Web-based Management and Assessment System for Postgraduate Research Symposium of Universiti Teknologi PETRONAS

By

Nguyen Si Minh

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information System)

November 2012

Universiti Teknologi PETRONAS
Bandar Seri Iskandar,
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

Web-based Management and Assessment System for Postgraduate Research Symposium of Universiti Teknologi PETRONAS

By

Nguyen Si Minh

A Project Dissertation submitted to the
Business Information System Programme
Universiti Teknologi PETRONAS
in partial fulfillment of the requirements for the
BACHELOR OF TECHNOLOGY (Hons)
(BUSINESS INFORMATION SYSTEM)

Approved by,

_____

(Assoc. Prof. Dr. Mohd Fadzil Bin Hassan)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

November 2012

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own as specified in the references and acknowledgement, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

_____

NGUYEN SI MINH

ABSTRACT

This research project is to develop a management system that computerizes the process of managing and assessing in educational organizations. It will be applied in the case of postgraduate research symposium in Universiti Teknologi PETRONAS (UTP). The society has evolved in a more modern and educational background, many countries has considered education as one of the most important factors in development. Due to the increasing number of students every year, the management and assessment processes have always been an administrative burden for academic staffs to collaborate and keep track of the student performance. The objective of this system is to become a centralized management and assessment portal for students, academic staffs, supervisors, and external examiners, which provides full control over the entire submission and evaluation processes. In the scope of UTP, the research symposium of postgraduate students is focused and the system is built on a web-based architecture which allows postgraduate students to submit their symposiums for their supervisors to evaluate and approve by digitalized assessment forms.

ACKNOWLEDGEMENT

This project would not be a successful one without the help and support from many individuals and organizations. Thus, the author would like to show the deepest appreciation to the people who were involved in ensuring the completion of the project.

First and foremost, the author would like to express his appreciation and grateful thanks to his supervisor, Assoc. Prof. Dr. Mohd Fadzil Bin Hassan, for taking time off his busy schedule to monitor and mentor his progress throughout the duration of the project. His constructive guidance, valuable advice, wise knowledge, and continuous supports had led to the final outcome of this project.

Second, the author would like to extend the thanks to his collaborators, Mr. Kamaludeen Usman Danyaro and Mr. Rabiu Ibrahim Fasaha, who had provided valuably fundamental summarizing ideas and supports to the author in carrying the project. The thought and knowledge shared by them was truly appreciated.

Third, the author would like to express his gratitude toward his family for always being there to provide moral supports and encourage him when he needed the most. A deeply appreciation is dedicated to the author's colleagues for supporting him in carrying and fulfilling the requirements of this project, especially for willingly participating in data gathering step.

Finally, the author would like to thank his friends for all the direct and indirect involvement in helping him to complete this project. Thank you all.

LIST OF FIGURES

LIST OF TABLES

ABREVIATIONS AND NOMENCLATURES

UTP	Universiti Teknologi PETRONAS
CGS	Center of Graduate Studies
RPD	Research Proposal Defense
RCS	Research Completion Seminar
MSc	Master of Science
PhD	Doctor of Philosophy
EDP	Electronic Data Processing
MIS	Management Information System
DSS	Decision Support System
EIS	Executive Information System
IHL	Institution of Higher Learning
CMS	Course Management System
CSCW	Computer Science CourseWare
ICT	Information and Communication Technology
EMS	Education Management System
LMS	Learning Management System
HCI	Human-Computer Interaction
GUI	Graphical User Interface
SMS	Short Message Service
RAD	Rapid Application Development
PERL	Practical Extraction and Report Language
SDLC	System Development Life Cycle
CIS	Computer and Information Sciences
HTML	Hypertext Markup Language
TAM	Technology Acceptance Model

TABLE OF CONTENT

CHAPTER 1
INTRODUCTION

1.1 Background of Study

Information systems has become as integrated into our daily activities as accounting, finance, operations management, marketing, human resource management, and even education. Information systems and technologies are vital components of successful businesses and organizations. In the scope of education and training, information technologies are playing important and expanding roles. It can help all kinds of education and training to improve the efficiency and effectiveness of their learning processes. This benefit occurs whether the information technology is used to support academic staffs, lecturers, students, and any other external parties. Information technologies and systems are, quite simply, an essential component for education and training in today's dynamic global environment.

