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ABSTRACT

Creativity is an important cognitive construct much sought after in both the education and work environment. Currently, creativity has been given much emphasized in education and both teachers and students are given the necessary training and support by the Education Ministry to enhance this potential.

However, creativity assessment has always posed a big challenge. Most valid and reliable creativity tests have been very difficult to score. The laborious scoring procedure has driven researchers and educators to use less reliable and valid measures.

To overcome this problem, a computer program called the Creativity Assessment System (CAS) was developed to help researchers and educators as well as employers and recruiters to score responses of their students or employees easily.

CAS is a system use to assess the creativity level of user which based on three main dimensions, namely Fluency, Flexibility and Originality. This system was designed as a total package whereby it not only gives a valid and reliable score, but also gives immediate interpretation of the respondents' scores as well as recommendations on how they will be able to enhance their level of creativity.

ACKNOWLEDGEMENT

First and foremost, I would like to thank **Faculty of Computer Science and Information Technology (FCSIT)** which accommodates these Latihan Ilmiah WXET 3181 and WXET 3182 into our courses. Through these courses, I can gain experience on how to develop a system and how to handle a real-time project by cooperate with lecturer from Education Faculty.

I would like to acknowledge with gratitude the opportunity given by my supervisor, **Dr.Teh Ying Wah** and **Dr.Ananda** from Education Faculty. I am appreciating for the guidance and patience that given by my supervisor to supervised me on my system. Not forget to thank to Dr.Ananda for his requirement and opinion on the system. With the cooperation between FSKTM and Education Faculty for this project, this group system also has a chance to participate in the Malaysia Technology Expo on February, 2006 and won a Silver Medal.

My sincere appreciation also goes to **Pn.Sri Devi** for her constructive criticism with many valuable suggestions and also as being my moderator for this project. Thank for her precious time to give viva for me.

Next is my partner for this group project, **Low Syuk Wah**. I would like to record my sincere gratitude to my partner who working together with me, we complete the system and solve problem together.

Last but not least, I would like to express my heartfelt thanks to my entire fellow friend who have been giving a helping hand to complete my system when I face a problem. Thanks for their support and advice.

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CHAPTER 1: INTRODUCTION

1.1 Project Overview

Creativity is vital for both education and organization that want to develop new and novel ideas for problem solving, opportunity finding, innovation and change. Creativity can be encouraged by changing a person's mindset or paradigm.

However, most valid and reliable creativity assessment tests, especially the Torrance Tests of Creative Thinking or TTCT both the Verbal and Figural versions which are used worldwide have been very difficult to score. The scoring procedures have driven researchers and educators to use less reliable and valid measures.

To solve this problem, CAS, an innovative and dynamic computer system designed to provide the most accurate and instant assessment of one's creativity by employing an intelligent and dynamic database that constantly updates itself based on the responses given. It assesses 3 main dimensions of creativity, namely **Fluency**, **Flexibility** and **Originality** as defined by J.P.Guilford and Prof.E.P.Torrance, world renowned as the Father of Creativity.

The implication of CAS is very wide; it is useful for all level of user. It especially has a wide application in assessing creative potential of individuals in both the education and vocation circles.

In the education circle, it is able to help educators assess students' current creativity strengths and weakness instantly. Educators are then able to restructure their

lessons to overcome the various weaknesses in students' creativity during their lessons. They will also be able to incorporate activities and exercises designed to enhance the various areas of creativity. Teachers and educators can also use CAS as a creativity enhancing activity which the students can try either on-line or off-line.

In the work environment, CAS can be used effectively in several ways. In recruitment, management intending to recruit creative workers for jobs relating to sales, marketing or advertising, will find CAS very useful in instantly identifying potentially creative employees. Creative individuals are easily and instantly identified using CAS and their individual strengths are also displayed. This will enable managers to assign individuals with the various creative abilities to the various jobs in the team.

This CAS was designed to provide not only valid and reliable score, but also gives instant result and interpretation of the respondents' scores as well as recommendations on how they will be able to enhance they level of creativity. Besides that, it also provides an analysis of graph based on different criteria such as age and average score.

1.2 Problem Statement

Previously, the creativity assessment test was conducted by using manual form. So, it consist many weaknesses as stated below:

- **Time-consuming and inefficient**

  Paper-based assessment take a lot of times (printing, distributing, collecting back) and even the worst task which is analysis level (check manually) where we have

to check one by one. Manual marking is taking a lot of time and studies show that the increase of paper work will increase the human error as well.

- **Wastage of resources**

  Printing the question will involve a higher cost compare to access from a web-based system. This current creativity assessment system can be assessing easily at anywhere and anytime as long as you have the internet connection. So, it is very convenient for the user.

- **Restrict to certain geographical area**

  Traditional manual form was hardly conducted across countries and around the world because of the constraint of time, cost and manpower spends. By applying it in web-based system, the problem of restriction will be solving.

1.3 Project Objectives

The objectives of this project:

- Implement existing research in web-based system and collect Malaysian data to develop a Malaysia-based database which is more applicable in Malaysia.
- To design an accurate and instant assessment of the various components of creativity based on established definitions.
- To provide instant results and interpretations of one's creativity.
- To provide instant recommendations on how to enhance one's creativity.
- Build a creative thinking system that can help discover the hidden patterns and behavior of user.

❖ Provide a security and cost effective creative thinking system.

1.4 *Project Scope*

Generally, CAS can be divided into two major parts, which are the System Administration Section and User Section. This system is basically target to all level of user especially teacher, parent and employer. The measuring criteria for this system are Fluency, Flexibility and Originality.

Administration Section

- Can help to add new user either user or admin.
- Can view the entire user's information and delete user record.
- Can view feedback from user such as comment and suggestion that given.
- Can view the analysis report of the entire user based on different criteria.

User Section

- Let the user to sign up as member to start the assessment.
- Enable the user to change the password.
- Enable the user to view, edit his or her profile.
- Let the user to view his or her previous record if they already sign up as member and have been assessed this system before.
- Enable the user to view the analysis report to compare he or she own score with the average score.
- Enable user to have a fast and easy access to demo trip to test for their creativity.

Targeted Users

- Teachers and parents will be able to identify the level of creativity among students instantly and keep records of their progress.
- Educators and curriculum planners can use CAS scores to design activities and content that enhances and enriches students' creativity.
- Employers will be able to identify creative employees and assign jobs that require high level of creativity and creative problem solving.

While for the scoring guideline is based on the ideas of Guilford (1959) and Torrance (1962) which are widely used even today. Guilford hypothesized of few creative thinking abilities, namely Fluency, Flexibility and Originality based on his Structure of Intellect model (Guilford, 1967).

1.5 Project Schedule

	Task Name	Duration	Start	Finish
1	Preliminary Investigation	10 days	Mon 7/25/05	Fri 8/5/05
2	System Requirement Analysis	15 days	Mon 8/8/05	Fri 8/26/05
3	System Analysis	20 days	Mon 8/29/05	Fri 9/23/05
4	System Design	60 days	Mon 9/26/05	Fri 12/16/05
5	System Implementation	80 days	Mon 11/14/05	Fri 3/3/06
6	Evaluation & Testing	55 days	Mon 12/19/05	Fri 3/3/06
7	Documentation	150 days	Mon 8/8/05	Fri 3/3/06

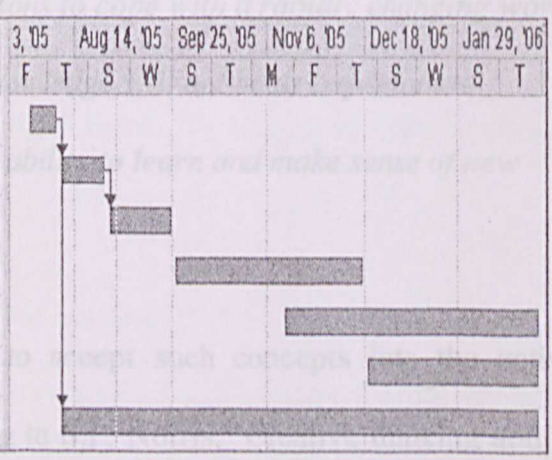


Figure 1: Gantt Chart

CHAPTER 2 LITERATURE REVIEW

2.1 Definition of Creative Thinking

The definition of "Creative Thinking" is the ability to generate new ideas by combining, changing, or reapplying existing ideas. Creative thinking focuses on exploring ideas, generating possibilities, looking for many right answers rather than just one.

2.2 Creativity

2.2.1 Background

In Kathleen Cotton's excellent article, "Teaching Thinking Skills," she quotes the following statement from Deborah Gough's Thinking About Thinking:

> *Perhaps most importantly in today's information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information.*

Many teachers in practice are slow to accept such concepts into the active framework of a working classroom. According to S.P. Norris, "Creative thinking ability is not widespread. Most students do not score well on tests that measure ability to recognize assumptions, evaluate arguments, and appraise inferences". This suggests a clear lack of emphasis on developing such abilities in students. At this issue is how to

narrow the gulf between theory and practice by showing ways that the goals of theory can be achieved by implementation

2.2.2 Creativity and its Components

Creativity has been defined in many ways. It is a construct which we know exists but escapes accurate definition. A survey of literature reveals the vast differences in the definitions and theories proposed about creativity.

Rhodes (1961) in summarizing the theories found that these theories fall into four main strands: process, person, product and press.

The first strand, "**process**", refers to the process by which a creative end product is obtained and the behavior directed towards creative achievement.

The "**person**" definitions include personality, traits, habits, self-perceptions and attitudes relating to creativity.

The "**press**" definitions refer to the relationship between human beings and their environment while the "**product**" refers to anything novel in a tangible form resulting from a creative idea.

Careful examination of these definitions reveals that they are not mutually exclusive. For example, having the potential for creative achievement is not enough because realizing this potential depends very much on personality characteristics which, among others, are motivation to be creative and perceptions of oneself as a creative person.

One of the most prominent instruments for measuring creativity as a process is the Torrance Tests of Creative Thinking. This instrument is based on Torrance's (1974) definition of creativity:

> a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult; searching for solutions, making guesses or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results. (p. 8)

This definition has been used in many studies worldwide mainly because it enables one to operationally define the kinds of abilities and mental functioning that facilitate or hinder the creative process. Based on its wide usage, this computer system employs Torrance's definition and Torrance Tests of Creative Thinking to obtain measures of creativity as a process.

The process by which creative people think has been said to occur in many different ways. One of the earliest ideas was proposed by a German physiologist and physicist, Herman von Helmholtz whose work was reported in a book by Graham Wallas (1926) entitled The Art of Thought. Four stages of creative process were suggested: Preparation, Incubation, Inspiration (Illumination) and Verification. The preparation step involves observing, listening, asking, reading, collecting, comparing, contrasting, analyzing and relating all kinds of objects and information. The incubation step is both

conscious and unconscious, involving thinking about parts, relationships and reasoning. Inspiration or Illumination appears during the fallow period following incubation where tensions are released so that one can be creative. Verification is a period of hard work which involves converting an idea into an object.

J. P. Guilford, E. P. Torrance, J. W. Getzels, P. W. Jackson, C. W. Taylor, K. Yamamoto and D. W. MacKinnon are some of the foremost researchers of creativity as a process. Of particular importance to this study are the ideas of Guilford (1959) and Torrance (1962) which are widely used even today. Guilford (1959) hypothesised four creative thinking abilities, namely, Originality, Fluency, Flexibility, Elaboration based on his Structure of Intellect model (Guilford, 1967).

2.2.3 Creative Thinking Abilities

The creative thinking abilities that apply in CAS are the three main dimensions creativity which is Fluency, Flexibility and Originality.

2.2.3.1 Fluency

Fluency is the ability to produce a large number of ideas or hypotheses concerning possible solutions to problems. These ideas need not be of different categories or classes. They may be elaborated or embellished ideas that stem from a common idea.

Hence, the Fluency score of a person is the number of responses he is able to give within a stipulated period.

2.2.3.2 Flexibility

Flexibility is the ability to adapt to changing instructions, to be free from inertia of thought and to use a variety of approaches. This is usually given by the number of different categories of responses the users are able to provide within the stipulated period.

CAS uses a dynamic database system to assess respondent flexibility. Responses entered in the spaces provided will be checked against the current database and the category is determined. The number of different categories these responses fall into gives the Flexibility score.

One unique feature of this software is that the database or categories are constantly updated by the intelligent system and so the flexibility scores obtained are far more reliable that those based on fixed database.

2.2.3.3 Originality

Originality is the ability to produce uncommon responses, unusual or unconventional associations.

The scores are given based on statistical infrequency of the responses given by the respondents. The originality scores are given based on the frequency of the responses given by users thus far.

This is the unique feature of the system where it uses the dynamic database system to give a more accurate evaluation of one's creativity. This intelligent system is able to update its database as more and more respondents attempt the assessment exercise.

The originality scores are given based on same criteria used in Torrance Tests of Creative Thinking (Torrance, 1992). The criteria used are shown in Table 1.

Table 1: Allocation of Points for Originality

Frequency of Responses	Originality Points
Between 0 and 1 %	3
Between 1 and 3 %	2
Between 3 and 5 %	1
More than 5 %	0

Responses not in the database are given 3 points since these responses will indeed be rare and unique. While for the responses which is more frequent will be giving less than 3 points which is showed in the Table 1. The sum of the originality points for each of the responses given is the originality score of the person.

2.3 Existing System Review

The review in existing system is important step in order to search for the similar characteristics when compare with the project. The result through research help the author to know some of the existing features that offered by similar system. Therefore the author will be able to study the existing system s and enhance it into more powerful features in the project later. From the research, the author will be able to analysis the strengths and limitations of several methodology and tools. Therefore, the author will

have sufficient knowledge in choosing correct methodology and development tools to develop the system.

At the moment, there is no a similar system like CAS in the market. Previously, assessment tools of Creative Thinking that used is through creative projects. Projects like that are too hard to grade, and take too long. Beside, the tradition methods of assessment: scantron tests comprised of multiple choice, fill in the blank, and true/false questions. Instead of the regurgitation of half-understood memorization, we opted for a form of assessment that would not only be a better gage of creative thinking development, but would also serve as reinforcement for that development.

CHAPTER 3 METHODOLOGY

3.1 System Development Life Cycle

The system development methodology is a systematic description of the sequence of activities required to develop a system. In order to develop a system in an organized an effective way, it is necessary to follow a sequence of steps to accommodate a computer set of tasks, which is generally called a process. Each system development process (see Figure 2) includes system requirements (user needs and resources) as input and a finished product as output.

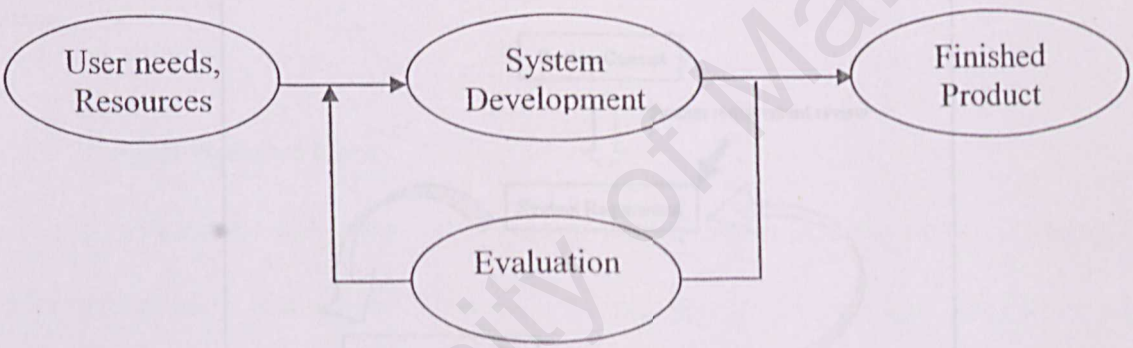


Figure 2: System Development Process Model

There are several process models in system development but the process model that I applied in my Creativity Assessment System is Prototyping Methodology.

3.2 *Selected Development Model*

3.2.1 Prototyping Methodology

Prototyping is an iterative process of systems development in which requirements are converted to a working system that is continually revised through close collaboration between an analyst and users. Firstly, determine the initial or basic requirements for the system. Then analyst quickly builds a prototype. Requirements are analyzed in detail and preliminary system is design. After that, this design review is coding and testing until a final version back to the user which fulfills their requirement.

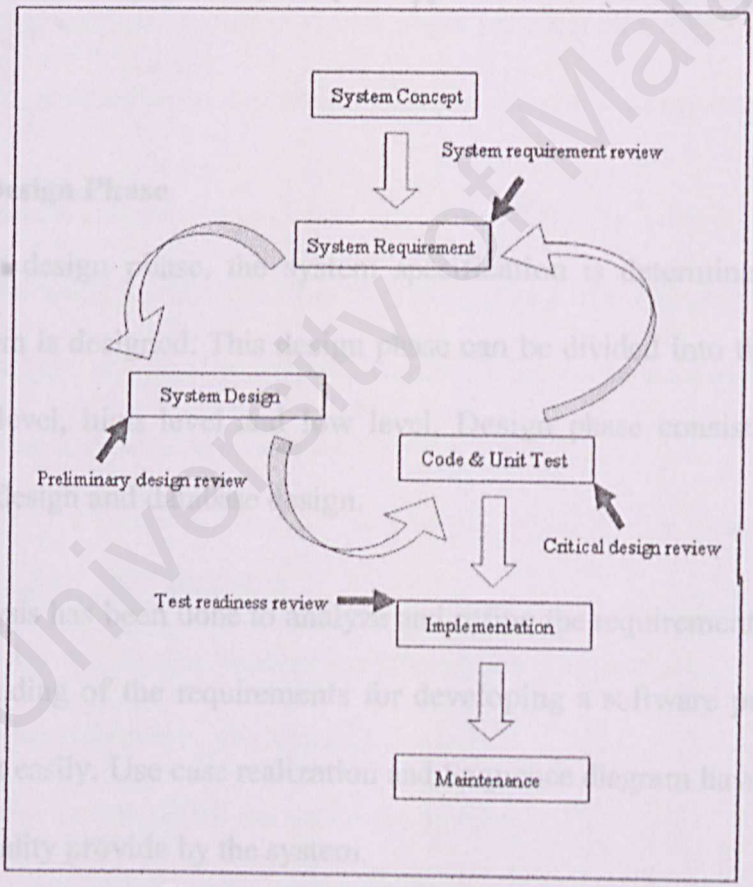


Figure 3: System prototyping

i. Requirement Phase

Firstly, determine the initial or basic requirements for the system and define part of the system's functionality. The problems are specify along to achieve the goals and constraints are identified. Besides, list out the requirements by discussion with supervisor. Software and hardware requirement also has been find out as well as determined and research on existing system.

ii. Prototyping Phase

In this phase, after the basic requirement have determined, a prototype for the system was build. The functionality of prototype is based on the requirement on the system.

iii. System Design Phase

In system design phase, the system specification is determined in detail and preliminary system is designed. This design phase can be divided into three level which are architecture level, high level and low level. Design phase consist of architecture design, interface design and database design.

The analysis has been done to analyze and refine the requirements to achieve the detailed understanding of the requirements for developing a software product correctly and maintaining it easily. Use case realization and Sequence diagram have been drawn to show the functionality provide by the system.

iv. Coding and Testing Phase

In this phase, design review is coding and testing until a final version back to the user which fulfills their requirement.

Testing is important in where to verify each unit meets its specification and find out any errors in the system. If it is failed, then system prototype has to be redefined or program stage reprocessed. Once successfully, all program units are tested in separate module then integrate and tested together.

v. Implementation and Maintenance Phase

In this phase, software is installed and put in practical use. Software is updated to satisfy user's need, adapted to accommodate changes in external environment.

Maintenance is carried out to correct any errors that didn't detect in the previous early stages. It also needs to enhance efficiency of system and improve system units. It used to collect, analyze and priority of user trouble. Maintenance needed because of new system installation and document changes.

Prototyping is very important because:

- To ensure the system meet the performance goals or constraints.
- To ensure the system are practical and flexible.
- To ensure the system fulfill the users' requirement.
- To have an insight of how the module and sub-modules interact with each other.

