system. Testing is carried out in small segments so that errors will be easier to isolate and correct. Testing is repeated for every module of the system to ensure that all the modules are functioning properly and error- free.

The top-down approach is adopted for integration testing. The top level, usually one controlling components called by the tested component(s) are combined and tested as a large unit. This approach is reapplied until all components are incorporated.

A component being tested may call another that is not yet tested, so a stub is written to simulate the activity of the missing component. The stub answers the calling sequence and passes back output data that lets the testing process continue.

For example, if the add participant in the member proposal submission section is not yet tested when the testing of add program tentative, then a stub will be written to pass back a fixed student ID to allow testing to proceed. The figure 6.1 shows the component hierarchy in SAAS project.

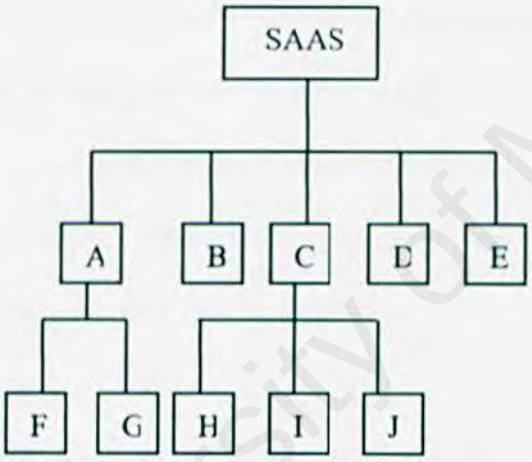


Figure 6.1 : Component Hierarchy

Definition
A - User Authentication
B - User Registration Process
C – Proposal Evaluation Process
D – Update Password
E - Add Participant Process
F - Login
G - Logout
H - Email Alert Participant
I - Delete Participant's Participation
J - Update Member's Proposal Status

First of all, only the top component, SAAS is tested by itself, with stubs needed for Web application. Once tested, it is combined with the components in the next level, which are A, B, C, D, E, and tested together. Stubs may be needed for components F,G,H,I and J. Finally, the entire system is tested.

6.4 System Testing

System testing is the final step of the testing stages that involves a series of different tasks with the primary purpose to fully exercise the complete system. System testing is the stage where the whole system integrated. The objective of the system testing is to validate and verify the functional requirements and non-functional requirements. Several steps, such as functional testing, performance testing and acceptance testing were carried out.

a) Functional testing

Functional testing focuses on system functionalities. Several guidelines were employed for the functional testing

i) High fault detection probabilities

ii) Know and anticipate expected input and actions.

iii) Test all valid and invalid input types.

iv) Include stopping criteria.

Besides, every process flow of the system is being tested to ensure the overall flow function properly. Furthermore, it also ensures well communication and linking among each module. The connection between the program and database is tested to ensure the accuracy of the input and output data. Test cases are carried out to ensure

that all components in the modules work accordingly as a larger system testing after integrating with the software elements as well as hardware elements

b) Performance testing

Performance testing addresses the non-functional requirements of the system. Performance objectives highlighted in the non-functional requirements such as flexibility, ease of use, accuracy and reliability are used as guidelines to measure system performance.

c) Acceptable testing

Acceptable testing is carried out to determine whether the system is indeed usable or able to meet the expectation of users especially the lecture and modurator.

6.5 End User Evaluation

End user evaluation is a process of evaluating the capability and usability of the developed system.This phase involves several assessment procedures that will gauge the success level of SAAS project.The evaluation was carried out to 2 office clerks, 2 human resource officers, 3 computer science students, 2 students of other faculties and 3 youngsters from secondary school. Overall, the clerks and human resource officers comment that the whole design of SAAS is fine and pleasant-looking. Most of the students agree that the process functionality is easy to be learned and attractive.Besides, they also find the navigation from one page to another is easy.Their average evaluation for graphic user interface and system functionality is good.

6.6 Summary

Conclusively, the topic of system testing is discussed about the objectives and plan in testing. The testing strategies had been carried out to perform the process are unit testing, integrated testing and system testing. Each strategy perform different testing task to ensure that the fully functionality and quality of the whole system.