As a case study, Universiti Teknologi PETRONAS (UTP) is one of the top technology universities in Malaysia. Its vision is a leader in technology education and centre for creativity and innovation. UTP exclusively focuses to become an institute of higher learning as providing knowledge and expertise for the advancement of engineering, science and technology. In order to accomplish the mission, UTP is moving ahead to promote postgraduate studies. As a result, the number of postgraduate students in UTP is increasing considerably every semester. Currently, there are over one thousand postgraduate students coming in to do coursework and dissertation mode study or undertake research programs.

Following the expansion in number of postgraduate students, UTP is facing a lot of difficulties in managing and controlling the enlargement of postgraduate data which is mainly reports and forms. All registered postgraduate students in UTP undergoing postgraduate programs by research mode are required to present their research

progress in a Postgraduate Symposium conducted by each and every academic department in the university on every semester. The postgraduate students need to submit their progress reports and research symposiums which will be verified by their supervisors and co-supervisors. Later on, the submission will be confirmed and assigned to corresponding examiners by the postgraduate coordinators of the department. The postgraduate coordinators are also required to establish the schedule for the Postgraduate Symposium. After the assessment is completed, all the marks will be later keyed in, consolidated, and submitted to the Centre of Graduate Studies (CGS).

Furthermore, there are about eight management staffs working in the CGS and four administrative staffs in each department who take charge of postgraduate students. Moreover, most of postgraduate processes in UTP are based on paperwork so that they are easily out of control for the management staffs due to missing documents or repetition of students' work from one semester to another semester. Besides, external examiners are invited to take part in the postgraduate evaluation process and all the necessary documents must be transferred to them with the risk of loss or the matter of time-consumption.

Therefore, the need of a computerized management system, which will ease the complexities in managing postgraduate students' academic records as well as tracking their performance, is rising significantly. At present, some of universities have developed their own project management system for postgraduate. However, it only supports the submission process of postgraduate students. Generally, this research project is designed to develop a management and assessment system for postgraduate studies in UTP, which provides a convenient and efficient way to both manage and evaluate students' work.

1.2 Problem Statement

The Internet and related technologies and applications have changed the ways education institutions operate and people work. Thus, many universities today are using Internet technologies to Web-enable their education processes and create innovative e-learning applications. E-learning includes all forms of electrically

supported learning and teaching. The information and communication systems serve as specific media to implement the learning process. Skills and knowledge are enabled and transferred through computers and networks. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration.

However, a common problem faced by average educational institutions adopting information technology systems is "performance gap", the gap between what the systems can do and what each educational institution requires. This gap tends to grow larger and larger over time, posing a serious threat to the education processes. An observable consequence is the disengagement and dissatisfaction of users, especially lecturers and academic staffs. For years, many organizations as well as individuals have devoted many efforts seeking for applicable solutions to close this performance gap, or at least to mitigate it to a minimum extent. It is among priority tasks of system developers to achieve long-term goals of intelligent systems which are able to fulfill the needs of academic activities.

With the transitions had taken place in Universiti Teknologi PETRONAS (UTP), the postgraduate studies are being focused and the number of students in postgraduate is increasing dramatically. However, the processes of managing and assessing postgraduate symposium in UTP are mostly based on paperwork. Postgraduate management and assessment processes require many procedures that both postgraduate students and examiners have to complete. During the study, postgraduate students must submit research progress report, symposium proceed with research work, research proposal defense (RPD), and final thesis for research completion seminar (RCS).

Moreover, the management and assessment processes are very complex and tedious as it involves multiple stakeholders and users including postgraduate students, supervisors, co-supervisors, examiners, and postgraduate coordinators of each department as well as the Centre for Graduate Studies (CGS). Accordingly, two copies of the written research report are required by the respective department's Academic Executive for the panel of examiners review. In order to record each process in documentation, a postgraduate student is asked to fill in and submit a

proper form for coordinators to record the respective process in documentation. On the other hand, supervisors and examiners are provided evaluation forms to measure performances of postgraduate students. With increasing number of postgraduate students every semester, postgraduate symposium collection and management become heavier and heavier; this problem leads to the possibility of missing documents or losing track of students' work.