Advantages:

i. especially useful when

a. Requirements are changing rapidly

b. Customer is reluctant to commit to a set of requirements

c. Neither the developer nor the customer understands the application well

d. There is strong demand for development speed

ii. Produces steady, visible progress

Disadvantages:

i. Difficult to know at the beginning duration to create an acceptable product.

ii. Poor design and maintainability.

iii. Inefficiency use of prototyping time..

iv. Unrealistic budget expectations.

3.3 Approaches on Information Gathering

To gather the information, some techniques have been carried out:

- **Discussion**

  Discuss with the supervisor and Dr.Ananda from Education Faculty about the requirements of the system to gain idea, advices, recommendations and information of requirements and proceedings of the project. Meeting always held with supervisor and Dr.Ananda for the system improvement. The discussion also exists with my project partner. We discuss about the requirements of the projects, system flow and design of the system.

- **Pilot Study**

A pilot study has been conducted to collect a local data from undergraduate student at Education Faculty. An evaluation for the validity and reliability of this CAS was done to test whether the system is reliable and valid in real-world.

- **Internet Searching**

The Internet has become the indispensable source for searching any required general information. It has become one of the major sources for obtaining the latest information. Information can be gathered in the most cost effective and time efficient manner using Internet. There are some related articles or researches are published in the internet. This information is very useful for the research purpose of the system.

CHAPTER 4 - SYSTEM ANALYSIS

4.1 System Requirement Analysis

System requirement analysis is an important process to determine the system being built in order to meet the customer's requirements. Ideally, the system requirements should simply describe the external behavior of the system and its operational constraints. There are two types of requirement, namely functional requirement and non-functional requirement.

4.1.1 Functional Requirements

Functional requirements are a statement of the services that a system should provide how the system reacts to particular inputs, and how the system should behave in particular situations. [Sommerville, Page 119]

The Creativity Assessment System consists of 2 sections. There are Administration section and User section. For my part, I was responsible for Administration Section which consists of User Account management, View Feedback from user and View Analysis Report. Apart from that, I am responsible for the Fluency Modules and Flexibility Modules under the User Section. And there is an Authentication and Authorization Module, and Personal Detail Module for both System Administrator Section and User Section.

4.1.1.1 Administration Section

i. User Account Management module

The module is enabling the admin to help to add a new user or delete existing user whether he or she is admin or user type. The registration form will implement a password protected web site for authorize access for valid user. The system will validate the user's password before they log in to the system.

ii. View Feedback module

One function of the admin is to view the feedback which provided by the user. Besides, admin also delete the selected feedback. Once the admin get the useful comment and suggestion from the user about this system, the admin will take action to improve and enhance the system.

iii. View Analysis Report

Admin can view two type of analysis report that based on different criteria. The first report is the maximum, average and minimum of creativity level among all users. The second report is average creativity group for seven type of age group based on Fluency, Flexibility and Originality. Through these analyses, the admin will know the trend and behavior of the user based on different criteria.

4.1.1.2 User Section

iv. Fluency Module

For Fluency Score is measured by the number of responses given within a stipulated period. The flow chart below gives an indication of how the system determines the number of responses.

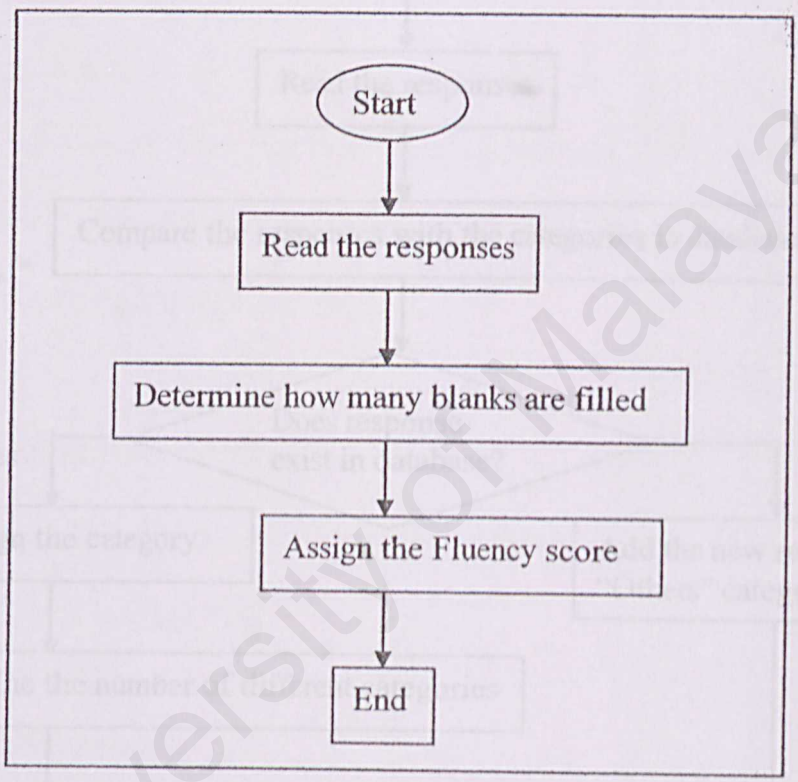


Figure 4: Flow chart of Fluency

v. **Flexibility Module**

The detail definition of Flexibility already defined in previous chapter, it is the number of different categories of responses given by the respondents. The flow chart below shows how Flexibility is computed by the system.

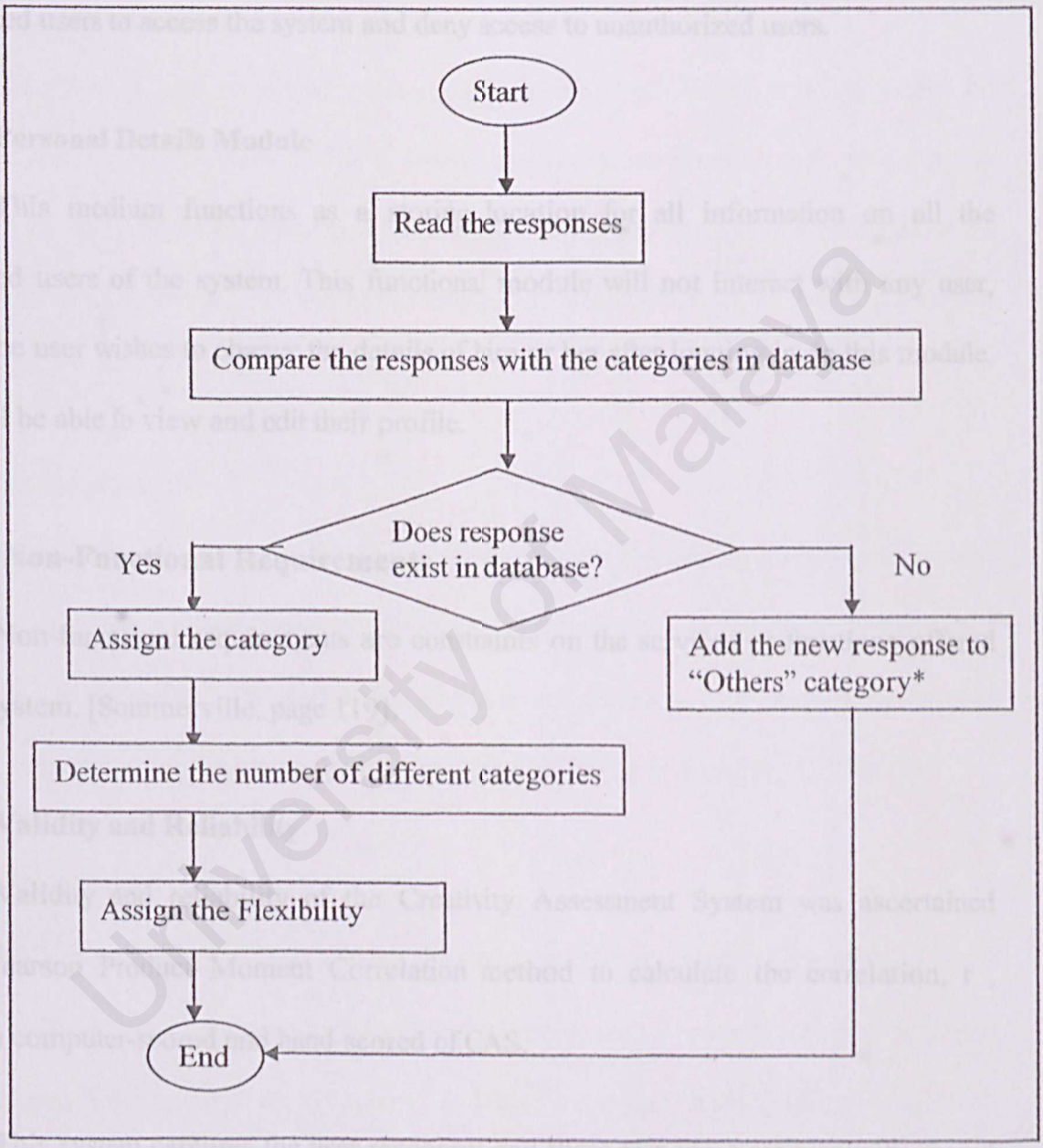


Figure 5: Flow chart of Flexibility

*** Responses in the "Others" category are manually assigned the category numbers and number of different categories are recalculated and a new Flexibility score is assigned.**

vi. **Authentication and Authorization Module**

This module functions as a medium for the system user, regardless whether they are system administrators or the user, to enter the system. The module provides a login function, which user must enter username and password to enter the system. Allow only authorized users to access the system and deny access to unauthorized users.

vii. **Personal Details Module**

This medium functions as a storing location for all information on all the registered users of the system. This functional module will not interact with any user, unless the user wishes to change the details of him or her after logging in. In this module, user will be able to view and edit their profile.

4.1.2 Non-Functional Requirements

Non-functional requirements are constraints on the services or functions offered by the system. [Sommerville, page 119].

i. **Validity and Reliability**

Validity and reliability of the Creativity Assessment System was ascertained using Pearson Product Moment Correlation method to calculate the correlation, r , between computer-scored and hand-scored of CAS.

This system captures the user responses and these responses are manually scored by a creativity expert for Fluency, Flexibility and Originality. Both the computer scored values and the hand-scored points were correlated for each component to obtain the validity indices.

These results show that CAS scores have very high validity for all components of creativity as well as its Total Creativity Score and hence can be used to identify the creative potential accurately and instantly.

ii. User friendly

The system has an attractive and easy-to-use application; users will not be confused when using the system. Main buttons are being provided in each web page to help user to navigate in the system. There will be a consistent interface throughout all screen displays. Confirmation message or any non-trial process such as deleting a record was given.

iii. Maintainability

The system is easy to maintain by the system developers in order to add in new data or delete a record. Maintainability is the ease with which a program can be corrected if an error is uncounted, adapted if its environment changes, or enhanced if the user desires a change in requirements. In this case, administration is handling for this part.

iv. Functionality

The functionality of the system is stress on the retrieving capability. This is important for a web-based application that deals with data insertion into database and data retrieval from this dynamic database. Besides, navigation and browsing features as well as application domain-related feature will be taken into account.

v. **Security**

All registered users shall log in to the system using username and password. Users were assigned with privileges according to their class (administrator or user). The password will be encrypted before it is stored into the database. Users shall not be allowed to log in using more than one identity simultaneously. Beside, validity for the username also will be compare whether there is an existing user with the same username.

vi. **Performance**

Performance is how the system should perform when it is delivered. The system shall be able to deliver services to the users at certain level of quality. The system should be able deliver relatively good response time in handling the user's request. The display time for the questions must as short as possible especially for an efficient online system.

vii. **Availability**

The user can access CAS at anywhere and anytime as long as have the internet connection ability.

4.2 Methodology Choosing and Justification

In the methodology chapter, Prototyping process model is chosen based on its several convincing reasons that supports and routing throughout the whole developing progress of system. Prototyping conducted concurrently with the requirements analysis and definition stage in the initial stage of the development life cycle, effectively helps me ensuring the developing system time to time that it always meets its definition of needs and is feasible enough. If any error or inappropriate concept and definition found during the early stage, correction and improvement will take place immediately. It is therefore

able to avoid or at least reduce cost of changing the whole testing stage when everything almost comes to the final stage.

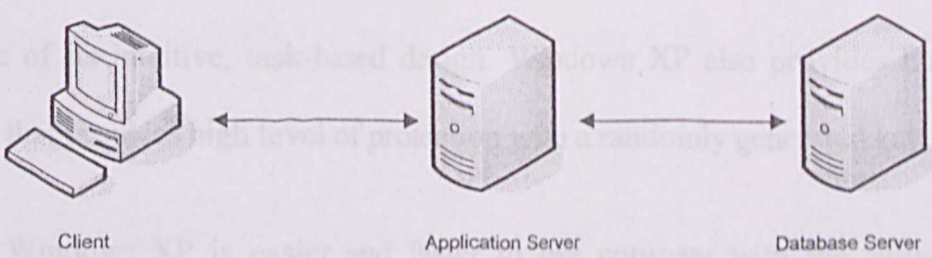
4.3 *Software Architecture Choosing and Justification*

Three-tier architecture was chosen on this project because it is easier to implement and design. Its added modularity makes it easier to modify or replace one tier without affecting the other tier. And the separating application functions and database functions make it easier to implement load balancing.

4.3.1 Three-tier Client-server Architecture

Three-tier client-server architecture consisting of three well defined and separate processes that each running on a different platform: (see Figure 6)

- ***Presentation logic***. Represents the user interface, for displaying data to the user and accepting input from the user.
- ***Business logic***. For data validation, ensuring data correctness before add to database.
- ***Data Access Logic***. Database management system (DBMS) that stores the data required by the middle tier.



The three-tier architecture attempts to overcome some of the limitations of the two-tier scheme by separating presentation, processing and data into separate distinct entities. Besides, this architecture having separate software entities allows for the parallel development of individual tiers by application specialists. It also improves performance for groups with a large number of users and improves flexibility when compared to the two-tier approach.

4.4 Development Tools Choosing and Justification

4.4.1 Operating System

For the Creativity Assessment System, Windows XP is chosen as the development platform because it is an improvement of Windows 2000 Professional and it is stable to use.

4.4.1.1 Windows XP

Windows XP is built on the Windows 2000 kernel with more personalized look to the desktop that make it easier for users to scan or import images and to acquire music file on the web and transfer them to portable devices. Window XP is more easily recover from system problems. The system restore features enable user to revert the system to a previous state when something goes wrong in computer. Windows XP is easy to use because of its intuitive, task-based design. Windows XP also provides Encrypting file system that provides high level of protection with a randomly generated key.

Windows XP is easier and faster to use compare with the earlier version of Windows. This is because Windows XP makes it easier to find information and programs

and faster establish of tasks such as customizing computer settings, using and printing files and documents. Besides, Windows XP delivers a new level of stability, which enable the user can focus on their job. For instance, programs still can run while another program is crashes.

4.4.2 Database Server

After considering some DBMS in the market, MySQL is chosen for Creativity Assessment System.

4.4.2.1 MySQL

MySQL is chosen because it is relatively fast and easy to learn. Besides, MySQL requires less system administration to configure and maintain. It also has a larger user base and is supported by more applications. MySQL can work effectively with PHP which is chosen as main programming Language for CAS.

MySQL is Open Source Software that anyone can download from Internet and use it freely. MySQL is a relational database management system that stores data in separate tables. This makes it more flexibility and fast. MySQL is a small, compact, easy to use database server, ideal for small and medium size application. It is based on the client-server architecture that consistes of a server and many different client programs. It can runs on variety of UNIX platforms, Linux, Windows NT, Windows 95/98/2000/XP.

4.4.3 Web Server

Apache Server has been chosen as a web server for this project because it is support readily available from worldwide developer and user communities. It is a flexible

and powerful URL rewriting. Apache also rich of feature set and it is extensible, which enable it to link new modules into the core server.

4.4.3.1 Apache

Apache provides freely distributed source code, active user support for the server, cross-platform support, protocol support (HTTP), modularity (API), security, logging and overall performance and robustness. Apache distributes a set core of modules that handle everything from user authentication and cookies type correction on URLs. Apache is a good choice for enterprise-level websites and for individuals as workshop, due to its robust design and extensibility, coupled with its freeware status and the availability of its source code to the public.

4.4.4 Programming Language

PHP is chosen because it is simple and easy to understand. Built-in extensions that bundled with each PHP installation offer far more functionality than desired by most developer. Simple functions such as FTP, data compression, file uploads, MD5, encryption and email are also included in PHP. Complex functions such as dynamic images, IMAP, SNMP, dynamic flash, PDF, native access (non ODBC) to Oracle, Ovrimos, Postgre, Sybase, MSql, MSSQL, Ingres, Interbase and Informix databases, LDAP, and sockets are available for free to any installation of PHP.

4.4.4.1 PHP

PHP is an easy-to-use and freely downloadable scripting language. PHP as a server-side scripting language is its ability to receive and process HTTP requests containing data collected from a HTML form. PHP offer excellent connectivity to most

of the common databases, including Oracle, Sybase, MySQL, ODBC and many more. It also offers integration with various external libraries, which allow the developer to do anything from generating PDF documents to parsing XML. Nevertheless, certain functions of PHP may be prohibited on a web server, due to the risks they entail, such as file management on the server, network protocol management, sending email, etc.

4.5 Development Requirements

4.5.1 Hardware requirement

Basic requirement for hardware as listed below:

Server Side:

- Intel Pentium III 450 MHz or above.
- 128 MB RAM (256 MB RAM recommended)
- 2GB free hard disk space
- 56K Modem / Network card NIC 10/100
- VGA Display Card with 64 MB minimum
- Keyboard and mouse

Client Side:

- Pentium III 250 Mhz and above
- 128 MB RAM (256 MB RAM recommended)
- Above 200 MB free space recommended
- 56K Modem / Network card NIC 10/100
- Keyboard and mouse

- VGA Display Card

4.5.2 Software Requirements

Development phase:

- Macromedia Dreamweaver MX
- Microsoft Windows XP (or other operating system)
- MySQL Server for the database
- MySQL-Front for GUI

Server Side:

- Microsoft Windows XP
- MySQL Database Version 4.1.12a as the relational database
- Apache Web Server Version 2.0.54
- PHP Script Language Version 5.0.4
- phpMyAdmin Database Manager Version 2.6.2-pl1
- Microsoft Internet Explorer 6.0 / other compatible Webpage Display software

Client Side:

- Microsoft Windows 98 / 2000 / ME / XP
- Microsoft Internet Explorer 6.0 / other compatible Webpage Display software
- Connection to Internet

CHAPTER 5 SYSTEM DESIGN

5.1 Introduction

System design has an important role and is a meaningful engineering representation of something that is to be built. The objective of system design is to transform the defined requirement into complete, detailed specifications for the system to guide the work of the development phases.

System design addresses how the system will met the defined functional, physical, interface and data requirement. At each stage, software design work products are reviewed for clarity, correctness, completeness and consistency with the requirement and with one and another in determining the success of a software project.

System design includes the following issues:

i. System Architecture Design

ii. System Functionality Design

iii. User Interface Design

iv. Database Design

5.2 System Architecture Design

The Creativity Assessment System is function in three-tier client server architecture. This is the basic of any web based system that involves the generation of dynamic web pages. The three-tier client server architecture consists of 3 device layers. The first is the client, a web browser for the user interface. The second is the application

dynamic web pages. The three-tier client server architecture consists of 3 device layers. The first is the client, a web browser for the user interface. The second is the application server, a web server connected to a "middle tier" application. The third tier consists of applications and their associated database, a persistent store that is frequently a relational database. (Refer to Figure 7).