Chapter 7 -- System Evaluation

7.1 Introduction

System evaluation is a process at the end of development process. Generally, some several technical and non-technical problems were encountered during the development stage. However, most of the problems were defeated and resolved eventually. In this phase, SAAS system will be evaluated to identify its total strength and limitation. Changes and current enhancement will be stated as a reference. Besides, proper recommendations and proposal will be suggested to enhance system performance and functionality in the future.

7.2 Problems Encountered and Solutions

7.2.1 Difficulties in Determining the System Scope

Due to the insufficient knowledge in system analysis and time constraint, it is impossible to build a full, complete scale system within the given time frame. To solve this problem, reference on current web site has been done in order to understand the system design. Besides, discussion with the supervisor has also been conducted to adopt some ideas into the system design.

Research and studies on the fields such as the systems similar to Student Academic Alert System are not much available in the Internet. There is no specific definition or terms of a system calling "Alert System".While for Alert System, almost all of the demo system are not in full package and the real system are costly and too complex to develop. At the beginning development of the system, I have confused and misunderstand of the scope of my system. Fortunately, through the guidelines from my supervisor and moderator, I get some idea in developing this system.Besides that, grasping the concepts of a totally new programming environment in Microsoft SQL Server 2000 using Active Server Page (ASP), VBScript and JavaScript are also take times to learn and master. A study though out the books does not guarantee you know how to apply it practically in your system. Moreover, many problems and difficulties appeared during the whole system

development. Few of the major problems and difficulties encountered during the development and coding process is listed below.

7.2.2 Difficulties In Choosing A Development Technology, Programming Language and Tools

There are many software tools available to develop a web-based database system currently as stated in the earlier chapters. Choosing a suitable technology and tool was a critical process as all tools have their strengths and weaknesses. In addition, the availability of the required tools for development is also a major consideration.

In order to solve this problem, advises and views were sought from project supervisor, course mates and even seniors engaging in similar project. Furthermore, surfing the Internet and visiting the library helped to clarify some doubts.

7.2.3 Getting Familiar with Development Platform and Tools

Microsoft Visual Interdev 6.0

While developing SAAS system, the first difficulty that is encountered is about the learning of the tools needed for development of the system. Through the teaching from my team members, I am getting a basic knowledge on how to work with this development tools.

Visual InterDev 6.0 is Microsoft's latest Rapid Application Development (RAD) development tool for Web applications. It was renumbered to fit the Visual Studio 6.0 development suite that also includes Visual Basic, Visual C++, and Visual J++. Visual InterDev 6.0 is a major upgrade that improves the development environment and product integration among the family of products within Visual Studio.

Visual InterDev is a complex product with many development and management features. Once you understand the technology of Active Server Pages, VBScript, JavaScript, and Active X Data Objects, you realize that Visual InterDev is really an all-in-one development tool for creating data-driven Web applications

Microsoft SQL Server 2000 (Developer Edition)

For first time user, especially for those who are not familiar with Microsoft SQL Server Database platform, like me facing some difficulties when using and configuring this software application database server. For example, at the beginning of my system development duration, I was unable to insert data into the database because of the incorrect setting. These force me to reinstalled the program again. By following the instruction though out the reference books the program was configured correctly.

7.2.4 Lack of knowledge in the Email application

The SAAS developer lack of knowledge in email application. It consumes a lot if time to explore the email development method, such as the SMTP configuration in IIS server as well as ASP .

To solve this problem, Internet is the most vital source. There are a lot of source codes, free tutorials and development ideas. In additional, the online forum is another way to help on solving the problems occurred during the SAAS system development.

7.2.5 Programming Languages and Tools

The programming language that been used to develop the whole SAAS system was Active Server Page (ASP) and the VBScript or JScript are as the scripting language.