1.3 Objectives

The main objective of this research project is to develop a computerized management system that will provide automation to the postgraduate research symposium management and assessment processes as well as simplify them to ease any complexities in the existing manual system.

Besides, the proposed system is expected to fully support multi-levels and multi-users components. Each user and stakeholder has a different level of privileges. This project is to establish, for academic staffs and postgraduate students as users, a simple computer platform. It works as a straightforward management model, assisting academic staffs to manage the submission and assessment of research symposiums from postgraduate students and examiners, as well as providing a portal for postgraduate students to upload their research symposiums and for examiners to assess through digitalized forms.

System functionality, performance and accuracy testing are to be conducted to evaluate the developed algorithm together with the system architecture developed throughout the project.

In term of this case study, the specific objectives are:

- To develop a portal that can help management staffs in Universiti Teknologi PETRONAS (UTP) to administer symposiums of postgraduate students more systematically depending on area of research.

- To provide a centralized portal for postgraduate students to execute their studies more conveniently and efficiently in terms of time and workload.
- To help supervisors and examiners to assess the performance of postgraduate students by using digitalized evaluation tools.

A more comprehensive and cohesive system is focused. In the system, specific design goals will be solved:

- Postgraduate Research Symposium: Provide system functionality aimed at the management and assessment processes of the postgraduate research symposium.
- Paperless System: One motivation of this research is to move the handling of the postgraduate research symposium to a totally paperless system and still provide a way for interaction between multiple users and stakeholders.
- Automation: Bring automation into the process as much as possible for enrolling postgraduate students, managing the research symposiums, and evaluating them.
- Accessibility: The Web-based management and assessment system must be accessible to students utilizing any operating system platform using a modern Web browser.
- Security: Since the data involved in managing a postgraduate research symposium contains confidential information such as student identifiers, or grades, the system must be capable of adequately protecting this information without restricting the functionality of the system.

1.4 Significance of the Project

Many academic systems built as computer applications focus primarily on the stability of the systems and general processes of education institutions. However, this model has been threatening with one common problem which is system's failure to acquire the specific requirements when it is applied in another education institution.

Consequently, performance gap grows larger over time, causing lower-than-expected performance from these systems, leading users to dissatisfaction and disengagement against the systems. As the final damage, this gap hinders the realization of full potential benefits from an academic computerized system. This project, with its ultimate goal to help mitigate this gap, contributes to the continuous efforts to improve the academic computerized model.

The development of this system also gives beneficial contribution to the fast growing field of applying information technologies into education. Simplicity and flexibility of academic computerized model has not yet been properly valued before. This project's web-based approach promises a valuable experiment to the field.

In case of Universiti Teknologi PETRONAS (UTP), while most of the currently available information technology systems are either over-power or too complex for lecturers or academic staffs, the uses of a simple and straightforward system will facilitate their jobs to achieve targeted outcomes relating to managing and assessing students' performance. It is not solely a case of an Information and Communication Technology (ICT) replacement for a manual system. There are simplification issues of changing long standing process and procedures that have been tightly bound to academic staffs and postgraduate students. There are not only within the Department but also in other Divisions including the Centre for Graduate Studies (CGS).

The system content has to be aligned with lead-in and follow-up material and processes. Academic staffs and postgraduate students must be informed and brought on board for significant changes to their established behavior norms. Simply stated all stakeholders are to undergo significant change in the way they handle postgraduate research symposium.

1.5 Scope of Study

This study is narrowed to the management and assessment processes of research symposium for postgraduate level in Universiti Teknologi PETRONAS (UTP).

As a web-based research symposium management system, it has to cover the following postgraduate levels and departments:

- Master of Science (MSc) / Doctor of Philosophy (PhD) in Chemical Engineering.
- MSc / PhD in Civil Engineering.
- MSc / PhD in Electrical and Electronic Engineering.
- MSc / PhD in Information Technology.
- MSc / PhD in Mechanical Engineering.
- MSc / PhD in Petroleum Engineering.
- MSc / PhD in Petroleum Geoscience.