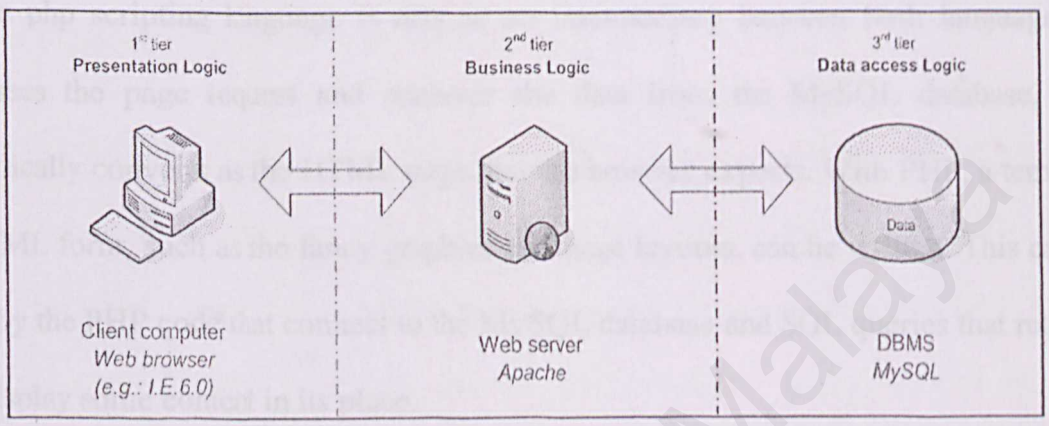


Figure 7: Three-tier client server architecture

In this system, the first tier (also called client tier) shall be the web browser such as Internet Explorer 6.0, Netscape Communicator 6.0, etc. this tier contains all the things that are visible to users in graphical user interface (GMI) which is displayed in web browser. The GMI contains the techniques like HTML, CSS, JSP and so on.

Meanwhile, the applications will reside within a web server (Apache) in second tier. Apache HTTP Server 2.0.52 in this system is responsible to manage the data. The request from the client will be processed by the web server and required results are returned in the web page format and displayed in interface (web browser). The server also will interact with database server to process data. To retrieve data from the database, the query is used.

Third tier consists of MySQL acts as database server. It is responsible to maintain the data repository.

The database-driven websites allows the site's content resides in a database. The content will be dynamically retrieved from the database to create standard HTML web pages and displayed in client side's web browser. As shown in the diagram below (Figure 8), the php scripting language is acts as an intermediary between both languages. It processes the page request and retrieves the data from the MySQL database, then dynamically converts as the HTML page that the browser expects. With PHP, a template in HTML form, such as the fancy graphics and page layouts, can be written. This can be done by the PHP code that connect to the MySQL database and SQL queries that retrieve and display some content in its place.

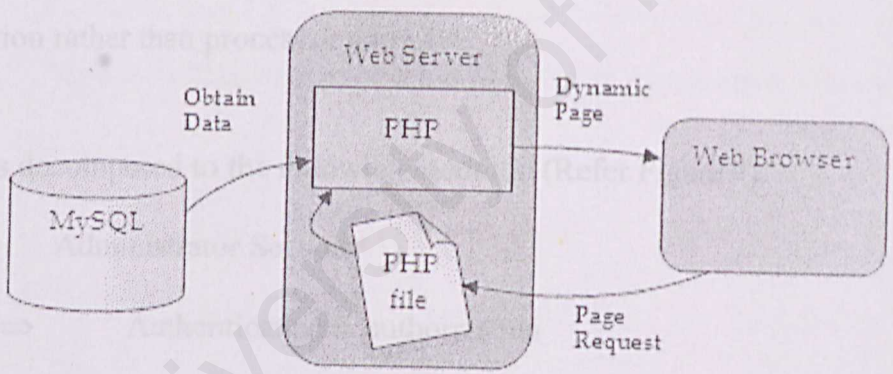


Figure 8: PHP scripting language and MySQL database engine architecture

5.3 System Functionality Design

System functionality design is based on the system functional requirement. It translates the system requirement into system functionality in functional design, large systems are decomposed into simpler modules that provide some related set of service.

The reason why modularity is desirable is because a modular system is easy to understand code, debug and maintain.

5.3.1 System Structure Charts

Structured chart is based on the functionality modules. It is issued to represent high level abstraction on a specified system. A structure chart is a tree-like diagram showing the interaction between modules in a system.

The following chart shows the hierarchical representation between the modules and the functions of every module in the Creativity Assessment System. The system consists of 2 major parts, which are the Administration Section and the User Section. For my part, I am responsible for Admin Section. Each module is further divided into sub-modules. It is more effective in presenting the system structure using graphical representation rather than process or narrative.

The CAS is decomposed to the following modules: (Refer Figure 9).

- Administrator Section
  - ⇒ Authentication & authorization
  - ⇒ Manage User Account
  - ⇒ Report Analysis management
  - ⇒ Feedback management

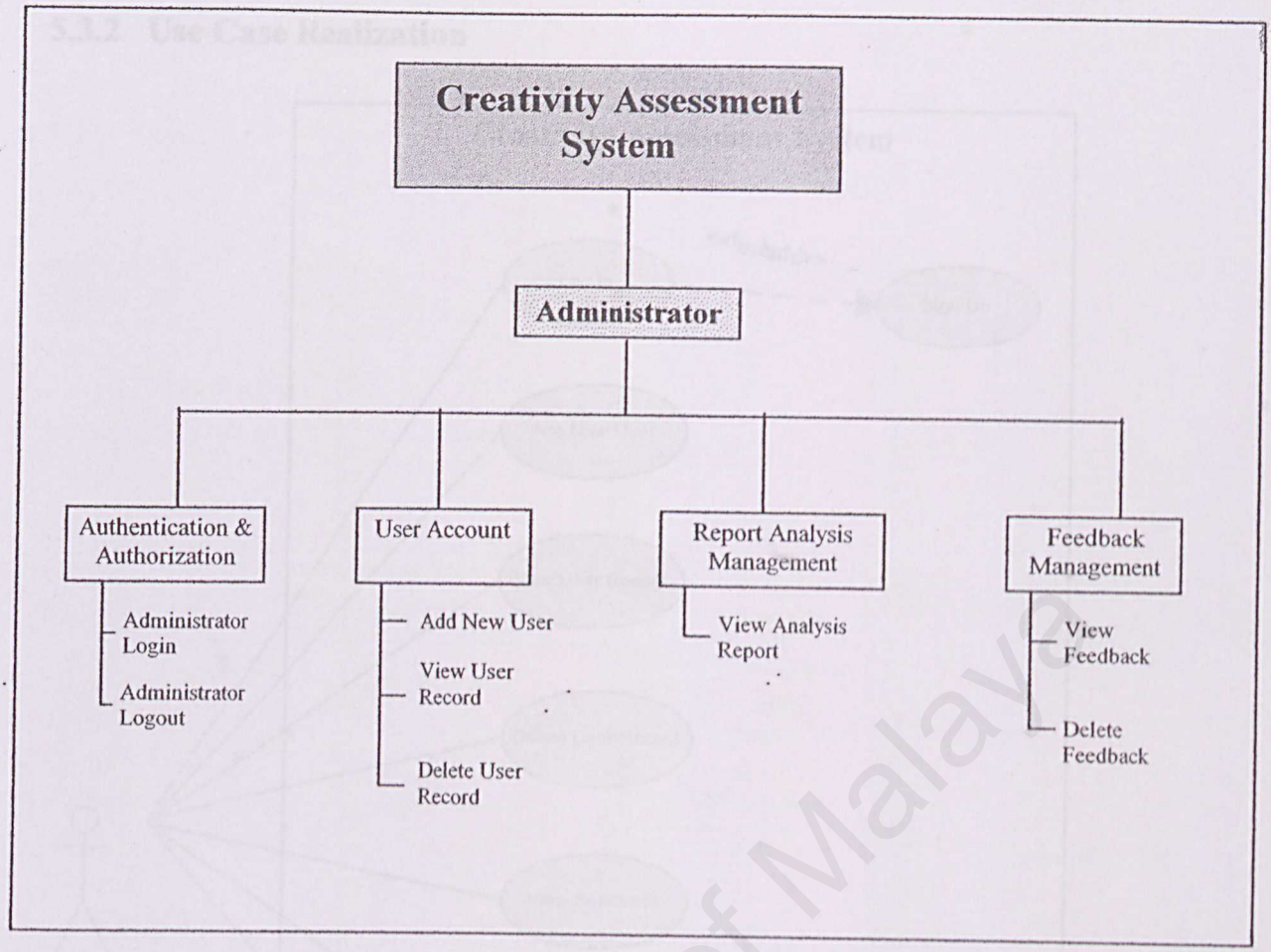
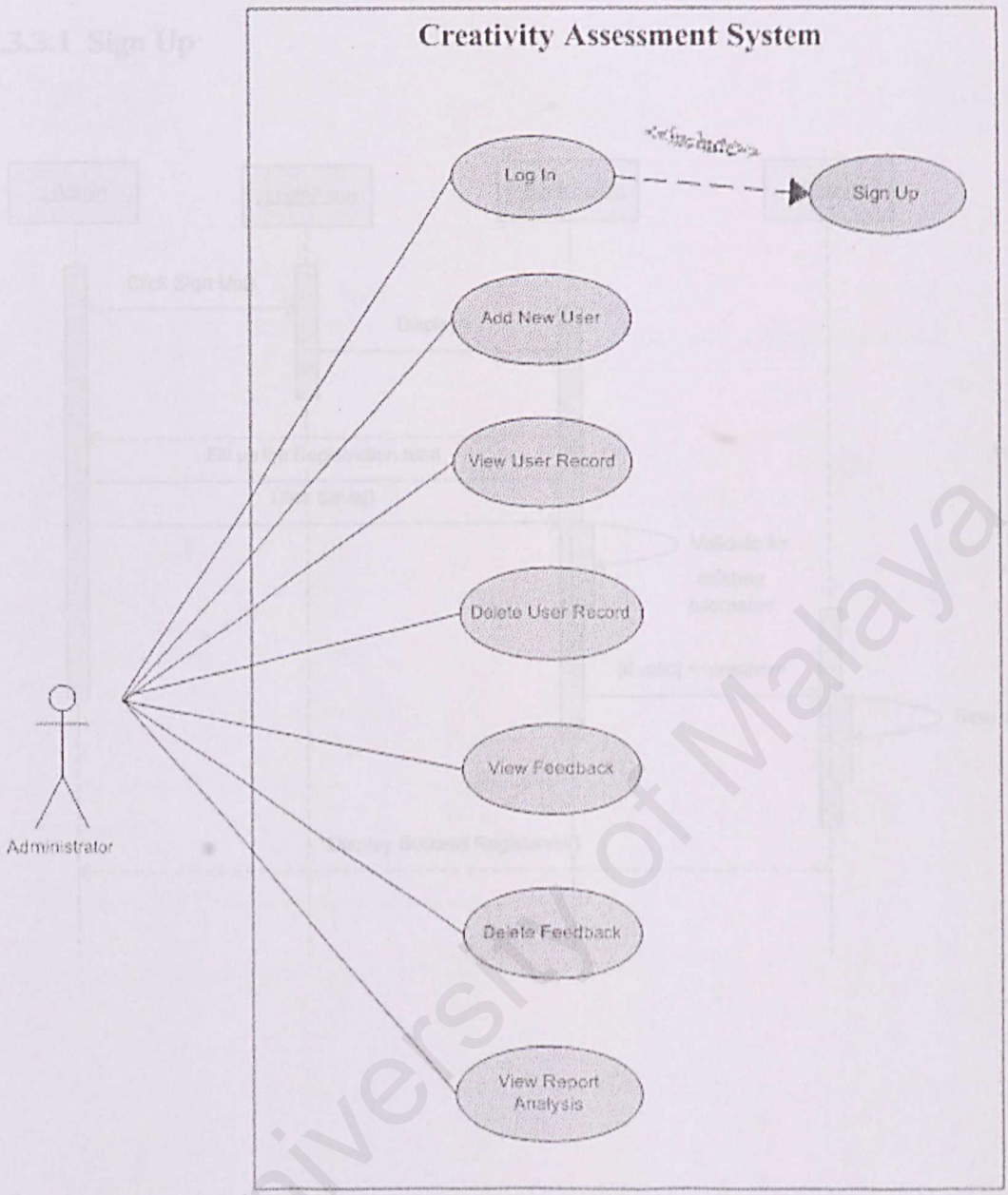


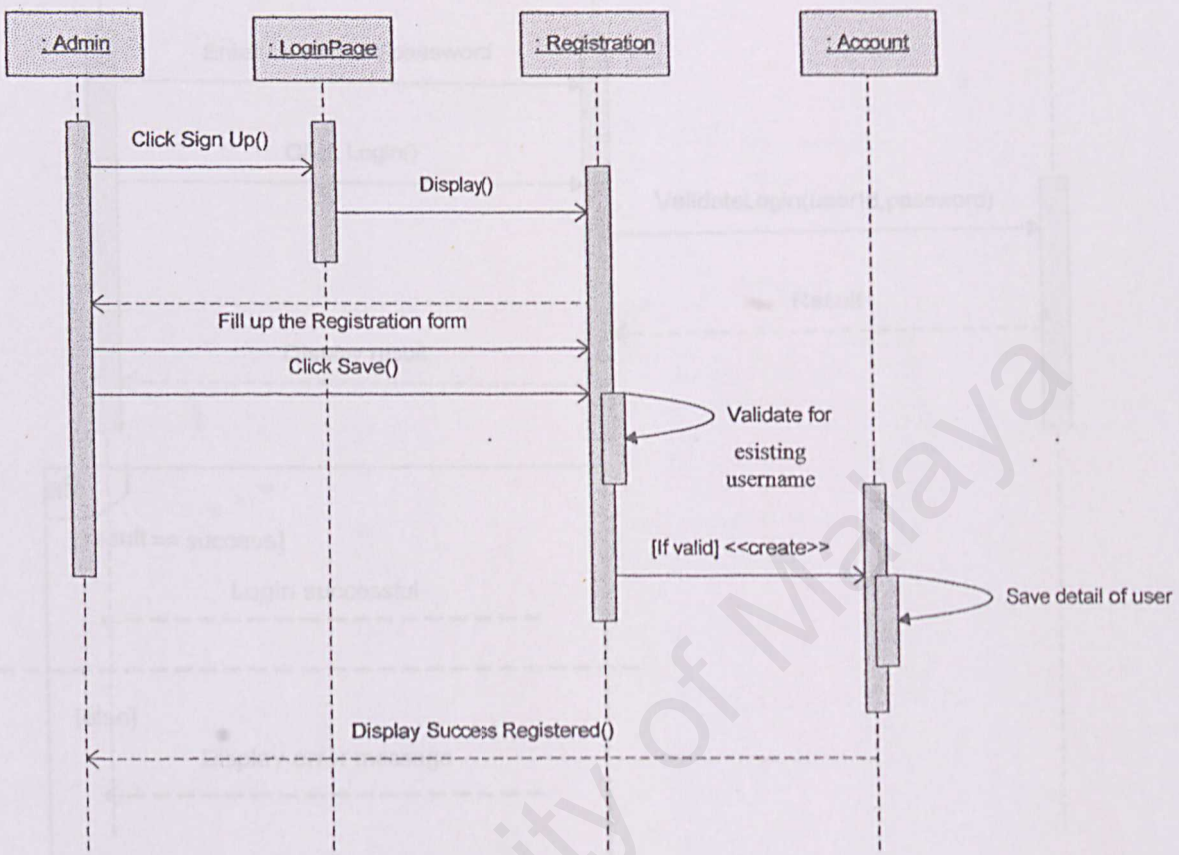
Figure 9: Structured chart of Creativity Assessment System