An Active Server Page (ASP) is an HTML page that includes one or more scripts (small embedded programs) that are processed on a Microsoft Web server before the page is sent to the user. An ASP is somewhat similar to a server-side include that all involve programs that run on the server, usually tailoring a page for

the user. Typically, the script in the Web page at the server uses input received as the result of the user's request for the page to access data from a database and then builds or customizes the page on the fly before sending it to the requestor.

ASP is a feature of the Microsoft Internet Information Server (IIS), but, since the server-side script is just building a regular HTML page, it can be delivered to almost any browser. You can create an ASP file by including a script written in VBScript or JScript in an HTML file or by using ActiveX Data Objects (ADOs) program statements in the HTML file. You name the HTML file with the ".asp" file suffix. Microsoft recommends the use of the server-side ASP rather than a client-side script, where there is actually a choice, because the server-side script will result in an easily displayable HTML page. Client-side scripts (for example, with JavaScript) may not work as intended on older browsers.

Problems that arise regarding the programming languages and tools would mostly because of limited knowledge programming in this few language. This major programming language being used –Active Server Pages (ASP) are totally new for me. In order to solve that, seeking help from others team members and thesis students who are also using ASP as their development tools and having exchange in views and knowledge helps to gain extra knowledge about the language. Besides that, by analysing references source code, and view the output results through the browser, you will get a better understanding of the function writing in those language.

7.3 System Strengths

7.3.1 Usability and Attractive Interface

The interface has been design in a way that eliminates typing need when the user input the data by having the effective use of hyperlink, icons and selection control. As an example, a standard header and hyperlinks are placed in every page to make sure that the users are able to navigate smoothly through the web site by using the simple 'point and click' method.

Furthermore, the interface design has been made attractive by choosing the appropriate color and font combination as well as text arrangement. Furthermore, colorful animations have been design for the welcome page to draw users' attention.

7.3.2 Setting Up an Own Web Server

A customized IIS server has been configured for both Web application. This software is able to be customized by changing the setting to improve the performance. Therefore, no commercial uploading services (eg. Geocities.com, Angelfire.com) is needed which at time are not functioning properly..

7.4 Future Enhancements

System development is a dynamic process and changes must be expected. For this information system, there can still have some improvements. Here are some suggestions for future enhancements to increasing the powerful of the whole SAAS system :

a) All the report can be printed

If the all the business reports and information can be printed in a hardcopy, this utilities will fulfilled the user requirements

b) Help Function

A Help function should be added into the system to provide information to all the user especially for the beginner user to operate with each module.

c) Login access Control

To increase the security of the system especially for SAAS's member property, it is better to enhance this system that will only given 3 chances for employee to login to the system like an ATM machine. System will not allow the user to access the system even though the correct password is entered the fourth time.

d) Attractive Homepage

SAAS will become better publicized if its homepage is enhanced to be more attractive and interactive by adding more meaningful and user-friendly images, 3D images, animation images and sounds.

e) More Modules and Functions

Adding more modules and functions, for example, Forum and Chatting Services can enhance SAAS System. Moreover, 3D chart result can be used to attract more users using the system.

f) User Customisation

User customisation is what currently most service providers are providing their users with. With user customisation, users can determine the contents of the site that they wish to have or member services that they intend to have. As user customisation will involve yet another complex and detailed planning to be done, it will be a good and beneficial service to be provided to users as a future enhancement.

6. Chapter 6 -- TESTING

6.1 Introduction

After the development and coding in implementation phases, this is followed by the system testing stage. Here is a testing principle which can help to guide system testing.

- All tests should be traceable to system requirements.
- Test should be planned long before testing begins. Testing planning can begin as soon as the requirement model is complete.
- Test should begin "in the small" and progress towards testing "in the large". The first test planned and executed generally focus on individual components. As testing progress, focus shifts in an attempt to find errors in integrated clusters of components and ultimately in the entire system.

Testing is an essential series of steps that helps assure quality of the system. It is done on many different levels at various intervals as work progresses. The testing strategies that will be used include unit testing, integrated testing and system testing. Each of these strategies will be discuss in the further detail in the following sections.