Other degrees such as undergraduate which has no research symposium are out of scope.

All interview and prototype testing activities are conducted within UTP, with participation of lecturers and postgraduate students involved in.

1.6 Feasibility of the Project

1.6.1 Technical and Scope feasibility

Technically, the author (system developer) is equipped with a moderate level of technology feasibility. Both hardware and software requirements are simple with not much burden for the system developer. Basic and intermediate uses of PHP (Hypertext Preprocessor) coding are sufficient to develop a functioning prototype of the system.

The size and scope of this project is considered medium and suitable for a Final Year Project at undergraduate level. By limiting the scope to postgraduate research symposiums in Universiti Teknologi PETRONAS (UTP) only, data gathering, data analysis, as well as prototype testing activities are convenient to the author.

1.6.2 Time constraints

As a Final Year Project in the academic structure, the author has been given a standard eight (8) months (two academic semesters) to complete the project. For the narrowed scope and its technical feasibility, the level of time risk is low.

A detailed project's Gantt chart was prepared by the author to dynamically monitor its progress throughout the project timeframe. More details can be found in "Methodology" chapter.

CHAPTER 2
LITERATURE REVIEW

The application of information systems have expanded significantly over the years. Until the 1960s, the role of most information systems was simple like transaction processing, record keeping, accounting, and other electronic data processing (EDP) applications. By the 1970s, it was evident that the management information systems (MIS) were not adequately meeting the decision-making needs of management, so the concept of decision support systems (DSS) was introduced. In the 1980s, several new roles for information systems such as end-user computing, executive information systems (EIS), and expert systems (ES) appeared. Finally, the rapid growth of the Internet, intranets, extranets, and other interconnection global networks in the 1990s dramatically changed the capabilities of information systems at the beginning of the 21st century. MIS is now solidly expanding to every aspect of society including academic operations.

Previously, academic information was kept under the form of paperwork without the need of computerization, but with today's education explosion, the workload for both students and academic staffs is increasing more and more. In most universities, coordinator jobs are handled through standardized paper forms that are completed by each student and managed though traditional paper filling systems. This system works well enough for gathering and storage purposes; however, for tracking and performance evaluation process, it becomes less efficient, especially on large numbers of students coming every semester.

2.1 Review on existing model of management and assessment systems adopted by Institutions of Higher Learning (IHLs)

Zhang et al. [7] proposed a symposium about the scientific research management system of colleges. Four main users including scientific research administrators,

department administrators, scientific research teachers, and visitors were the targets of the scientific research management system. A unique ID number was distributed to every administrator and teacher to manage conveniently. Different functions were installed for different users and concentrated in different pages. The function of managing and examining just belongs to the administrators to ensure the confidentiality of the information while the teacher can only input information. When entering different information into the home pages, the corresponding functions or information pages will appear on the system framework.

In details of the scientific research management system, each managing user owns a different system framework which is given as follows:

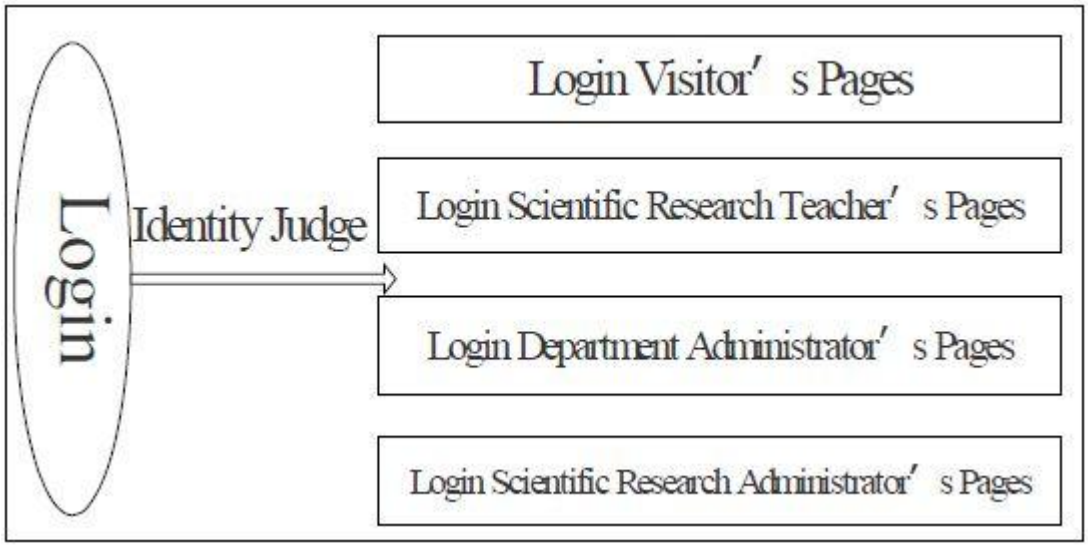

FIGURE 2.1 The General Framework of Scientific Research System

The final examine of the scientific research information is responsible by scientific researches administrators who have the upmost administration authorities. On the scientific research management page, they can register for users including the teachers, and the department administrators but are unable to register for users with system administration role. Renewing the periodicals is another duty of the system administrator together with modifying, deleting the information of the periodicals, and adding more periodicals so that the teachers can choose conveniently and the information of the periodicals can be more integrated in the system. Only the system

administrators can renew the ranking information of the scientific research information, and the querying ranking rate.

Besides, the ranking system can mark according to the concrete situation, designing a specific method to realize marking which observes the scientific research quantitative methods severely is needed. During the course evaluation, any information that is examined by the departments can be re-examined by the scientific research administrators, but the information that is examined by the scientific research administrators cannot be modified by the department administrators. Therefore, it can guarantee that the grades in the system are disinterested and judicial.

The views are used to make querying data more expediently and rapidly. The data in one table or several tables is integrated in data view, so that the querying speed is improved and managing data is convenient. Data cannot be modified or deleted in the data view, because it is the collecting and gathering of one or several tables. The database is designed to achieve the logistic standards of the database and reduce the redundancy capability of the data. Every datasheet only saves the information related to the contents, and the contents related to querying are not included. The tables are integrated in order to query every piece of information expediently and rapidly.

Master pages are used to design the pages that share the same content. The common page layout is created and master pages can show universal contents on many pages. It helps website maintenance, extension and modification become easy. Three-class management schema is adopted in the scientific research management system, so there will be many similar contents in the process of designing the pages, and different layers which use the system framework. There are three master pages in the scientific research management system and different master pages have different user authorities. When the users of the system are logging on, the system can determine which page will be entered and carry out different operations according to the users' authorities.

In another study, Gotel, O., Scharff, C., & Wildenberg, A. [8] developed a web-based programming and assessment environment for use in supporting programming

fundamentals courses taught in Java. The system was linked with WebWorK, an open source web-based system developed at the University of Rochester. WebWorK was popular for administering and assessing mathematics and physics coursework although it was designed for the potential integration with other course management system (CMS) environments. The system can collect and grade multiple-choice and short answer questions as well as free-form program fragments written in Java. Then, the marks would be consolidated and sent directly to the corresponding lecturers for each courses.