5.3.2 Use Case Realization

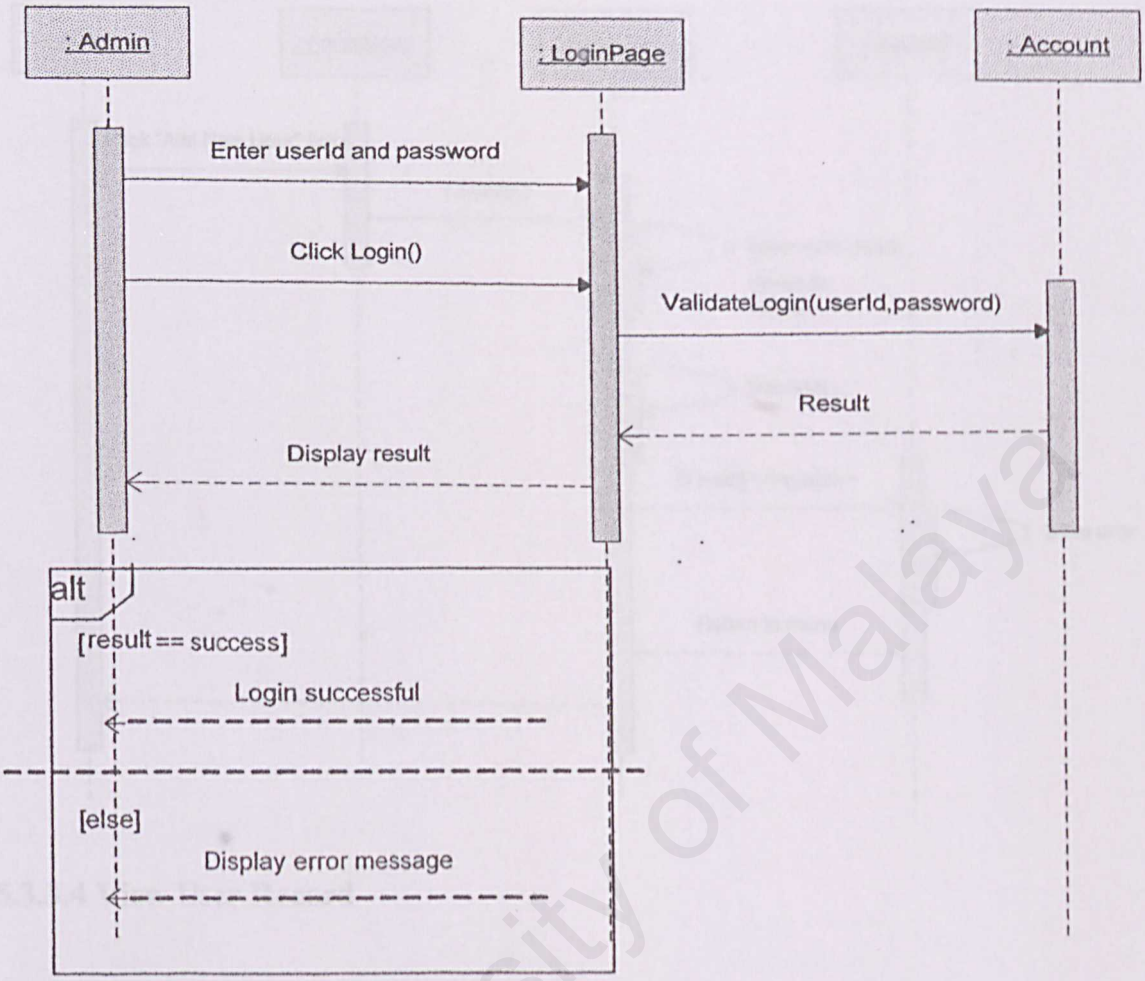


5.3.3 Sequence Diagram

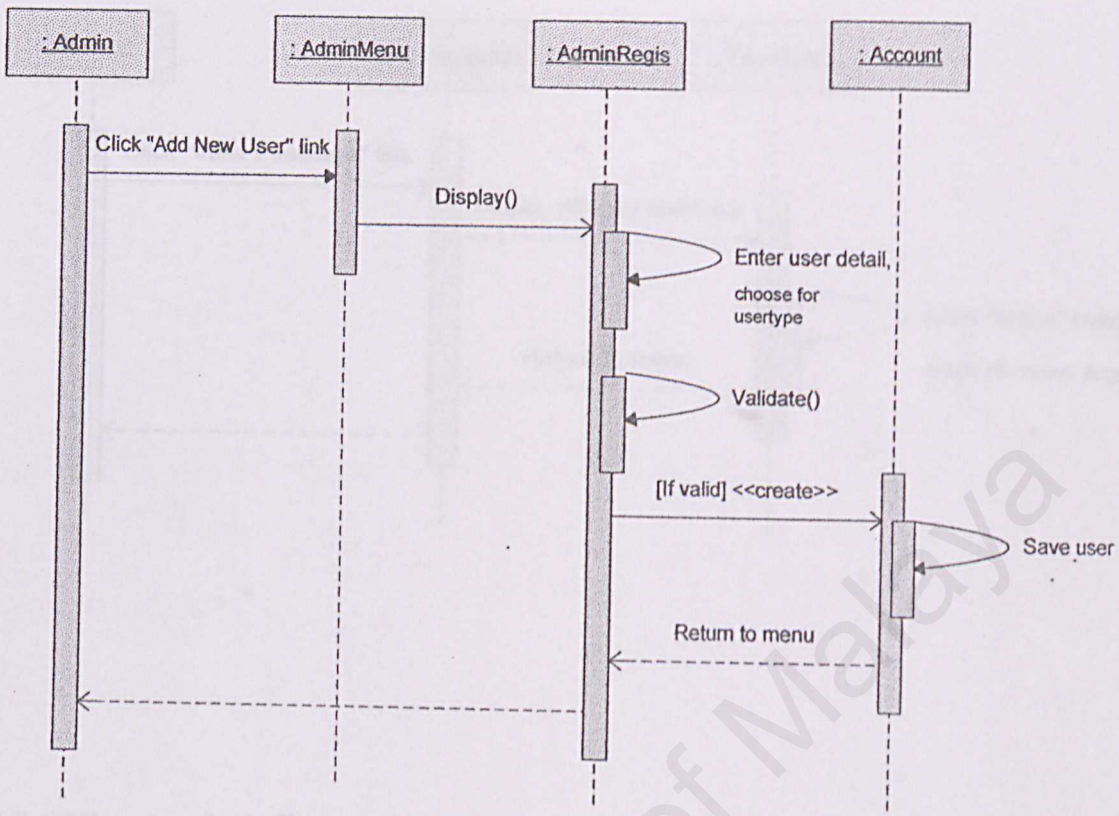
5.3.3.1 Sign Up



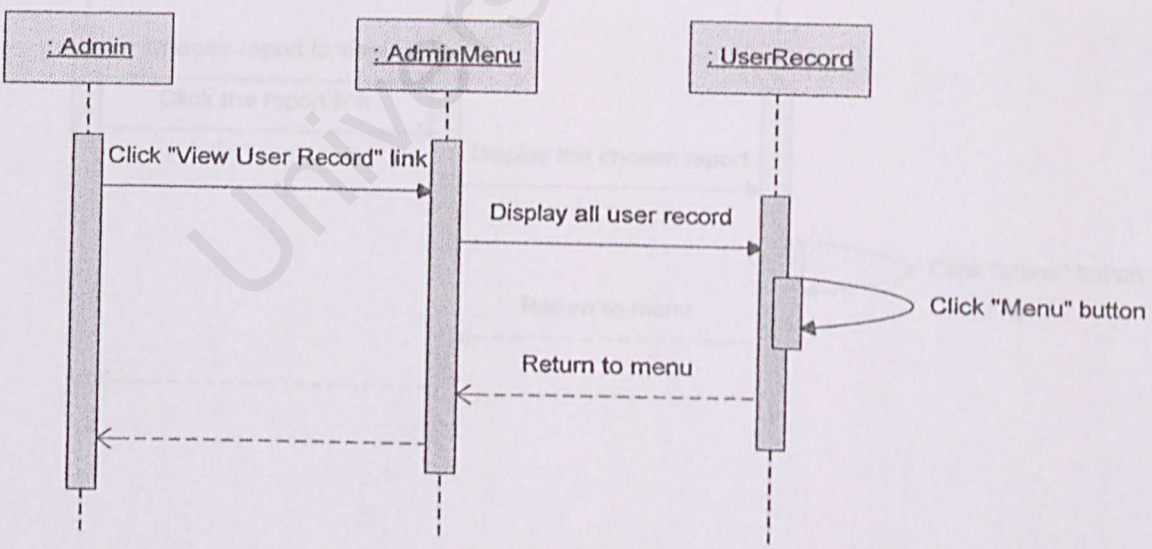
5.3.3.2 Log In



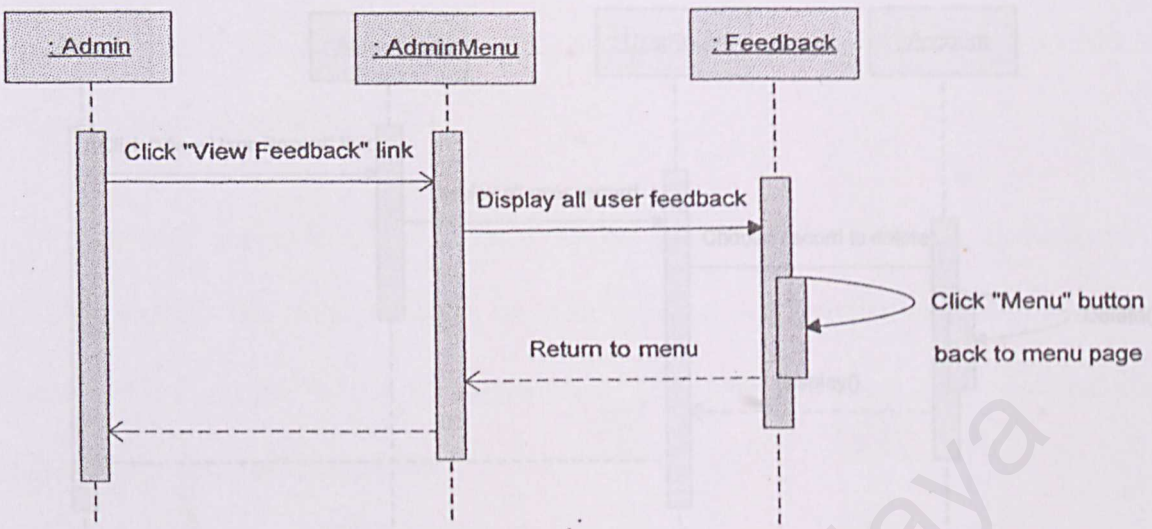
5.3.3.3 Add New User



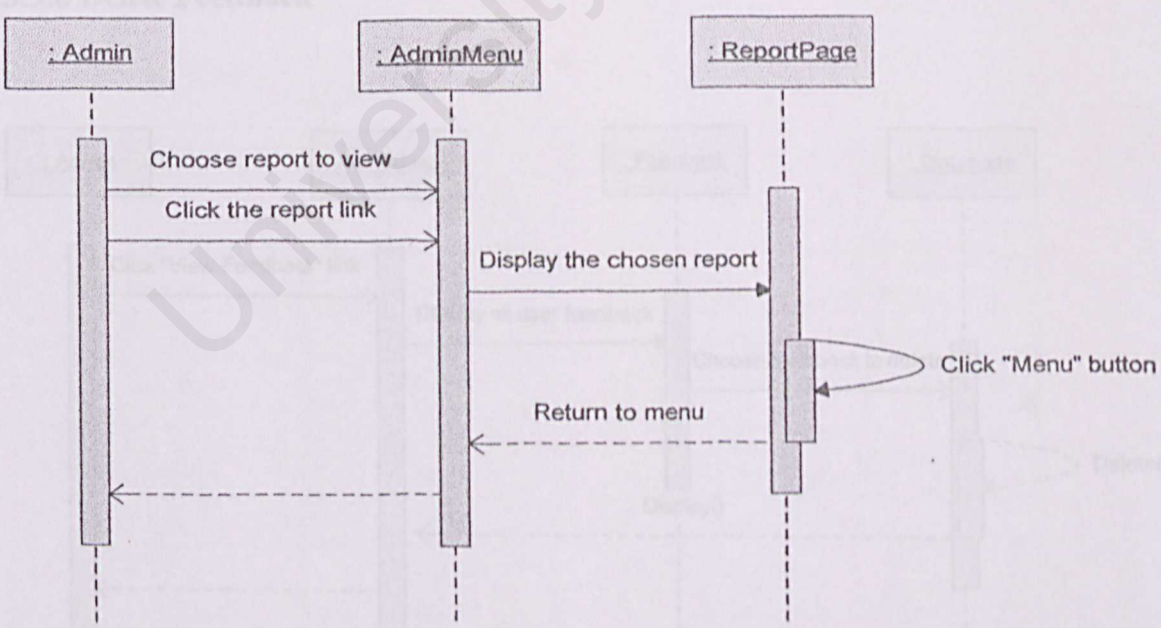
5.3.3.4 View User Record



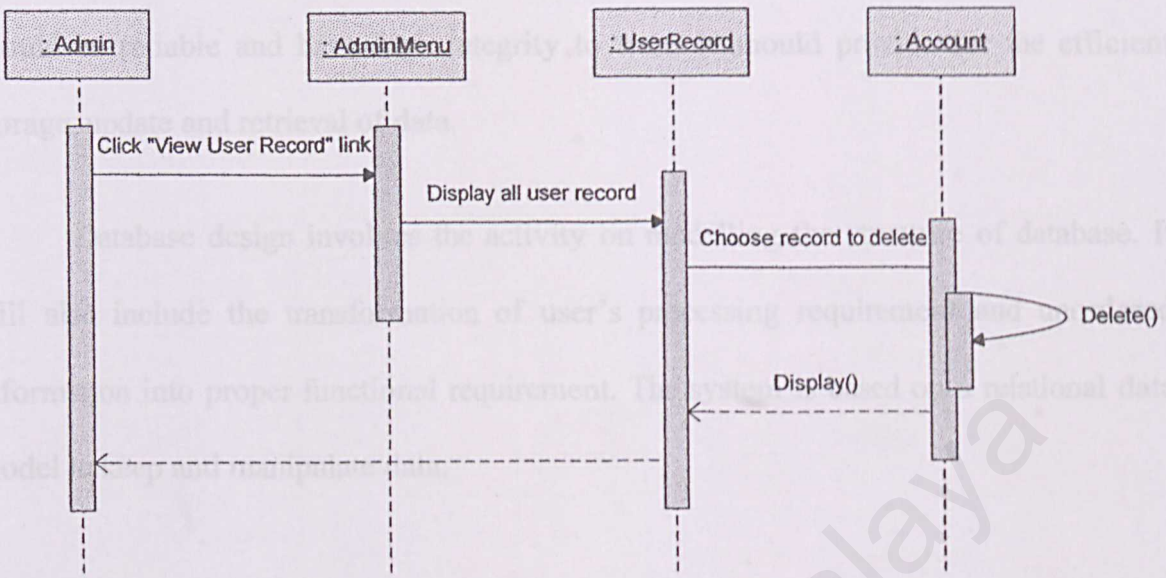
5.3.3.5 View Feedback



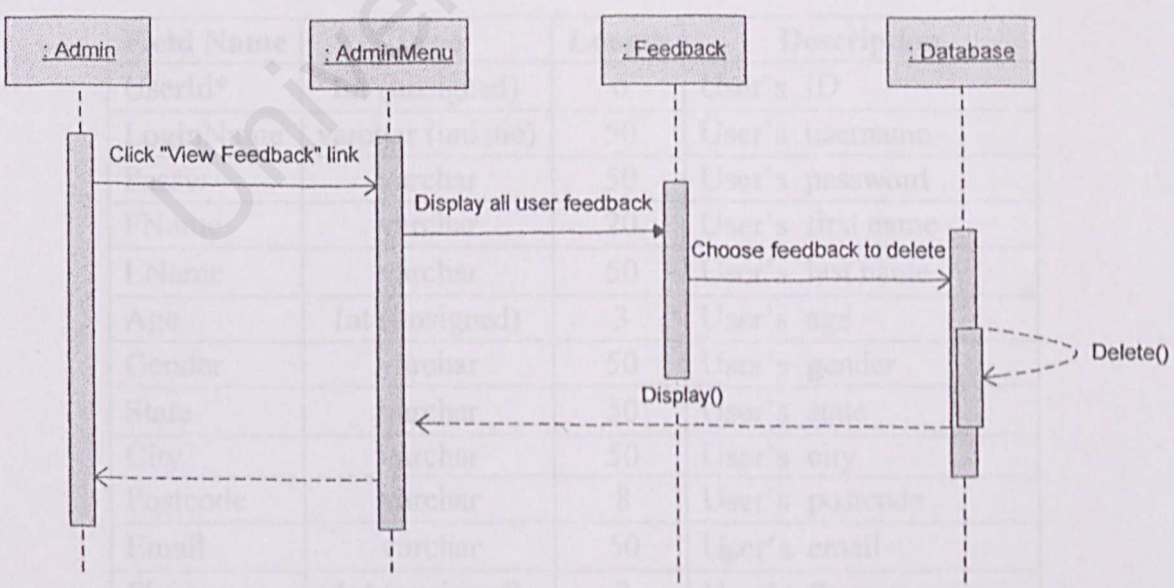
5.3.3.6 View Analysis Report



5.3.3.7 Delete User Record



5.3.3.8 Delete Feedback



5.4 *Database Design*

Database is data storage that will store and maintain data records. A database should be reliable and have high integrity to trust. It should provide for the efficient storage, update and retrieval of data.

Database design involves the activity on modelling the structure of database. It will also include the transformation of user's processing requirement and unordered information into proper functional requirement. The system is based on a relational data model to keep and manipulate data.

5.4.1 Data Dictionary

Data dictionary can be defined as descriptions of the database structure and contents. Data dictionaries are lists of all of the names used in the system models. Descriptions of the entities, relationships and attributes are also included.

Table 2: useprofile

Field Name	Type	Length	Description
UserId*	Int (unsigned)	6	User's ID
LoginName	varchar (unique)	50	User's username
Passw	varchar	50	User's password
FName	varchar	20	User's first name
LName	varchar	50	User's last name
Age	Int (unsigned)	3	User's age
Gender	varchar	50	User's gender
State	varchar	50	User's state
City	varchar	50	User's city
Postcode	varchar	8	User's postcode
Email	varchar	50	User's email
Fluency	Int (unsigned)	3	User's fluency score

Flexibility	Int (unsigned)	3	User's flexibility score
Originality	Int (unsigned)	3	User's originality score
Usertype	varchar	50	User's usertype
Occupation	varchar	50	User's occupation

Table 3: answer

Field Name	Type	Length	Description
AnsId	Int (unsigned)	6	User's answer Id
Ans1	varchar	50	User's first answer
Ans2	varchar	50	User's second answer
Ans3	varchar	50	User's third answer
Ans4	varchar	50	User's fourth answer
Ans5	varchar	50	User's fifth answer
Ans6	varchar	50	User's sixth answer
Ans7	varchar	50	User's seventh answer
Ans8	varchar	50	User's eighth answer
Ans9	varchar	50	User's nineth answer
Ans10	varchar	50	User's tenth answer
Ans11	varchar	50	User's evelen answer
Ans12	varchar	50	User's twelve answer
Ans13	varchar	50	User's thirteen answer
Ans14	varchar	50	User's fourteen answer
Ans15	varchar	50	User's fifteen answer
Ans16	varchar	50	User's sixteen answer
Ans17	varchar	50	User's seventeen answer
Ans18	varchar	50	User's eighteen answer
Ans19	varchar	50	User's nineteen answer
Ans20	varchar	50	User's twenty answer
Ans21	varchar	50	User's twenty-one answer
Ans22	varchar	50	User's twenty-two answer
Ans23	varchar	50	User's twenty-three answer
Ans24	varchar	50	User's twenty-four answer
Ans25	varchar	50	User's twenty-five answer
Ans26	varchar	50	User's twenty-six answer
Ans27	.varchar	50	User's twenty-seven answer
Ans28	varchar	50	User's twenty-eight answer
Ans29	varchar	50	User's twenty-nine answer
Ans30	varchar	50	User's thirty answer
Ans31	varchar	50	User's thirty-one answer
Ans32	varchar	50	User's thirty-two answer
Ans33	varchar	50	User's thirty-three answer
Ans34	varchar	50	User's thirty-four answer

Ans35	varchar	50	User's thirty-five answer
Ans36	varchar	50	User's thirty-six answer
Ans37	varchar	50	User's thirty-seven answer
Ans38	varchar	50	User's thirty-eight answer
Ans39	varchar	50	User's thirty-nine answer
Ans40	varchar	50	User's forty answer
Ans41	varchar	50	User's forty-one answer
Ans42	varchar	50	User's forty-two answer
Ans43	varchar	50	User's forty-three answer
Ans44	varchar	50	User's forty-four answer
Ans45	varchar	50	User's forty-five answer
Ans46	varchar	50	User's forty-six answer
Ans47	varchar	50	User's forty-seven answer
Ans48	varchar	50	User's forty-eight answer
Ans49	varcharv	50	User's forty-nine answer
Ans50	varchar	50	User's fifty answer
UserId	Int (unsigned)	6	User's Id

Table 4: dictionary

Field Name	Type	Length	Description
DicId	Int (unsigned)	6	Id for dictionary table
Word	Varchar	50	Example words in dictionary

Table 5: feedback

Field Name	Type	Length	Description
FeedbkId	Int (unsigned)	6	Id for feedback table
Name	Varchar	50	User's name who posted feedback
Email	Varchar	50	User's email
Message	Varchar	250	Message posted by user
FeedbkDate	Varchar	50	Date posted feedback

Table 6: flexibility

Field Name	Type	Length	Description
FlexibilityId	Int (unsigned)	6	Id for flexibility table
Examples	Varchar	50	Examples in flexibility table
Category	Varchar	50	Category of example

Table 7: originality

Field Name	Type	Length	Description
OriginalityId	Int (unsigned)	6	Id for originality table
Responses	Varchar	100	Responses in originality table
Frequency	Int (unsigned)	6	Frequency responses

Table 8: interpretation

Field Name	Type	Length	Description
InterId*	Int (unsigned)	6	Id for interpretation table
FluenInter	varchar (unique)	50	Interpretation for fluency
FluenRecomment	varchar	50	Recommendation for fluency
FlexInter	varchar	20	Interpretation for flexibility
FlexRecomment	varchar	50	Recommendation for flexibility
OriInter		3	Interpretation for originality
OriRecomment	varchar	50	Recommendation for originality
UserId	Int (unsigned)	10	Result of user

5.5 User Interface Design

User interface design is a very important part of a system as the interface of a system plays an important role in communicating between the processing functions and the users' request. It enables the users to grab the needed information and also provide a medium for user to apply more information to the system. User interface gives the site visitors the first impression of the site and also works as the direct interaction between the user and the system. Thus, the interface must be able to interact with the user so that the user can accept and adapt to the interface to perform task. In addition, the interface must be simple and consistent, providing an easy and fast data entry and retrieval.

5.5.1 Login

The login page allows user to enter their user ID and password.

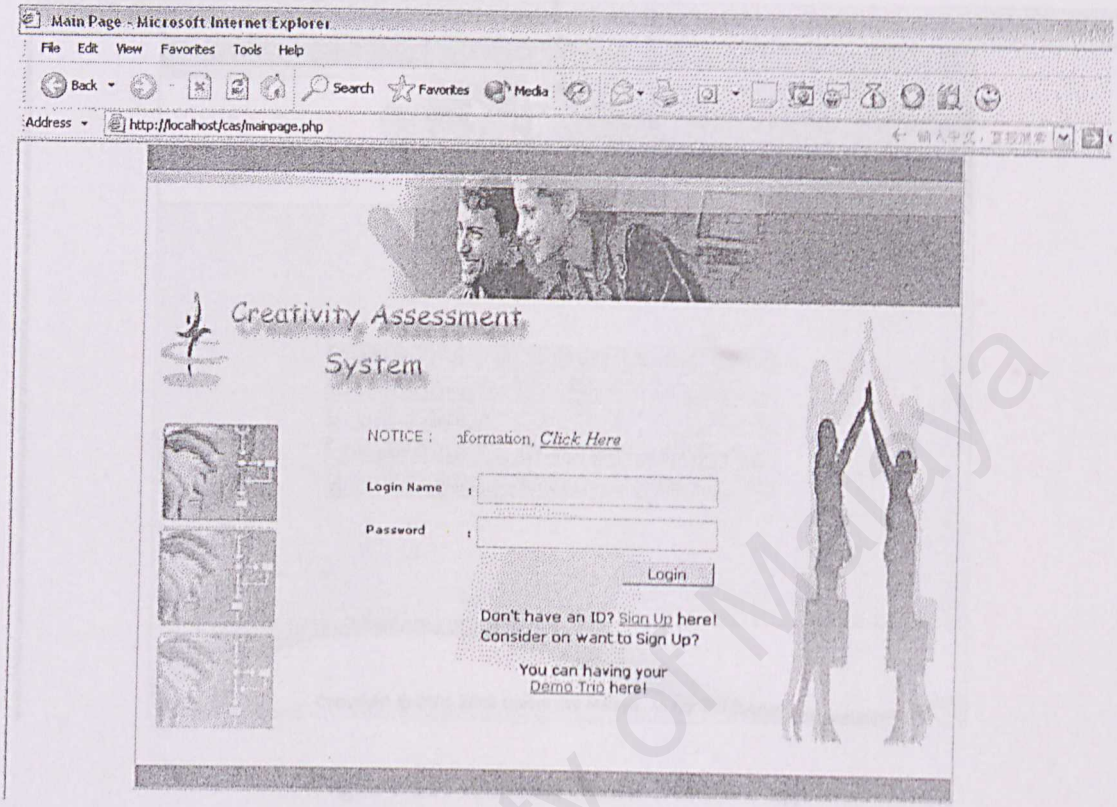


Figure 10: CAS's Login Page

5.5.2 Admin Main Menu

After Admin login, he or she will go to this page and choose an action to take.