6.2 Unit Testing

After a program is completely coded, it will be tested under unit testing. Individual components are tested to ensure that they operate correctly. Each component is tested independently, without other system components. Test cases are developed to show

that the input is properly converted to the desired output. The following are examples of the unit testing that have been done previously.

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6.2.1.1 General Module

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Whenever the user wants to login or entering into the restricted area, the system is able to perform authentication and give different access view for different type of users. For example, the normal user will be restricted from viewing the TNC(HEPUM) module. Whenever a user has signed in, the system is able to keep track the authorized user's identity.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Insert the valid TNC(HEPUM)'s user name and password.	Able to log in successfully.	The TNC(HEPUM)'s module will be displayed which is different than the user's module.
2.	Insert valid member name and password.	Able to log in successfully.	The user's module will be displayed which is different than the TNC(HEPUM) or Head Club module.
3.	Insert invalid member/ TNC(HEPUM) or Head Club name and	Access is denied.	Error message is prompt to inform user invalid login,please try again.

	password.		
4.	Insert an invalid user name and a valid password.	Access is denied.	Error message is prompt to inform user invalid login.
5.	Insert valid username and an invalid password.	Access is denied.	Error message is prompt to inform user invalid login

Table 6.1 : Unit test case for login.

2. Unit test case for user logout process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Click on the logout hyperlinks	Able to logout successfully.	The login page module will be displayed and user unable to return to the previous page.

Table 6.2 : Unit test case for logout.

3. Unit test case for user Change password process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Insert the valid password and reenter valid password	Able to update user password successfully.	Password is updated and user can use new password to login again
2.	Insert invalid	Access is denied	Error message is displayed to

	password and valid confirm password		inform user password does not match each other in,please try again.
3.	Insert valid password and invalid confirm password.	Access is denied.	Error message is prompt to inform user password does not match each other and try again.
4.	Leave both password field blank and click submit	Access is denied.	Error message is prompt to inform user one of the password is blank.

Table 6.3 : Unit test case for change password.

6.2.1.2 Member Module

1. Unit test case for Submit a new proposal process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Submit button is clicked without inserting all the required data such as program organiser, name,title,objective,location and date	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty field
2.	Submit button is clicked after inserting all the required data such as program organiser, name,title,objective,location and date	No errors found.	When the user click on the "save and continue with next section" data successfully add to the database and redirect to next page

Table 6.4 : Unit test case for submit new proposal.

2. Unit test case for member add in program's participant process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Leave the all field's blank	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty field
2.	Fill up all required and click "Save and Next"button	No errors found.	Participant's name and matrics is successfully added into the participants list
3.	Click on the remove button beside the participant matrics number	No errors found	Participant that added just now is successfully remove from the participants list.
4.	Click on "save and next" button	No errors found	User will be confirmed to add the particular participant in the list and click 'OK' will successfully proceed to another page which is program tentative page.

Table 6.5 : Unit test case for submit new proposal.

6.2.1.3 Head of Club,Society or Residential College Module

1. Unit test case for retrieve pending proposal

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1.	Clicking the Proposal management will link user to View Proposal page	No errors found.	All member applied proposal that is not being approved by TNC is pending and displayed on the proposal pending list
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3.	Submit the form without select the status drop down menu	No errors found.	Alert messga"Please select an option"prompt out

Table 6.6 : Unit test case for Pending Proposal List.

2. Unit test case for Propsal Evaluation Section

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	After clicking action icon on pending proposal list	No errors found.	The particular proposal is retrieve from the database and participants with CGPA < or (2<=CGPA<=3) and clubamount >3 or CGPA>3.0 and with club amount more than 4 is display in red color
2.	Submit the form without select the status drop down menu	No errors found.	Alert message"Please select an option"prompt out,request user to choose an option.
3.	Submit the form after choose an option from the drop down menu	No errors found.	A message displayed that the proposal is submitted and request user to back to the previous page.

Table 6.7 : Unit test case for Proposal Evaluation Section.