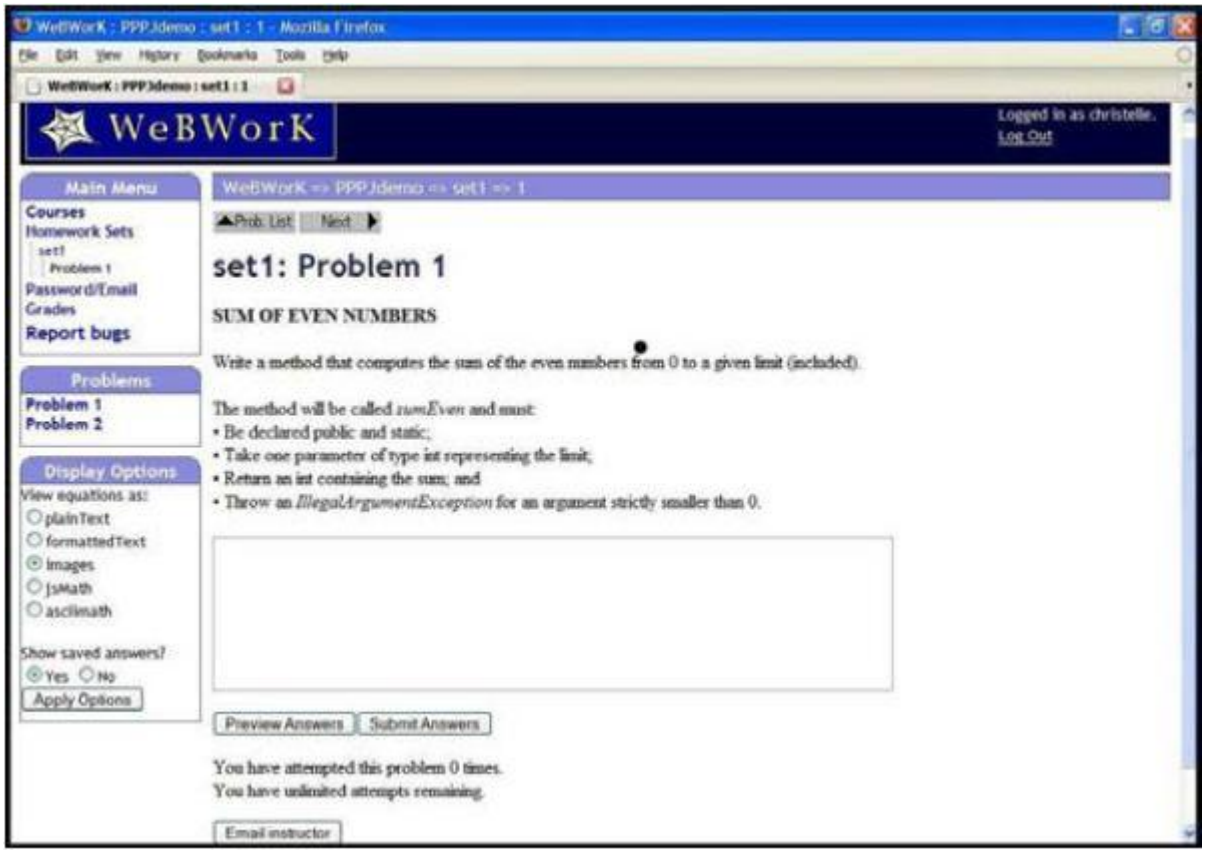

FIGURE 2.2 A Screenshot of the WeBWorK system

Similarly, Helmick, M. T. [9] designed Computer Science CourseWare (CSCW), a Web-based integrated online courseware system for the management of computer science courses in the Department of Computer Science and System Analysis, Miami University. The system was developed to assign, collect, and grade computer programming assignments. Incremental development was promoted through rapid feedback for students with the system's integrated Java style checking and automatic grading capabilities. CSCW integrated with existing version control infrastructure

and authentication infrastructure to minimize administration. Paperless handling of programming assignments was encouraged with the ability for precise feedback to be entered by instructors for student consumption. CSCW was actively being used at Miami University.