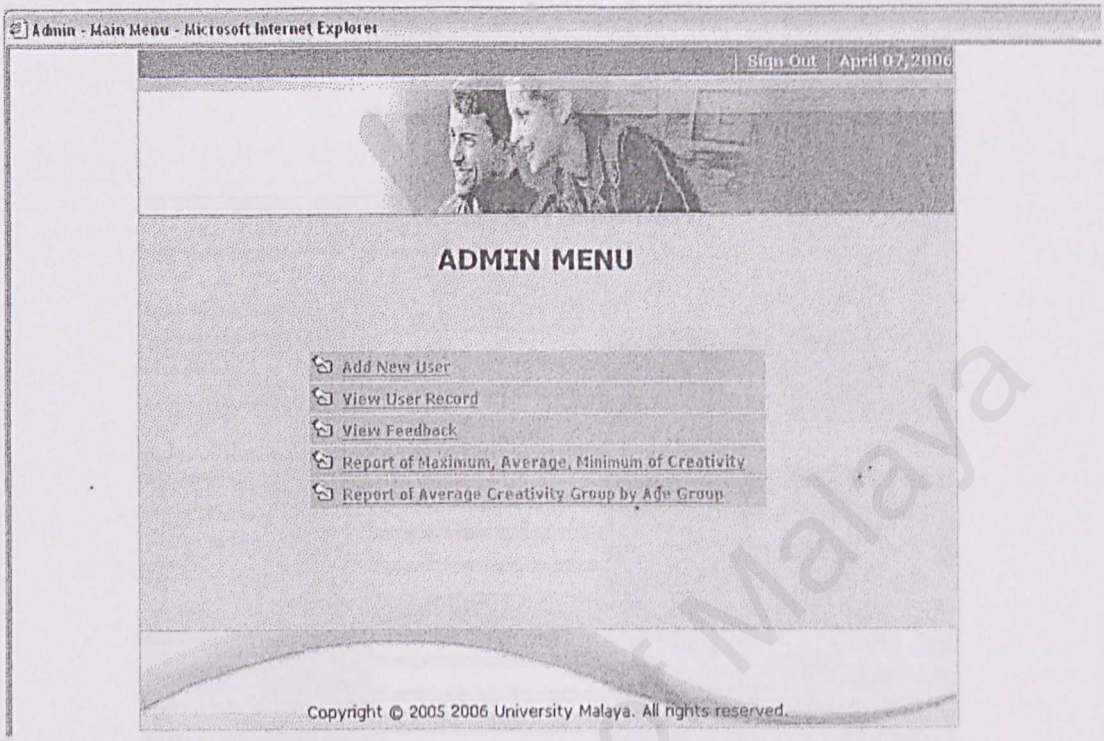


Figure 11: Admin Main Menu Page

5.5.3 Add New User

Admin will help to add new user where the user either is user or admin in this page.

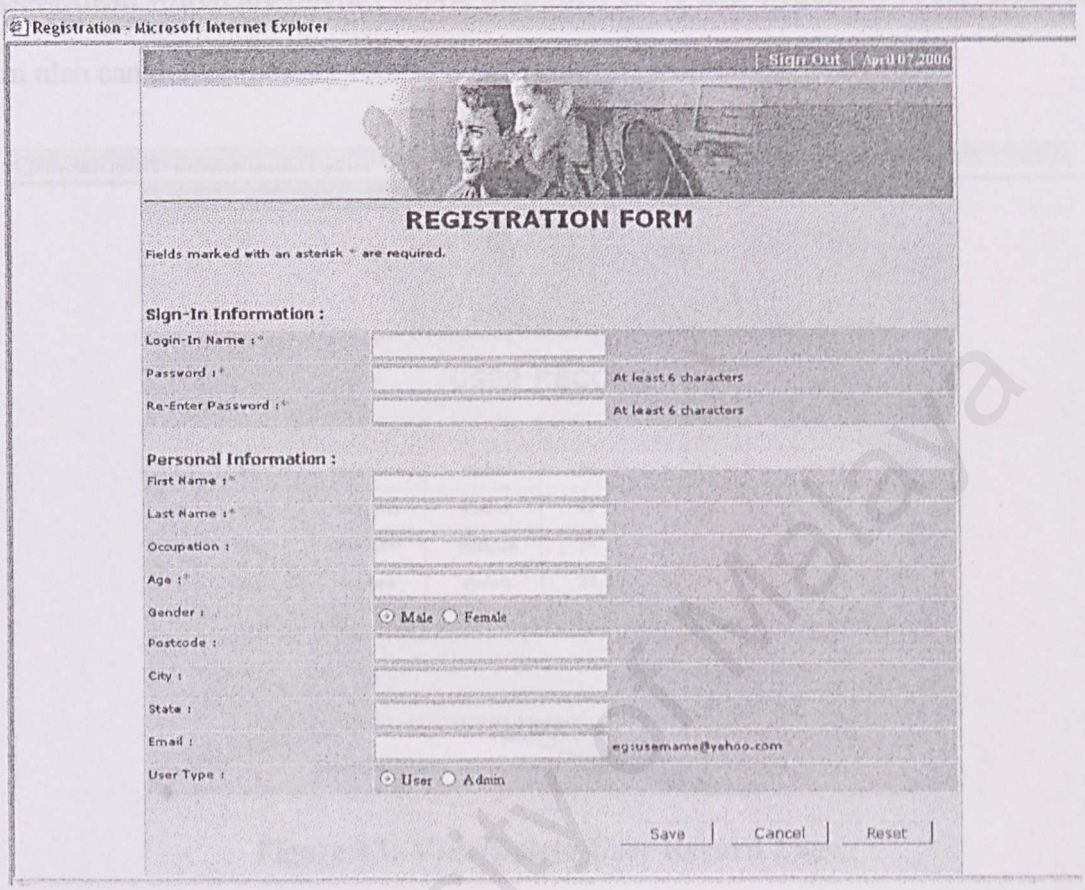


Figure 12: Add New User Page

5.5.4 View/Delete User Record

Admin can view all the user record with their required personal detail and their result for the assessment which are fluency score, flexibility score and originality score. Besides, admin also can delete the user record by clicking the icon on each record.

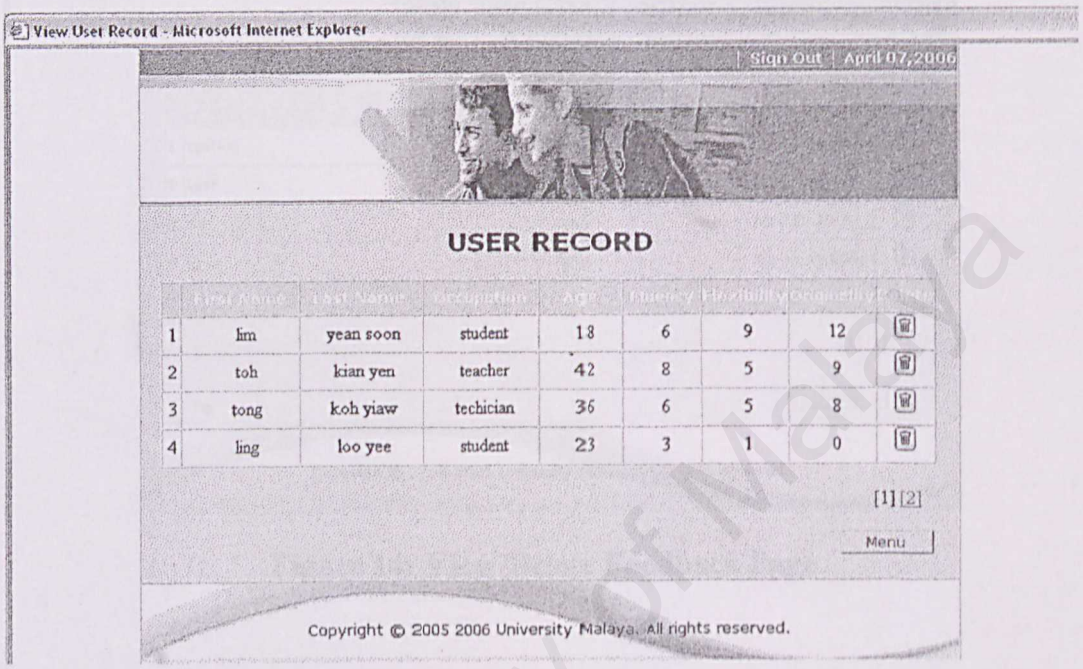


Figure 13: View/Delete User Record Page

5.5.5 View/Delete Feedback

Admin has the right to view the feedback posted by user and delete each feedback.

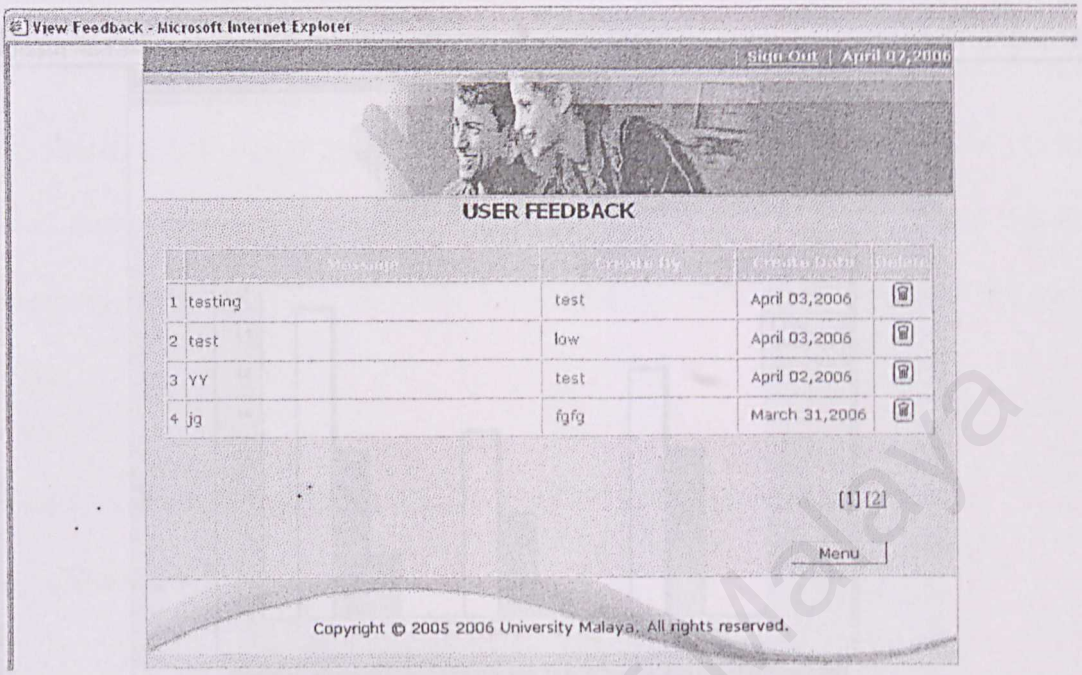


Figure 14: View/Delete Feedback Page

5.5.6 View Analysis Report

Admin can view all the graph which analyze based on different criteria.

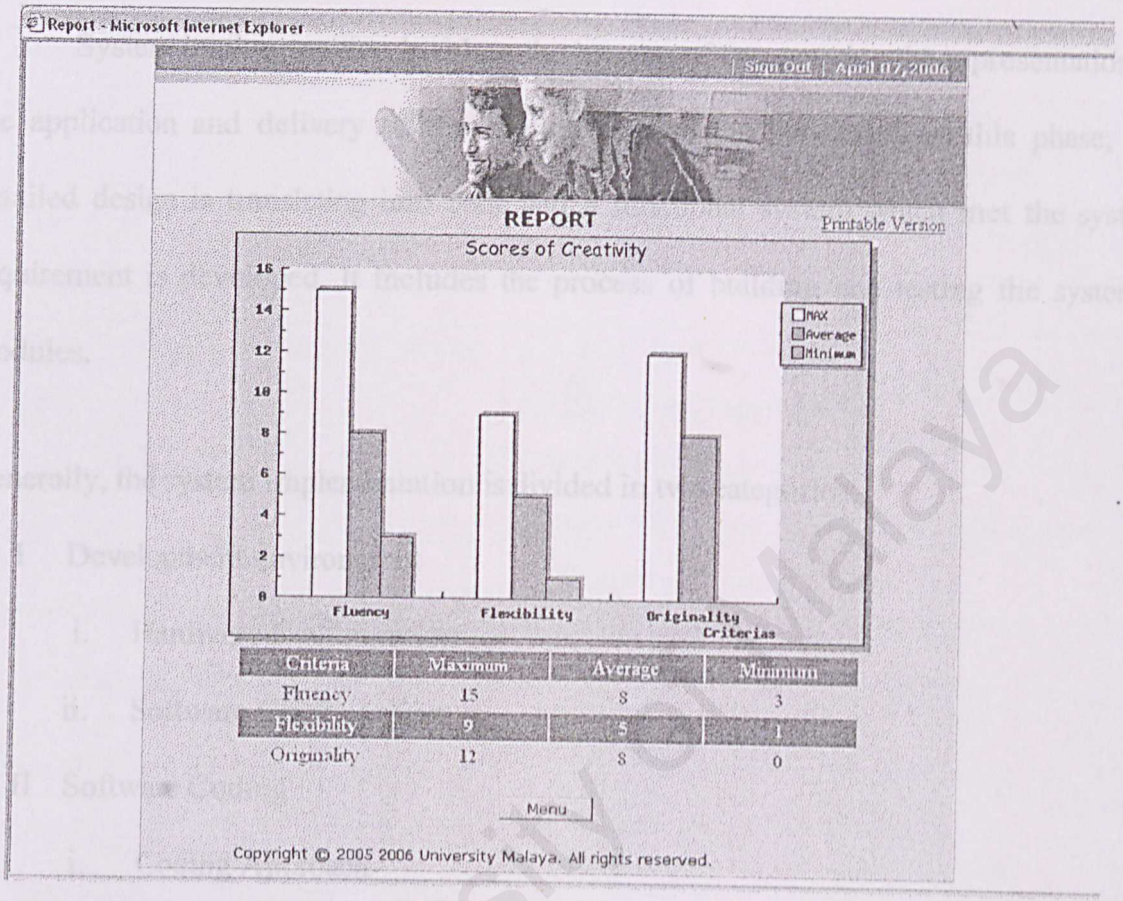


Figure 15: View Analysis Report Page

CHAPTER 6: SYSTEM IMPLEMENTATION

6.1 Introduction

System implementation involves the process of constructing the representation of the application and delivery of the application into the "product". In this phase, the detailed design is translating into code and a functional system which met the system requirement is developed. It includes the process of building and testing the system's modules.

Generally, the system implementation is divided in two categories:

I Development environment

i. Hardware Configuration

ii. Software Configuration

II Software Coding

i. Coding Approach

ii. Coding Principles

6.2 Development Environment

Development environment is the first step of system implementing. Setting up the development environment involves hardware and software configurations. Chosen the suitable hardware and software tools will help to accelerate the process of development the system.

Below, the tables shown the hardware and software tools that have been chosen to develop the Creativity Assessment System.

6.2.1 Hardware Configuration

Table 9: Hardware configuration

Hardware	Requirements
Processor	Intel Pentium 4 processor 1.40 GHz
Motherboard	PC Partner I845 chipset Main board
RAM	256MB Kingston SDRAM PC133MHZ
Hard disk	HDD 40.0GB Maxtor/Seagate 7200rpm HDD
Graphic Card	32MB NVIDIA TNT2 AGP
Other standard computer peripherals	52x 24x 52x CDRW 10/100MBPS Ethernet card 1.44MB Floppy Disk Drive Windows Compatible Keyboard and Mouse 15"Samsung Monitor

6.2.2 Software Configuration

Table 10: Software configuration

Software	Purpose	Description
Microsoft Windows XP Professional	System Requirement	Operating System [Final Stage]
Apache Web Server Version 2.0.54	System Requirement	Web Server host [Final Stage]
PHP Version 5.0.4	System Development	Coding the web pages
Microsoft Internet Explorer 6.0 (IE 6.0)	System Development	Web Browser
MySQL Database Version 4.1.12a	System Development	Database Design & Database Server
Macromedia Dreamweaver MX	System Development	
Adobe Photoshop	Interface Design	Image design and creation
Microsoft Visio 2003	System Design	Diagram Creation [Earlier and final stage]
Microsoft Word 2003	Documentation	System Documentation [Earlier and final stage]

6.3 *System Coding*

Beside of development environment, the system implementation also includes software coding. The software coding involves the process of converting the system requirements into codes and translating a design into a program by programming and coding procedures.

6.3.1 Coding Approach

There are two types of coding approach, top-down and bottom-up. The top-down approaches is based on the design begins by specifying complex pieces and then dividing them into sequentially smaller pieces. Ultimately, the components are specific enough to be coded and the program is written. The bottom-up approach is opposite of the top-down approach. It is refers to a style where an application is built starting with simpler functions, and constructing gradually more and more complicated features, until the all of the application has been written.

The Creativity Assessment System was developed using the bottom-up approach. Each simpler function and procedure was developed individually and then integrated them into complicated modules accordingly. Bottom-up approach offers some advantages such as:

i. Critical functions can be coded initially to test their efficiency.
ii. Increase the development process as the primitive modules or functions can be built independently and simultaneously without waiting or delaying the others.
iii. Testing can be conduct on some of the modules while the others are still under construction.

iv. Faults are easier to be detected.

6.3.2 Coding Style

Coding style is an attribute of source code that determines the comprehensibly, readability and maintainability of program. The maintenance and enhancement will be easier to implement if the source code is simple and easy to read. The coding style includes internal documentation which is resided in the source code, methods for data declaration and approach to statement construction.

Typically, there is some condition to be fulfill, intent to have a good coding practices. Firstly, indent coding should be applied by formatting and indenting the codes. This will make the error and faulty easier to be found and detected. Furthermore, the indented code is easier to read and this is useful while it is involves a lot of conditional structure and loop structure. Secondly, layout the program source code such as begin a new line for each sentence, indent the statement following control structure, using white space to distinguish related blocks of code and so forth. This will helps to improve the program readability. Thirdly, to lessen the use of comments, use a consistent and meaningful variables name. Lastly, write the description and comments in the source codes.

i. PHP Script

A PHP script is a simple text file which the web server sends to an interpreter: the PHP engine. For a file to be recognized as PHP script, it must show an appropriate extension: ".PHP".

All PHP codes must start with the *<?php* tag and finish with ?>. All content located outside these two tags is sent back to the browser without being interpreted by the PHP engine. This structure allows combining PHP code sections, which handle the dynamic content, with regular, static HTML elements. This is the same principle used in the JavaScript code delineated by *<script>* and *</script>* tags.

ii. PHP's MySQL connection File

Below is an example codes taken from the project file name " webConfig.php".

```
<?

        $database="cas";
        $hostname="localhost";
        $user="root";
        $password="";

        if(!$db = mysql_connect("$hostname", "$user", "$password"))
        print("Can't connect to the database");
        else
        mysql_select_db("$database", $db);

?>
```

Figure 16: A PHP Code for database connection—"webConfig.php"

iii. SQL query File

SQL query is using to retrieve, insert, update data from database or delete data from the database. Below are examples of SQL statement:

- SELECT [columns] FROM [tablename] WHERE [conditions]
  - The database will retrieve the values for the '*columns*' columns in the '*tablename*' table where the '*conditions*' conditions is met.
- INSERT INTO [tablename] ([column1], [column2]) VALUES ([value1], [value2])

- The database engine will insert a new row into '*tablename*' table, using the '*value1*' and '*value2*' values for the '*column1*' and '*column2*' columns, respectively.