6.2.1.4 TNC(HEPUM) Module

1. Unit test case for user registration process.

No.	Test procedure	Output / Error	Analysis of Test Result / Solution
1.	Submit button is clicked without inserting all the required data such as matrics number ,username,password, email address confirm password.	No errors found.	The system will check and validate the form completeness. An alert box will be displayed if any of the required data is empty. When the user clicks the OK button, the cursor will points to the empty text or password box.
2.	The non-alphanumeric value is entered to the username entry box.	No errors found.	An alert box will be displayed. When the user clicks the OK button, the cursor will point to the relevant text box.
3.	Insert all the required and valid value.	Errors found are corrected.	An alert box will be displayed. If the user clicks the OK button, the system proceeds to the next page and otherwise if the user clicks the CANCEL button.
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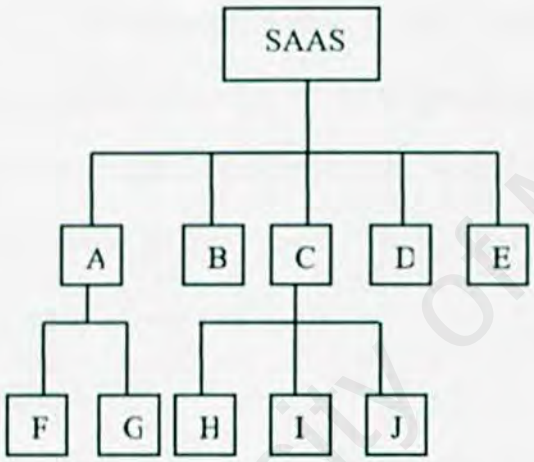

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C – Proposal Evaluation Process
D – Update Password
E - Add Participant Process
F - Login
G - Logout
H - Email Alert Participant
I - Delete Participant's Participation
J - Update Member's Proposal Status

First of all, only the top component, SAAS is tested by itself, with stubs needed for Web application. Once tested, it is combined with the components in the next level, which are A, B, C, D, E, and tested together. Stubs may be needed for components F,G,H,I and J. Finally, the entire system is tested.

6.4 System Testing

System testing is the final step of the testing stages that involves a series of different tasks with the primary purpose to fully exercise the complete system. System testing is the stage where the whole system integrated. The objective of the system testing is to validate and verify the functional requirements and non-functional requirements. Several steps, such as functional testing, performance testing and acceptance testing were carried out.

a) Functional testing

Functional testing focuses on system functionalities. Several guidelines were employed for the functional testing

i) High fault detection probabilities

ii) Know and anticipate expected input and actions.

iii) Test all valid and invalid input types.

iv) Include stopping criteria.

Besides, every process flow of the system is being tested to ensure the overall flow function properly. Furthermore, it also ensures well communication and linking among each module. The connection between the program and database is tested to ensure the accuracy of the input and output data. Test cases are carried out to ensure

that all components in the modules work accordingly as a larger system testing after integrating with the software elements as well as hardware elements

b) Performance testing

Performance testing addresses the non-functional requirements of the system. Performance objectives highlighted in the non-functional requirements such as flexibility, ease of use, accuracy and reliability are used as guidelines to measure system performance.

c) Acceptable testing

Acceptable testing is carried out to determine whether the system is indeed usable or able to meet the expectation of users especially the lecture and modurator.

6.5 End User Evaluation

End user evaluation is a process of evaluating the capability and usability of the developed system.This phase involves several assessment procedures that will gauge the success level of SAAS project.The evaluation was carried out to 2 office clerks, 2 human resource officers, 3 computer science students, 2 students of other faculties and 3 youngsters from secondary school. Overall, the clerks and human resource officers comment that the whole design of SAAS is fine and pleasant-looking. Most of the students agree that the process functionality is easy to be learned and attractive.Besides, they also find the navigation from one page to another is easy.Their average evaluation for graphic user interface and system functionality is good.

6.6 Summary

Conclusively, the topic of system testing is discussed about the objectives and plan in testing. The testing strategies had been carried out to perform the process are unit testing, integrated testing and system testing. Each strategy perform different testing task to ensure that the fully functionality and quality of the whole system.