- UPDATE [tablename] SET [column1] = [value1], [column2] = [value2]
  - The database will update for the column1 into 'tablename' table with the value1 respectively.

- DELETE FROM [tablename] WHERE [conditions]
  - The database will delete the existing record from '[tablename]' where the '[conditions]' is met.

Below is an example taken from the project file name "Anscode.php".

```
<?php

        include ("webConfig.php");
        session_start();
        $id = $_SESSION['id'];

        $sql_previousrecord = mysql_query("SELECT UserId from answer WHERE UserId =
'$id'",$db);
        $num_rows = mysql_num_rows($sql_previousrecord);

        if($num_rows==0){
$sql_insert = mysql_query ("INSERT INTO answer (Ans1, Ans2,
Ans3,Ans4,Ans5,Ans6,Ans7,Ans8,Ans9,Ans10,Ans11,Ans12,Ans13,Ans14,Ans15,Ans16,Ans17,Ans18,A
ns19,Ans20,Ans21,Ans22,Ans23,Ans24,Ans25,Ans26,Ans27,Ans28,Ans29,Ans30,Ans31,Ans32,Ans33,A
ns34,Ans35,Ans36,Ans37,Ans38,Ans39,Ans40,Ans41,Ans42,Ans43,Ans44,Ans45,Ans46,Ans47,Ans48,A
ns49,Ans50,UserId) VALUES ('$a1',
'$a2','$a3' ,'$a4' ,'$a5' ,'$a6' ,'$a7' ,'$a8' ,'$a9' ,'$a10' ,'$a11','$a12','$a13','$a14','$a15','$a16','$a17','$a18','$a1
9','$a20','$a21','$a22','$a23','$a24','$a25','$a26','$a27','$a28','$a29','$a30','$a31','$a32','$a33','$a34','$a35','$a
36','$a37','$a38','$a39','$a40','$a41','$a42','$a43','$a44','$a45','$a46','$a47','$a48','$a49','$a50','$id')",$db);
}

else {
$sql_update = mysql_query ("UPDATE answer SET Ans1 = '$a1', Ans2 = '$a2', Ans3 = '$a3', Ans4 =
'$a4', Ans5 = '$a5', Ans6 = '$a6', Ans7 = '$a7', Ans8 = '$a8', Ans9 = '$a9', Ans10 = '$a10', Ans11 = '$a11',
Ans12 = '$a12',Ans13 = '$a13', Ans14 = '$a14', Ans15 = '$a15', Ans16 = '$a16', Ans17 = '$a17', Ans18 =
'$a18', Ans19 = '$a19', Ans20 = '$a20', Ans21 = '$a21', Ans22 = '$a22', Ans23 = '$a23', Ans24 =
'$a24',Ans25 = '$a25',Ans26 = '$a26',Ans27 = '$a27',Ans28 = '$a28',Ans29 = '$a29',Ans30 = '$a30',Ans31
= '$a31', Ans32 = '$a32',Ans33 = '$a33', Ans34 = '$a34', Ans35 = '$a35', Ans36 = '$a36', Ans37 = '$a37',
Ans38 = '$a38', Ans39 = '$a39', Ans40 = '$a40', Ans41 = '$a41', Ans42 = '$a42',Ans43 = '$a43',Ans44 =
'$a44',Ans45 = '$a45',Ans46 = '$a46',Ans47 = '$a47',Ans48 = '$a48',Ans49 = '$a49',Ans50 = '$a50'
WHERE UserId = '$id'", $db);
}
```

```
        if(isset($id)) {
                mysql_query ("DELETE FROM feedback WHERE FeedbkId='$id'",$db);
        }
?>
```

Figure 17: Part of the PHP code in "Anscode.php"

iv. Include File

The include function enables to copy the contents of the file whose URL is passed as an argument, into the page. By insert this line in the page, it can make use of the functionality of graph.

Below is an example taken from the project file name "graph1.php".

```
<?php
        include ("../webConfig.php");
        session_start();
        $id=$_SESSION['id'] ;

        include ("graph/jpgraph.php");
        include ("graph/jpgraph_bar.php");

$datax = array("Fluency","Flexibility","Originality");
$sql_score = mysql_query("SELECT Fluency, Flexibility,Originality from useprofile WHERE UserId =
'$id' ",$db);
$row = mysql_fetch_array($sql_score);
$fluen = $row["Fluency"];
$flex = $row["Flexibility"];
$ori = $row["Originality"];
$datay = array($fluen,$flex,$ori);

// Setup the graph.
$graph = new Graph(330,350,"auto");
$graph->img->SetMargin(40,20,30,80);
$graph->SetScale("textlin");
$graph->SetMarginColor("#FFFFCC");
$graph->SetShadow();

// Set up the title for the graph
$graph->title->Set("My Scores");
$graph->title->SetFont(FF_COMIC,FS_NORMAL,12);
$graph->title->SetColor("darkred");

// Show 0 label on Y-axis (default is not to show)
$graph->yscale->ticks->SupressZeroLabel(false);
```

```
// Setup X-axis labels
$graph->xaxis->SetTickLabels($datax);
$graph->xaxis->SetLabelAngle(50);

// Create the bar pot
$bplot = new BarPlot($datay);
$bplot->SetWidth(0.4);

// Setup color for gradient fill style
$bplot->SetFillGradient("navy","#EEEEEE",GRAD_LEFT_REFLECTION);

// Set color for the frame of each bar
$bplot->SetColor("white");
$graph->Add($bplot);

// Finally send the graph to the browser
$graph->Stroke();

?>
```

Figure 18: PHP code for display the image—"graph1.php"

v. Scripting Language

Scripting language used for CAS is Javascript. Same as ASP, PHP also allows for HTML and a scripting language to be interspersed in a web page.

Below is an example of code that jump between HTML, PHP and Javascript.

```
<script language="javascript">
function winopen(targeturl){
        window.opener="anyvalue"
        window.close()
        var targeturl=targeturl;
        newwin=window.open("","","status,scrollbars,menubar,toolbar,directories,location")
        if (document.all){
         newwin.moveTo(0,0)
         newwin.resizeTo(screen.width,screen.height)
        }
        newwin.location=targeturl;
}
</script>

<style type="text/css">
<!--
.style11 {font-weight: bold; font-size: x-small; }
.style12 {font-size: x-small}

-->
</style>
```

```
// Setup X-axis labels
$graph->xaxis->SetTickLabels($datax);
$graph->xaxis->SetLabelAngle(50);

// Create the bar pot
$bplot = new BarPlot($datay);
$bplot->SetWidth(0.4);

// Setup color for gradient fill style
$bplot->SetFillGradient("navy","#EEEEEE",GRAD_LEFT_REFLECTION);

// Set color for the frame of each bar
$bplot->SetColor("white");
$graph->Add($bplot);

// Finally send the graph to the browser
$graph->Stroke();

?>
```

Figure 18: PHP code for display the image—"graph1.php"

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Below is an example of code that jump between HTML, PHP and Javascript.

```
<script language="javascript">
function winopen(targeturl){
        window.opener="anyvalue"
        window.close()
        var targeturl=targeturl;
        newwin=window.open("","","status,scrollbars,menubar,toolbar,directories,location")
        if (document.all){
         newwin.moveTo(0,0)
         newwin.resizeTo(screen.width,screen.height)
        }
        newwin.location=targeturl;
}
</script>

<style type="text/css">
<!--
.style11 {font-weight: bold; font-size: x-small; }
.style12 {font-size: x-small}

-->
</style>
```

```
<P align="left">
<TABLE id="heading" style="POSITION: static; HEIGHT: 32px" cellSpacing="0" cellPadding="0"
width="100%" align="left" border="0">
<COLGROUP>
        <COL width="100%"></COLGROUP>
<TR><td id="UserInfo" title="" style="WIDTH: 99%" vAlign="top" noWrap align="right"><FONT
color="white">|</FONT>  
<a href="" onClick="winopen('mainpage.php')" class="style12"><font color="white" face="Verdana,
Arial, Helvetica, sans-serif"><strong>Sign Out</strong></font></a><strong> 
<FONT color="white" >|</FONT></strong>  <font color="white" face="verdane" size="2"
><strong><?php echo date("F d,Y");?></strong></font></td>
        </TR>
        </TABLE>
</P>
```

Figure 19: Code jump between HTML, PHP and Java Script--"HeadingRegis.php"

vi. CSS (Cascading Style Sheets)

CSS is also used to gain better control of the interface design.

```
/* Default CSS Stylesheet for a new Web Application project */
.lblform
{
        font-family: Verdana,Tahoma;
        font-size : 10px;
        background-color :#c0c0c0;
        height:20px;
        width:90px;
        vertical-align:top;
}
```

Figure 20: CSS in CAS

6.3.3 Integration

Since the system consists of several modules and sub system, the integration is needed to combine all of them into a whole and complete system. Some of the actions,

such as matching the font size and color, background color and add in related hyperlink, have been taken while integrating the design of each module. The integration must be applied on those pages without influence the system operation.

6.4 Coding Principles

During the development of system, there are some principles to be followed. It is to ensure good quality and the proper structure in the code generation. The principles will be discussed are reusability, readability and robustness.

i. Reusability

This system is emphasis on reusability which helps to improve product quality throughout the software development process. Pieces of programs written bottom-up tend to be more general, and thus more reusable. Reuse refers to code that is reused without change and has to be adapted to integrate it with new code. Components that designed to be reused in subsequent applications are created. In this system, some coding block that is reused in other program code is created, such as header and footer code of every web page file.

ii. Readability

Codes are wrote and formatted with readability so that it is easy to trace by other developer for error checking or the system enhancement in the future. Consistent and meaningful variables names, description and comments in the source codes, proper identification and begin a new line for each sentence will helps to improve and preserve the readability of codes.

iii. Robustness

Robustness is capability of a system to handle an unexpected error and echo back with appropriate responses. A system should included error handling to increase the robustness. The system also has the ability to validate systems input to ensure the inserted data is correct so that the system integrity is protected. A proper error message will be displayed as response to user's input. Besides that, database will also be back-up automatically for restore purpose when there is some unplanned system interruption occurs.

CHAPTER 7: SYSTEM TESTING

7.1 Introduction

System testing is an integral component of the software process and an activity that must be carried out throughout the life cycle. The main function of testing is to discover the defects in a program where the behavior of the program is incorrect, undesirable or does not conform to its specification, and to judge whether the program is usable in real application. Besides, testing also use to demonstrate that software functions appear to be working according to specification, and to demonstrate that behavioral and performance requirements appear to have been meet.

Bottom-up approach is adopted in system testing for CAS. Each module at the lowest level of the system hierarchy is tested individually. Then, all the tested modules would be related to the next module testing. This approach is repeated until all the modules are tested successfully.

7.2 Type of faults

It is important to learn some type of faults since it may be detected during the process of system testing.

❖ Algorithmic fault

Algorithmic fault is the condition where the system does not produce the expected and correct output for an input. This fault is occurred usually due to the mistake made during the program design process. This can be easily detected by going through line by line of the program code.

❖ Document Fault

Usually, documentation is derived from the system design and provides a clear description about the program. While the documentation is not match with the real application, and this is known as documentation fault. Due to this wrong implementation, it may lead to other faults later.

❖ Syntax Fault

This is the fault where the construction of the language is improper. Syntax fault can be checked while parsing for algorithmic faults.

7.3 Testing Process

In generally, the testing of this project is begin at the unit level and then combining the units into sub-system or module, and each interactions of these units were tested. Different testing techniques are appropriate at different points in time.

In general, the testing process of CAS can be shown in the following figure. All the details will be further explained in subsequent sub-sections.

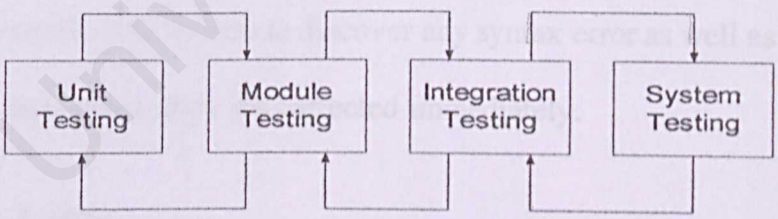


Figure 21: Testing Process

7.3.1 Types of testing

There are 4 types of testing strategies is used. There are unit testing, module testing, integration testing and system testing.

7.3.1.1 Unit testing

Unit testing is an automated technique whereby each unit is tested alone in an attempt to discover any errors that may exist in the code. Unit test is performed concurrently with the development process.

For Creativity Assessment System, each module may contain sub modules and the sub modules may consist of functions. The functions are individually tested before the entire module is tested. In the development of CAS, unit testing was conducted after development of each of the component and it is a continuous process throughout the coding phase.

Steps that are carried out during the unit testing of CAS are as follows:

- Control objects are tested to ensure its functionality.
- Different type of data is used to test the error handling function.
- Codes are reviewed line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.

7.3.1.2 Module Testing

A module consists of a collection of dependent components to perform a particular task or function. Testing on this module is to ensure that the module calling sequence in this project is systematic and verify the correctness of the flows of events.

Thus, while the system development process is being carried out module by module, the module testing will also be carried out once a module has been completed. Different possible test cases are applied to the module and the test results would be verified. If there is any incorrect in output, the unusual results will be analyzed.

7.3.1.3 Integration Testing

Combining modules and testing them is called integration testing. The integration testing will verify the system components are work together as describe in the system and program design specification. The main focus in integration test is to navigate the interfaces repeatedly to detect any interface mismatch problem. The test is conducted on the interface of two interactive components in a single unit and the process of two interface components in the system will be examined. This procedure is continuing until the entire program has been tested as unit.

7.3.1.4 System Testing

Instead of integrating modules into programs for testing, system testing is integrating programs into system. The objective of system testing is to find errors that result form unanticipated interactions between sub-system and verify that whether the system meets the specified requirements.

There are several types of system testing is performed to worthwhile the system. There are:

- Function testing

Function testing is performed to compare the integrated modules with the system's function requirements. Each module involved is tested individually to determine whether the system performs as required.

- Performance Testing

Performance testing is performed to test the run-time performance of software within the context of an integrated system.

- Security Testing

Security testing is performed to verify that protection mechanism built in the system that protects it from penetration.

7.4 Testing Validity and Reliability of CAS

Validity and reliability of the Creativity Assessment System was ascertained using Pearson Product Moment Correlation method to calculate the correlation, r , between computer-scored and hand-scored of CAS.

This system captures the user responses and these responses are manually scored by a creativity expert for Fluency, Flexibility and Originality. Both the computer scored values and the hand-scored points were correlated for each component to obtain the validity indices.

Table 11 shows the CAS validity results indicated by Pearson Product-Moment Correlation coefficients, *r*, between CAS scores and hand-scored points obtained based on the Torrance Tests of Creative Thinking (TTCT) Manual. The accuracy of CAS is

found to be highest for Fluency ($r = 1.00$), followed by Originality ($r = .99$) and Flexibility ($r = .93$).

The Pearson Product Moment Correlation coefficient between the Total Creativity Score computed by CAS and the Total Creativity Score scored by hand was .95 ($p < .01$).

Table 11: CAS validity results

Pearson Product Moment Correlations between CAS scores and TTCT based Handscored values				
		FLUHAND	FLXHAND	ORIHAND
FLUCOM	Pearson Correlation	1.000**	.657**	.750**
	Sig. (2-tailed)	.	.000	.000
FLXCOM	Pearson Correlation	.656**	.926**	.531**
	Sig. (2-tailed)	.000	.000	.004
ORICOM	Pearson Correlation	.730**	.599**	.994**
	Sig. (2-tailed)	.000	.001	.000

** Correlation is significant at the 0.01 level (2-tailed).

FLU – Fluency FLX – Flexibility ORI - Originality

Suffix COM - scored by CAS
Suffix HAND - handscored based on TTCT

These results show that CAS scores have very high validity for all components of creativity as well as its Total Creativity Score and hence can be used to identify the creative potential accurately and instantly.

CHAPTER 8: SYSTEM EVALUATION

8.1 Introduction

System evaluation is related to user environment, attitudes, information priorities and other concern that are to need to be considered carefully before effectiveness can be concluded. Evaluation is a process that occurs continuously for all phases of the system approaches and drawing on a variety of sources and information.

8.2 Problems and Solutions

i. Difficulty in choosing suitable Development technology, programming language and tools

There are many software tools is available to develop CAS. It is hard to choose a suitable technology and tools as all the tools have their own strengths and weaknesses. Previously, we plan to use Microsoft Visual Studio.Net and Microsoft SQL Server 2000 but these involve a costly framework license and SQL server license.

After discussed with my project partner and supervisor, finally, we choose open source which are Apache Server as web server, MySQL as database and PHP as programming language to develop this system in order to lower the cost of selling to commercial company or school.

ii. Lack of Knowledge in PHP and JavaScript

These programming languages and concepts never learned before. Due to lack of this knowledge, I was uncertainly on how to organize the codes to produces a web-based system.

To overcome this problem, I try to pick up some good habits right to learn the syntax and structures of language, and gone through some online tutorial. Besides, I able to found some good help on the net to solve most of the problem faced. Discussion with project partner also a great help since he is more knowledgeably in PHP. And the most efficient method is through trail and error during the coding phase.

iii. Lack of hardware and Software Configuration Knowledge

The environment between software and hardware is quite complex, and hardware and software need to be configured before the start of the development phase, such as the directory root of the web server need to be change to our own directory, configure PHP for Apache, configure PHP with MySQL and so forth. Since I don't have any knowledge about Apache/PHP/MySQL, it is hard for me to do so.

Yet, my course mate was introducing me to use AppServ v2.5.4a which is a package that includes all a latest version of Apache web server, PHP script language and MySQL database. It is very easy to set up and do not require any complex configuration.

8.3 System Strengths

i. Simple and User Friendly Interfaces

The Graphical User Interfaces (GUI) design for the system is simple and user friendly. The system interfaces uses a series of light and soft color as its main color. Forms and other command buttons are readable, simple and easy to use. Besides, for the page to do the assessment, the textbox will only appear after user type an answer compare

to previous 50 textboxes appearance in the same page. The Web pages are designed to suit a wide spectrum of user. The novice users will feel comfortable with this system because this system does not using the jargons in its GUI.

ii. Web Enabled

The system was based on the web technology. By applying in web-based system, CAS is easy to access anywhere and anytime. It can save a lot of time to collect data from user and it calculate the result faster and reliable compare to manual marking.

iii. Instant Result, Interpretation and Recommendation

CAS provides an accurate and instant result and interpretation of one's creativity after the user has tried the assessment. Besides result and interpretation, it also provide an instant recommendation to user based on the result that user gained on how to enhance one's creativity.

iv. Significant validation on input data

Check for the validation of every data input in the field and prompt the user of invalid data being input and ask for valid data. Data field that disallow data to duplicates will also prompt the user about the error.

v. Implements error handling

To avoid run time error, this system is developed with error handling function. Error message will be displayed when exceptions encounters.

vi. **Effective User Login and User Identification System**

Users are protected by authentication feature. Login and password are required before allowing the users access to the protected site. All types of users using a same login page to login their account. The system is able to identify different type of user and the level of access to the system. The system will only allow the user to access to respective links only.

8.4 System Constraints and Limitations

Creativity Assessment System is still not delicate enough to work at its full efficiency. Some improvement and enhancement needs to be applied to the system to increase it usability and reliability.

i. **Do not have complex error checking function**

In CAS, it just have function of validation like email validation, password validation and etc. So, in order to advance this system, it should add more complex error checking function.

ii. **Type of version**

At the moment, we just developed an English Version of CAS since English is an international language. But for further assessment, we will add Bahasa Malaysia version to increase the availability and efficiency of this system.

iii. Accessible of previous record

User cannot view their previous record at other page, they just can view through menu page after the user login. It is not so effective if the user want to view at other page instead of menu page.

8.5 Future Enhancements

Future enhancement can be done to make the system more advances in order to improve the quality of the system. A system development knows no boundaries as new requirements and better implementation methods continue to arise and evolve. There are several enhancements that could extend after developed the system.

i. Provide a Front-end maintenance for the distribution of "Others" category responses

In order to reduce burden of administrator, a front-end maintenance should be created indeed of back-end. This is because there are a lot of new keyword that entered by user to the database, it is an unwise choices for admin to distribute those "Others" category responses to different categories respectively. It will take a lot of time for the regularly checking.

ii. Provide Bahasa Malaysia Version

As the system is aim at Malaysian Citizens, therefore besides English, providing Bahasa Malaysia version of the national language would be a good idea. Since Malaysia is a multiracial country, provide an alternative choice to the user will increase the efficiency of the system.

iii. Increase the number of previous record in "View Previous Record" page

Currently, there is only one record of the answer, result and interpretation in "View Previous Record" page. Instead of update the previous record directly, this system should keep few more previous record and display to the user. So, user can compare their previous result and tend to assess the assessment again by increasing their creativity.

REFERENCE

[1] Hoffer, J.A., George, J.F. & Valacich, J.S. (2005). Modern Systems Analysis and Design. 4th edition. England: Pearson Education Ltd.

[2] Sommerville, I. (2004). *Software Engineering*. 7th edition. England: Pearson Education Ltd.

[3] Apache Web Server: http://www.apache.org

[4] MySQL: http://www.mysql.com

[5] PHP Hypertext preprocessor: http://www.php.net

[6] PHP Manual: http://us2.php.net/manual/en/index.php

[7] URL- http://www.phphelp.com/

[8] URL- http://www.w3schools.com/php/default.asp

[9] URL- http://www.visualdesigncore.com/tutorials/PHP-MySQL

[10] URL- http://www.php.net/manual/en/ref.mysql.php

[11] URL- http://my.php.net/manual/en/index.php

[12] URL- http://www.php-mysql-tutorial.com/index.php

[13] URL- http://www.phpfreaks.com/

[14] URL- http://www.phpriot.com/d/articles/php/index.html

[15] URL- http://www.onlinesupport.interland.net/freedom/guide/mysql.htm

APPENDIX

Question - Microsoft Internet Explorer

My Profile Sign Out

Parallel Lines

In ten minutes see how many objects or pictures you can make from the pairs of straight lines. The pairs of straight lines should be the main part of whatever you make. Try to think of things that no one else will think of. Name as many different objects as you can with parallel lines. Type the names or titles in the spaces provided. Only words with correct spelling will be awarded points.

Continue Cancel

Paralle Lines - Microsoft Internet Explorer

My Profile Sign Out

1) 16)
2) 17)
3) 18)
4) 19)
5) 20)
6) 21)
7) 22)
8) 23)
9) 24)
10) 25)
11) 26)
12) 27)
13) 28)
14) 29)
15) 30)

Reset

Done

Local intranet

scoring D/b.

SCORING FOR FLEXIBILITY

FLEXIBILITY – refers to the number of different categories of responses.

Identify how many different categories your responses belong to.

No	Category	Examples
1	Accessories	Bracelet, crown, glasses, hat, necklace, purse, etc.
2	Vehicle	Aircrafts, rockets, spaceships, automobile, etc.
3	Animal	All animals including animal faces and heads, insects, etc
4.	Games	All items used in games e.g. balloon, chess pieces, etc
5	Human	All forms of human shapes, parts etc.
6	Stationery	Books, pencils, newspapers, etc
7	Building	House, church, animal house, etc road.
8	Clothing	Shirts, dress, hat, coat, etc
9	Household items	Hanger, jug, toy, umbrella, art, etc.
10	Food	Egg, vegetables, bread, chicken curry, etc
11	Fruit	All types of fruits
12	Furniture	All types of furniture, bed, etc
13	Nature	Mountain, river, volcano, etc.
14	Planets	Earth, sun, moon, mars, etc.
15	Alphabets and Numbers	All alphabets and numbers
16	Machine	Robot, sewing machine, etc
17	Musical Instrument	Guitar, drum, piano, etc
18	Sports	Football, golf, gymnastic, all sports equipment, etc
19	Symbols	Badge, question mark, peace symbol, etc flag.
20	Tool	Axe, hammer, rake, etc
21	Weapon	Gun, bow and arrow, bomb, etc
22	Electronic Equipment	Radio, TV, Computer, etc
23		ALL OTHER ITEMS NOT LISTED ABOVE

> st-ks
stick

SCORING GUIDE FOR ~~CIRCLES~~ ACTIVITY

RESPONSES SCORING ZERO (0) POINT FOR ORIGINALITY

Abstract designs without any meaningful title, Book, Box(es), Door, Geometric Shape, House, Human face or figure, Ladder, Letter(s) of the alphabet, Numeral(s), Picture frame, Present, Package, Gift, Rocket, Stick person(s), Tree(s), Window and shirt

RESPONSES SCORING ONE (1) POINT FOR ORIGINALITY

Board, Boat (motor, sail, etc), Bottle, Clock, Cube, Fence, Flag(s), Flower (tulip, rose, etc), Gift, Can (metal), Candle(s), Checkerboard, Glass (drinking), Goalposts (football), Hat, Highway, Hourglass, Milk carton, Pants (man's), Paper (piece of, sheet, typing), Pencil)s), Railroad, Stairs, Swing (swing set), Table, Tick-tack-toe, Jail window, ~~Woman's face~~.

RESPONSES SCORING TWO (2) POINT FOR ORIGINALITY

Apartment (building), Arrow(s), Automabile, Barn, Bed(s), Blackboard, Bow (tie, ribbon), Chimney(ies), City skyline (buildings), Crayon(s), Crayon(s), Cup, Desk, Dress, Drum. Dynamite, Fireplace, Garbage can, Gate (fence gate), Bridge, Bucket (paint, water), Bullet (shell), Butterfly, Cage (for animal) Cake, Calender,

Candy, Car, Chalkboard, Hut, Ice cream cone, Jail, Man's leg, Letter (to person), Light (lamp), Lollipop, Mailbox, Monster (whole), Pail, Pocketbook, Prison building, Robot, Sack, Signs (traffic), Silo, Skyscapper, Spaceship, Stilts, Telephone poles, Train track, Trash can, Truck, Wastebasket, Weapon (bow & arrow)

RESPONSES SCORING THREE (3) POINT FOR ORIGINALITY

Abacus, Airplane, Balloons, Basket, Bird(s), Birdhouse, Block(toy), Bookshelf, Bread (loaf), Chewing gum, Church, Clothesline, Coat, Columns (building), Crown (king), Diving board, Dog, Doghouse, Dollar bill, Egg(s), Envelope, Eye(s), Eyeglasses, Firecrackers, Fish, Flowerpot, Football field, Fork (to eat with), Broom, Cabinet (cupboard), Camera, Cards (playing), Castle, Cat, Cave, Hammer, Horse, House (tree), Jar (jelly), Kite, Knife, Lighthouse, Light (socket, switch), Log (tree), Map, Maze, Mirror, Mountain Peaks, Mug (drinking), Mushroom, Musical note, Pot (container), Radio, Ruler, Shoe (boot), Spool (spindle), Stove, String, Swimming pool, Tank (container), Tombstone, Tower Umbrella, Vase, Wagon, Wall(s), and Washing machine

Activiti 3: GARIS-GARIS

Berdasarkan pasangan garis lurus yang berada di halaman ini dan juga halaman yang berikutnya, berapakah benda atau gambar yang dapat kamu lukiskan dalam masa sepuluh minit?

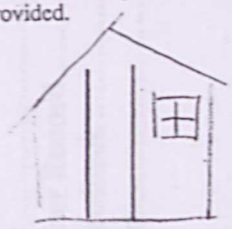
Pasangan garis lurus itu harus dijadikan bahagian yang penting kepada apa juga benda atau gambar yang kamu lukis itu. Siapkan lukisan itu dengan pensel atau krayon. Anda boleh melukis di mana-mana juga mengikut kesukaan hati anda. Misalnya, anda boleh melukis di antara pasangan garis lurus itu, di pasangan garis itu dan juga di luar garis lurus itu. Cuba fikirkan benda atau gambar yang tidak pernah difikirkan oleh orang lain. Buatlah sebanyak mungkin jenis-jenis benda atau gambar yang berlainan. Tambahkan fikiran-fikiran baru sebanyak yang anda boleh. Lukisan itu harus dilukis sebegitu rupa supaya ianya dapat menerangkan selengkap mungkin sebuah cerita yang menarik.

Tuliskan nama atau tajuk setiap lukisan itu di ruang yang disediakan.

Activity 3. LINES

In ten minutes see how many objects or pictures you can make from the pairs of straight lines below and on the next two pages. The pairs of straight lines should be the main part of whatever you make. With pencil or crayon add lines to the pairs of lines to complete your picture. You can place marks between the lines, on the lines, and outside the lines—wherever you want to in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles in the spaces provided.

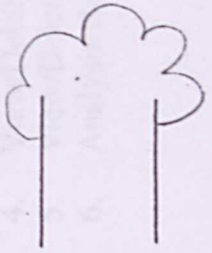
1. flag



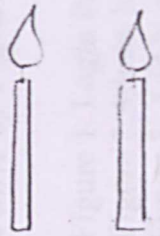
2. House

3. Junction road

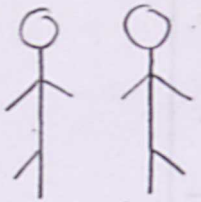
4. Kon



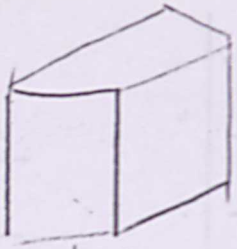
5. tree



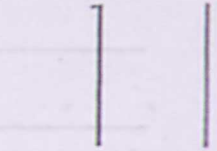
6. light



7. people



8. box



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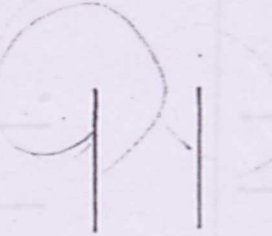

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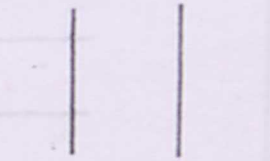
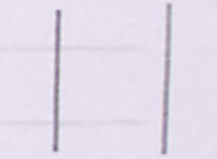


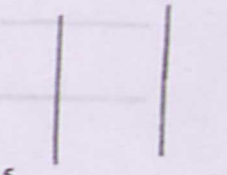
11.



12.

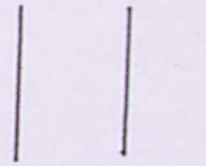
13.

14.

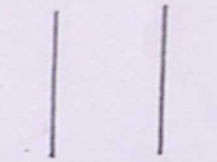


15.

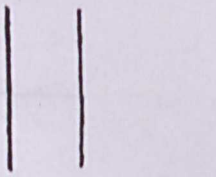
16.



17.

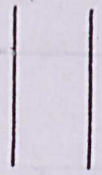


18.



19. _____

20. _____

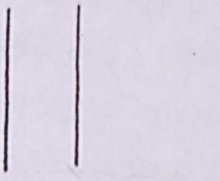


21. _____

22. _____

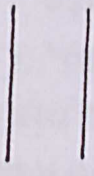
23. _____

24. _____

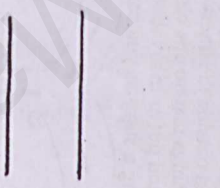


25. _____

26. _____



27. _____



28. _____

29. _____

30. _____

USER MANUAL

Table of Content

Table of Figures

User Manual

This user manual will describe and state instruction on how to use this system steps by steps. The purpose is to provide the user guidance in order to use the system effectively.

A. Administrator Section

1. Login

i) Key in the Login Name and Password in corresponding textboxes as shown in the Figure 1.

ii) Click Login button. The system will validate the username and the password. If the detail is correct, the main menu page will be shown (refer Figure 2). Else the error message will be shown.

Caution: User who has activated pop-up in their Internet browsers, may need to unblock the pop-up menu before proceeding. Further information can be obtaining at the Click Here link that shown in Figure 1.

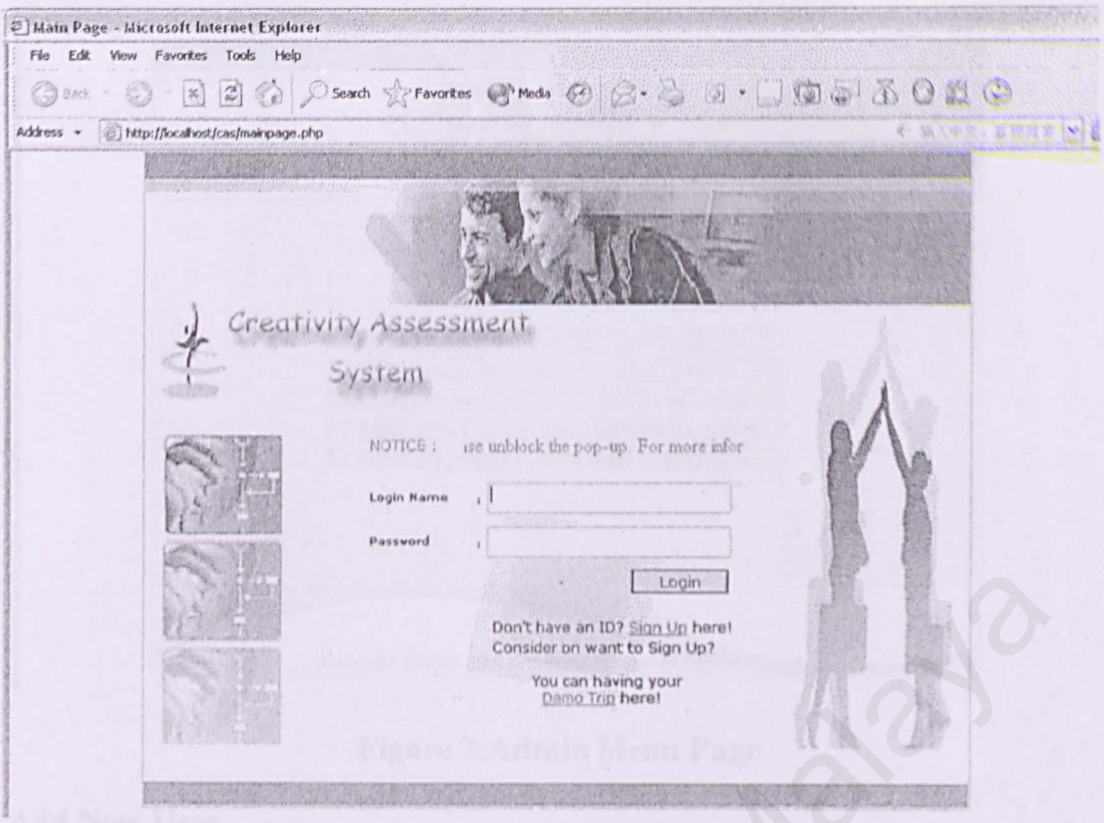


Figure 1: Login Page

2. Admin Menu Page

Admin Main menu page contains hyperlinks that will link to other functional pages such as Add New User, View User Record, View Feedback and view two type of analysis report. Sign Out link will direct back to the Login Page.

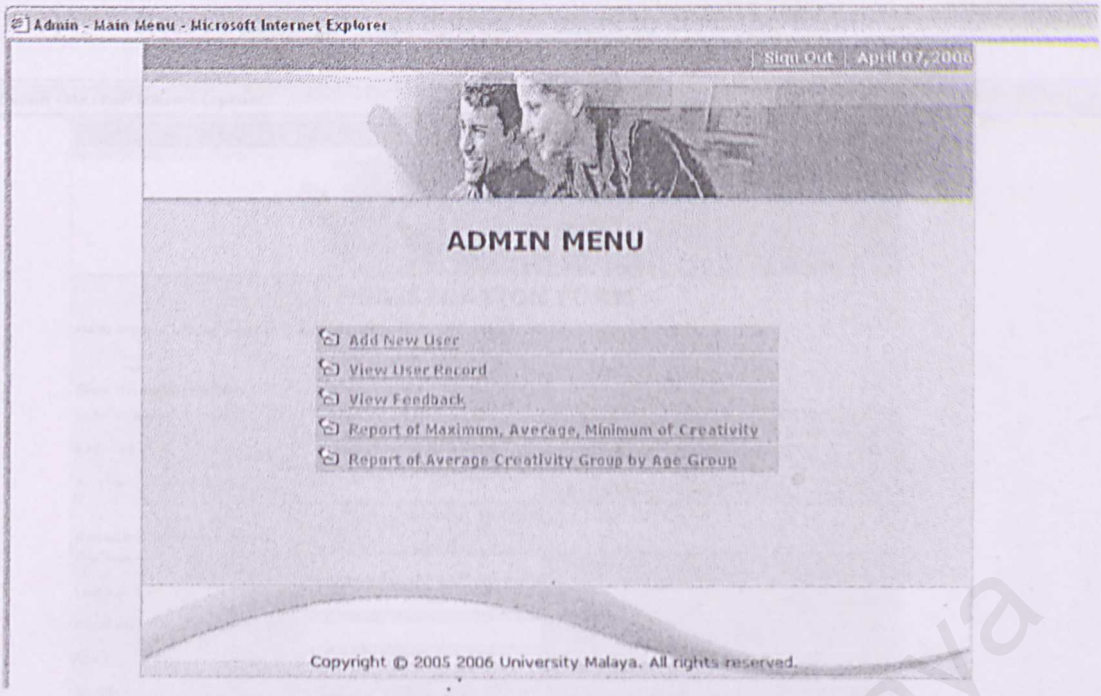


Figure 2:Admin Menu Page

3. Add New User

Admin can help to add new user where the user either is user or admin.

i) Key in all the corresponding information in the relevant fields. Fields state with * symbol are require fields. Error message will be shown once one of the require fields is not completed.

ii) The form will validate for password (at least 6 characters for security purpose), invalid age input which must be a numeric number and invalid email address.

iii) Click Save button to complete the registration. System will validate the registration to check if the Login Name that chosen already registered. A message will be shown to state the user already in list.

iv) Cancel button and Sign Out link in the top banner will direct the users return to the Login Page to terminate the registration process.

v) Reset button give an option to users to clear the form.

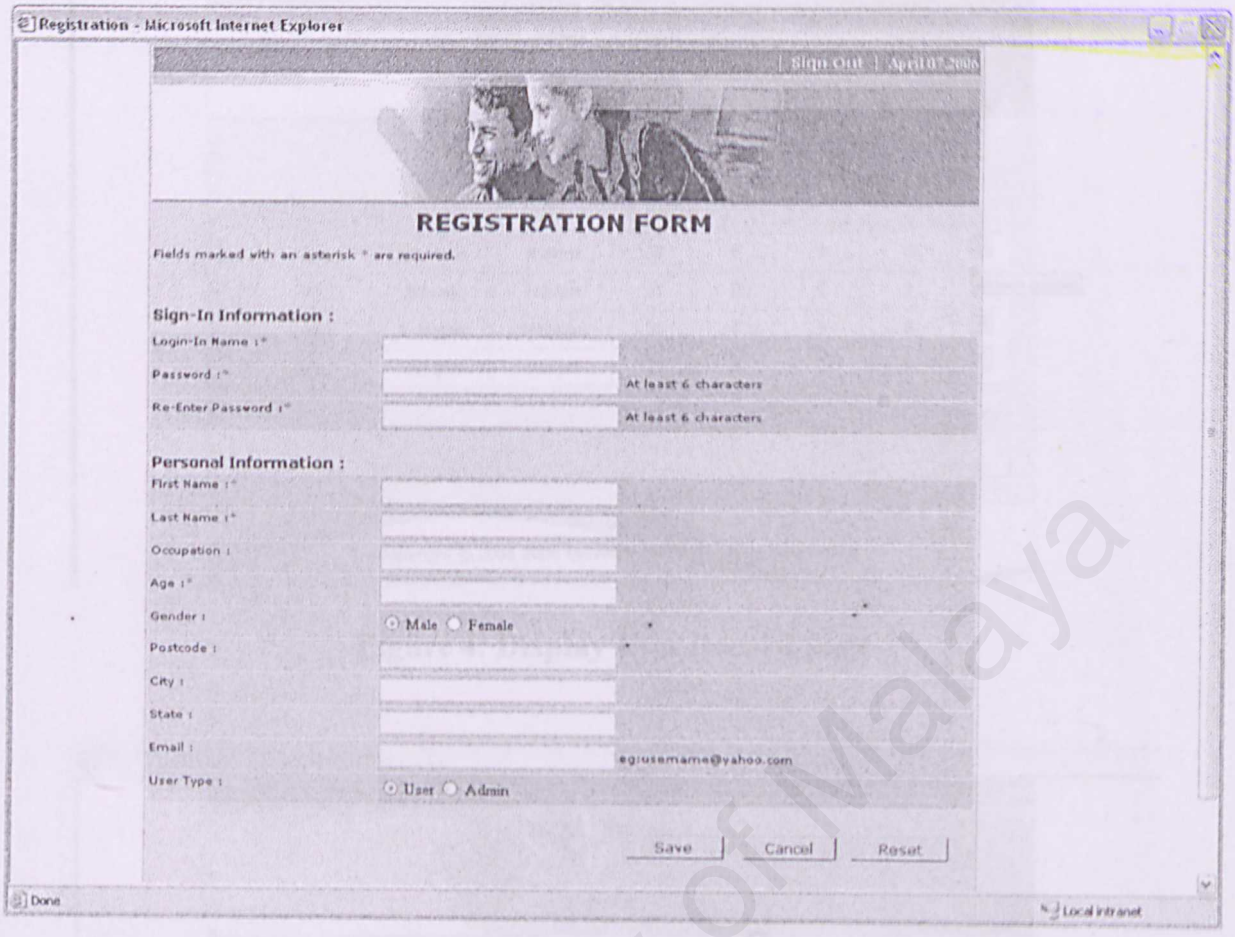


Figure 3: Add New User Page

4. View/Delete User Record

In this page, all the user record will be displaying. If the admin want to delete user record, it just needs to click the icon on each row like showed in Figure 4.

i) When admin click the delete icon, a confirmation message will pop up to confirm whether want to delete that record (shown in Figure 5).

ii) Click "OK" will take the delete action and delete that record, click "Cancel" go back to user record page.

iii) Click "Menu" button will go back to Admin Menu page.

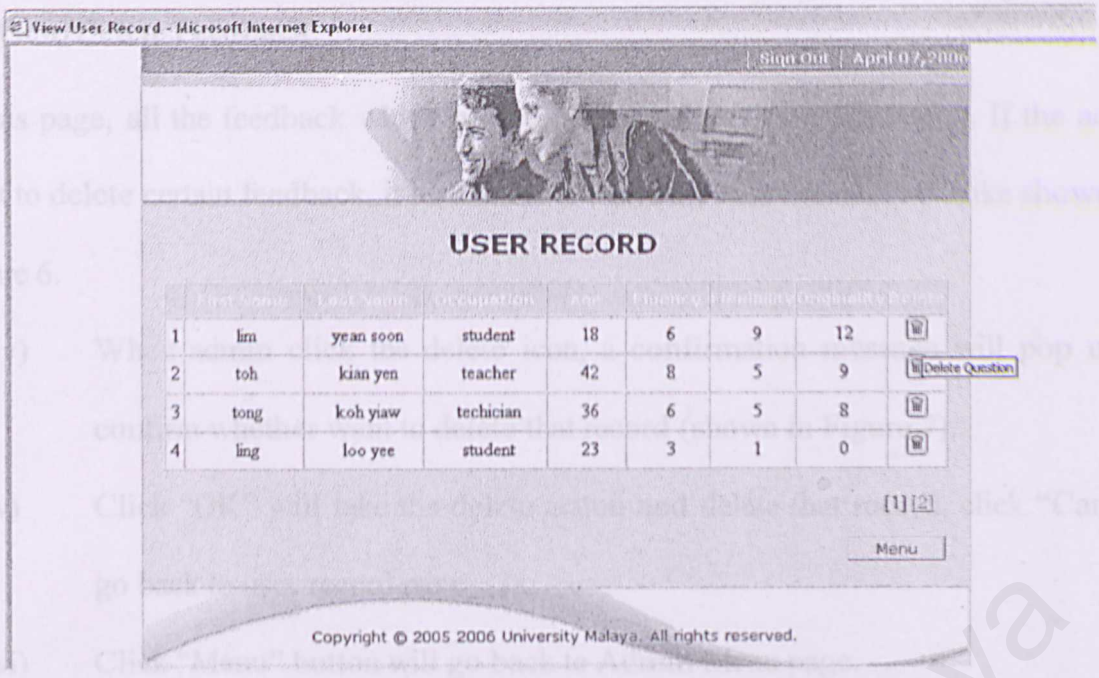


Figure 4: Display User Record page

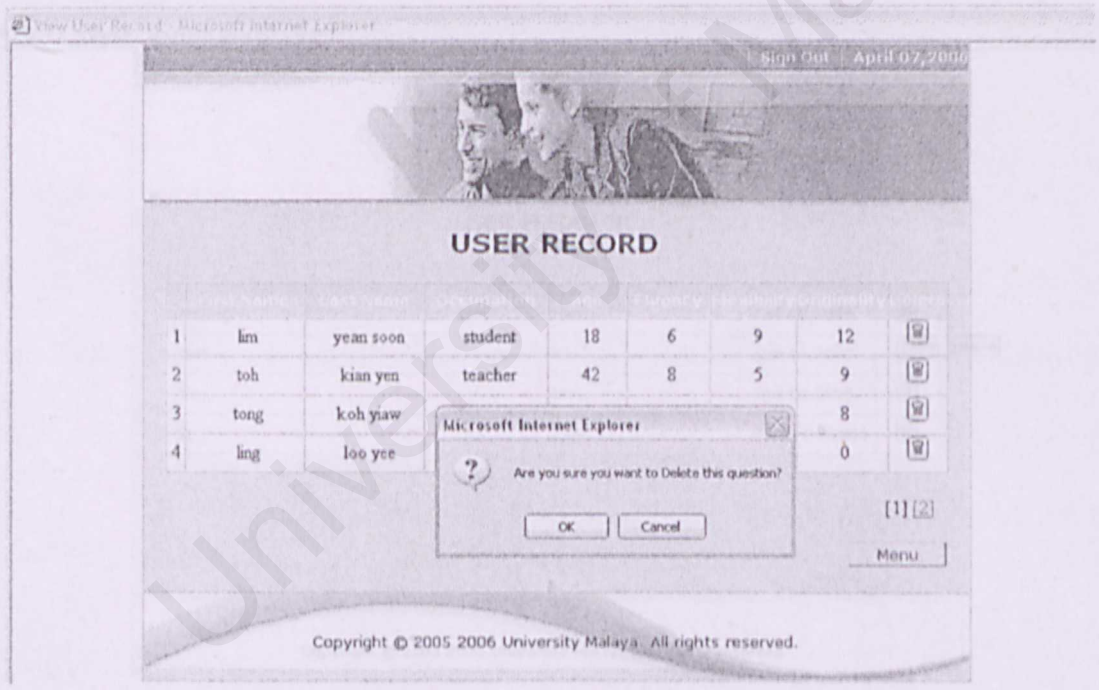


Figure 5: Confirmation Delete Record Message

* By clicking the number at the right bottom, it will show the rest of the user record

5. View/Delete Feedback

In this page, all the feedback which posted by the user will be displaying. If the admin want to delete certain feedback, it just needs to click the icon on each row like showed in Figure 6.

iv) When admin click the delete icon, a confirmation message will pop up to confirm whether want to delete that record (shown in Figure 7).

v) Click "OK" will take the delete action and delete that record, click "Cancel" go back to user record page.

vi) Click "Menu" button will go back to Admin Menu page.

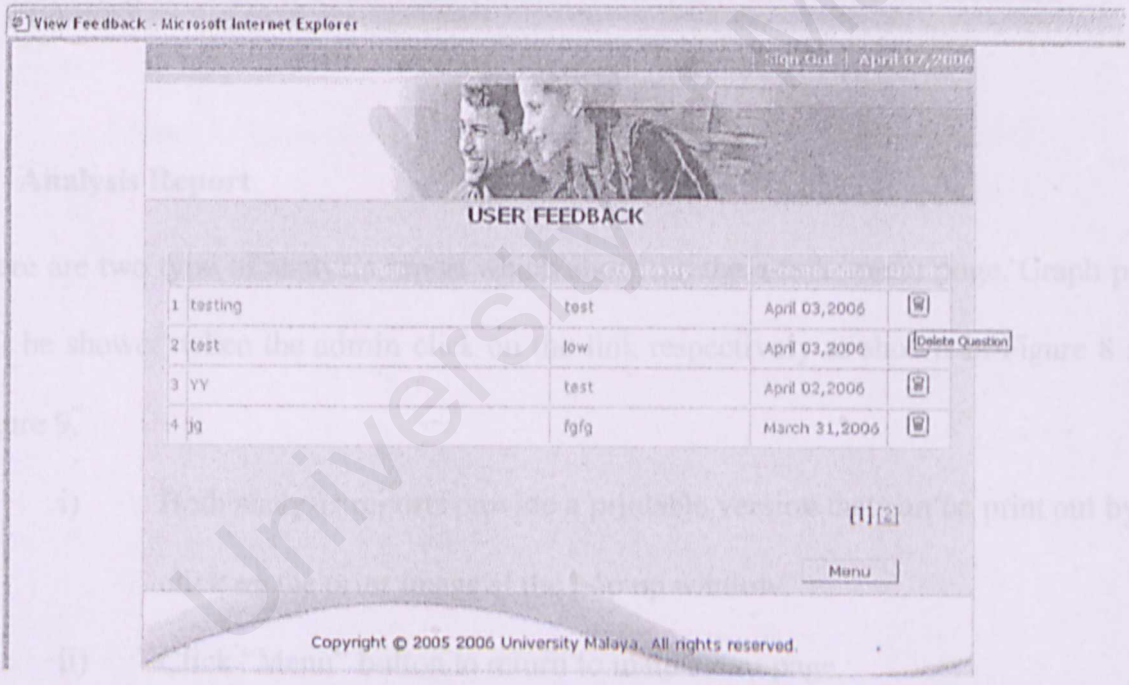


Figure 6: Display Feedback page

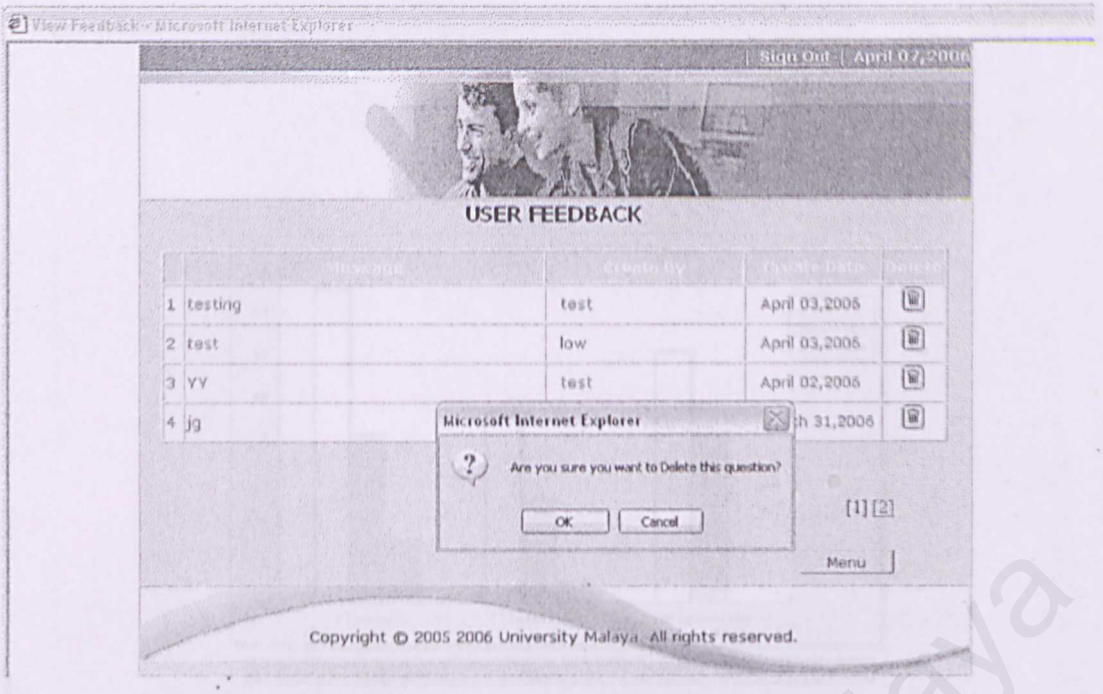


Figure 7: Confirmation Delete Record Message

* By clicking the number at the right bottom, it will show the rest of the feedback

6. Analysis Report

There are two type of analysis report which shown in the admin menu page. Graph page will be showed when the admin click on the link respectively as shown in Figure 8 and Figure 9.

i) Both analysis reports provide a printable version that can be print out by click on the print image at the pop up window.

ii) Click "Menu" button to return to main menu page.

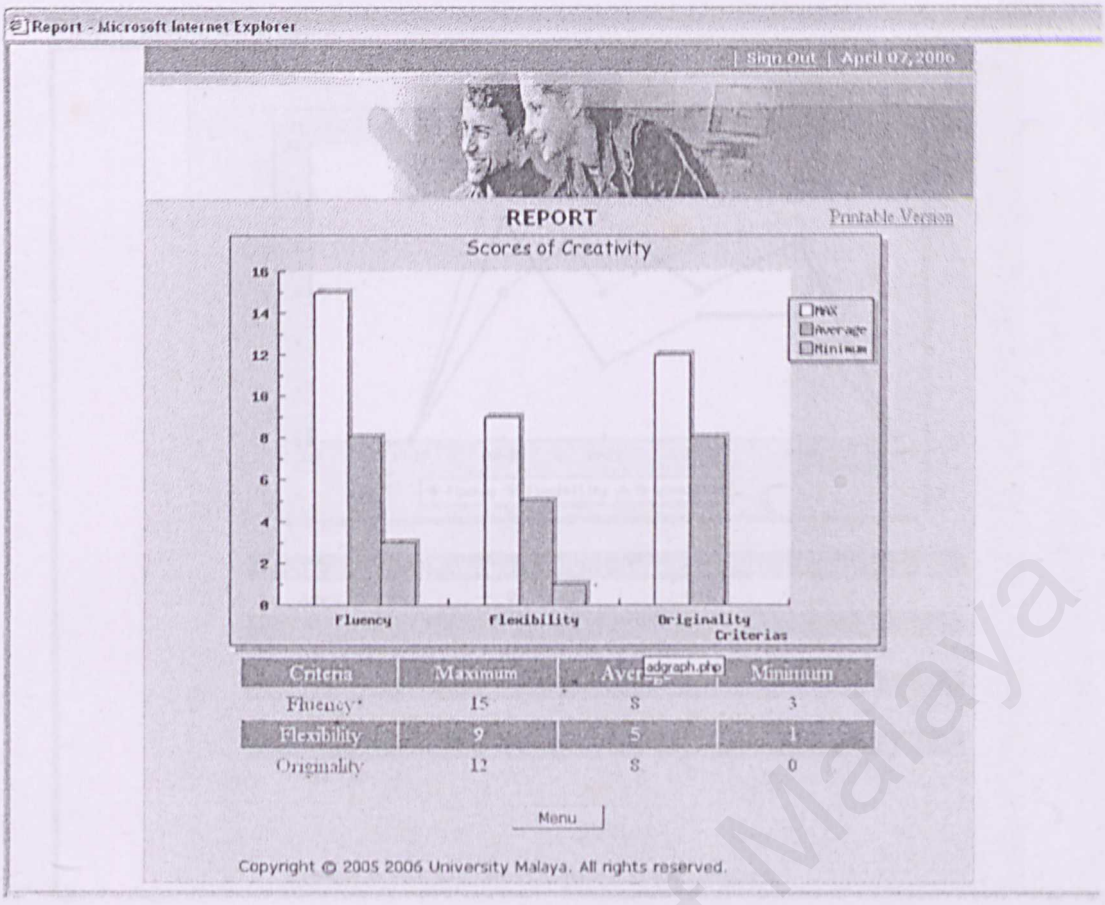
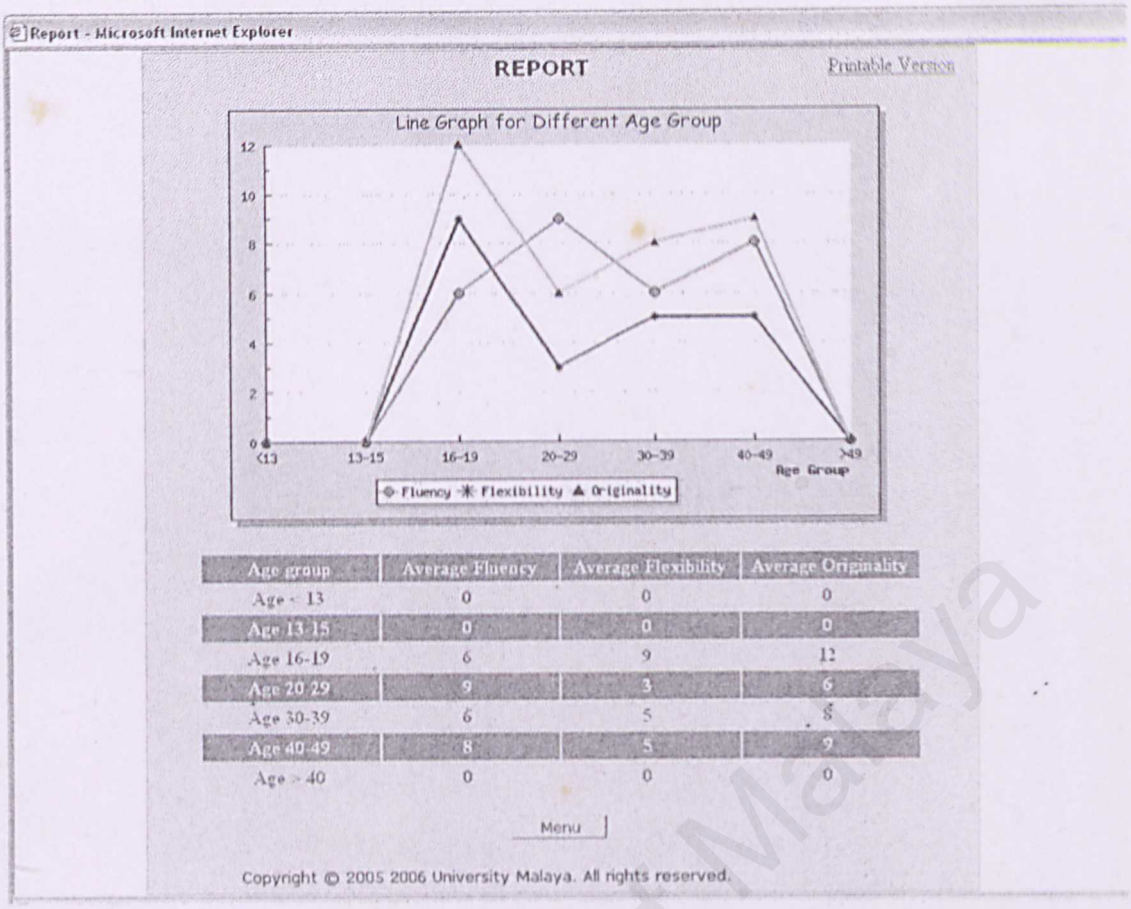


Figure 8: Report of Maximum, Average, Minimum of Creativity



Age group	Average Fluency	Average Flexibility	Average Originality
Age < 13	0	0	0
Age 13-15	0	0	0
Age 16-19	6	9	12
Age 20-29	9	3	6
Age 30-39	6	5	8
Age 40-49	8	5	9
Age > 40	0	0	0

Menu

Figure 9: Report of Average Creativity Group by Age Group