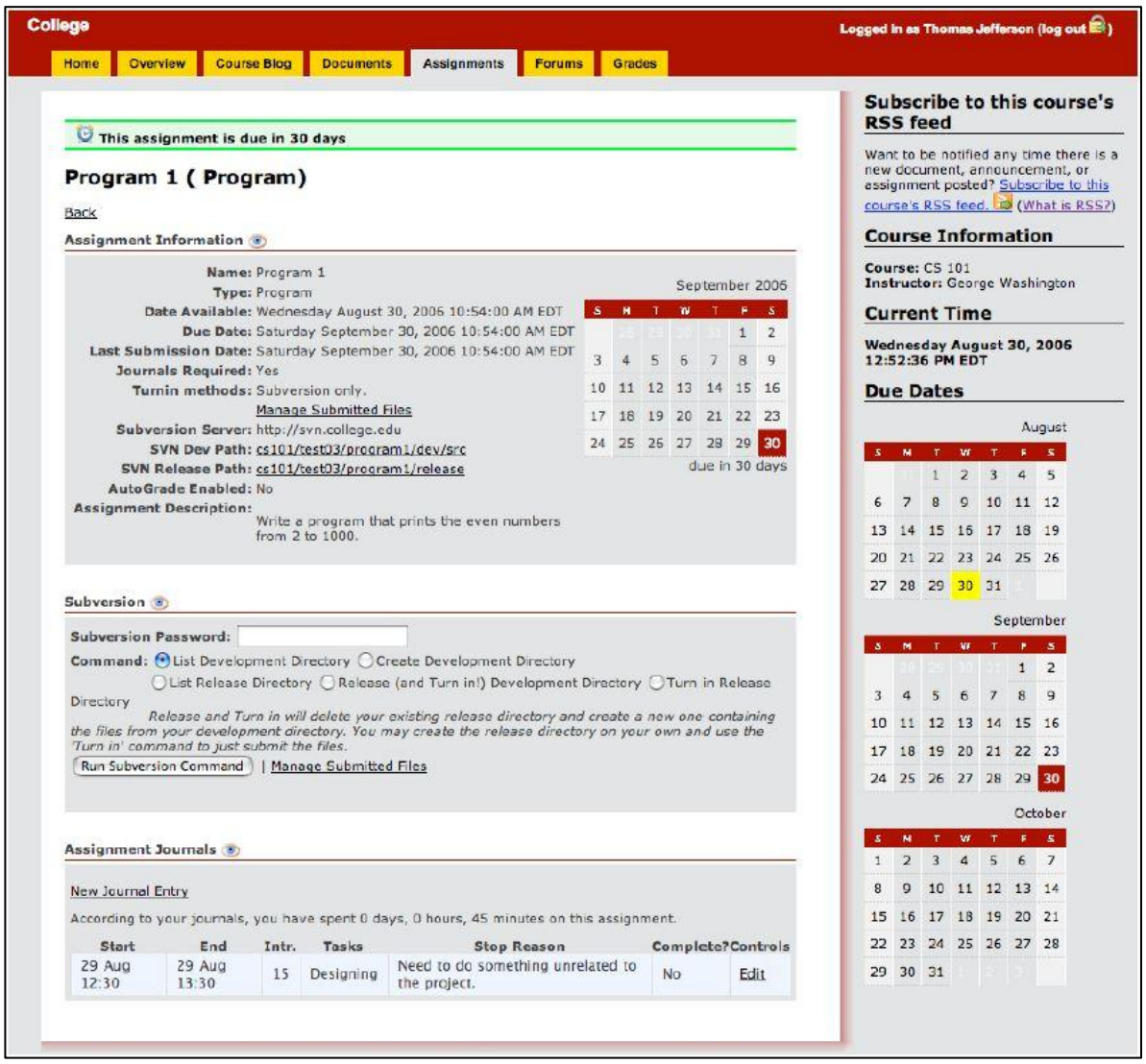

FIGURE 2.3 Student's View of an Assignment in the CSCW

In the scope of postgraduate studies, People[XS] - a European human resource (HR) solution company - has realized the severe limitations on data access presented by the traditional paper-based system. [10] They have developed a PhD management system which is an electronic relational database designed to address the information management problems associated with postgraduate students and academic staffs. It allows candidates to submit their PhD applications and proposals for their

supervisors to evaluate and approve. The system has been deployed in some universities such as Deft University of Technology in Deft, Netherlands, and Aarhus University in Aarhus, Denmark.

2.2 Review on interfacing and interaction of multiple systems adopted by IHLs

The user experience is often spoken about as an experience internalized by an individual. [11] Screen design should be based on the contextual triggers while interaction design should facilitate the learned skilled behaviors they trigger. Lehane, P. [12] had a research paper on designing interactions for the collective user experience which introduced the theoretical background to the interaction design used to develop an assignment drop box at an Australian regional University and the subsequent pilot assessment. There were several problems that had been stated out due to the assignment submissions of students through an existing LMS. Hence, the answer to these issues was to sponsor an Information and Communication Technology (ICT) project which was to deliver a new electronic assignment submission drop box.

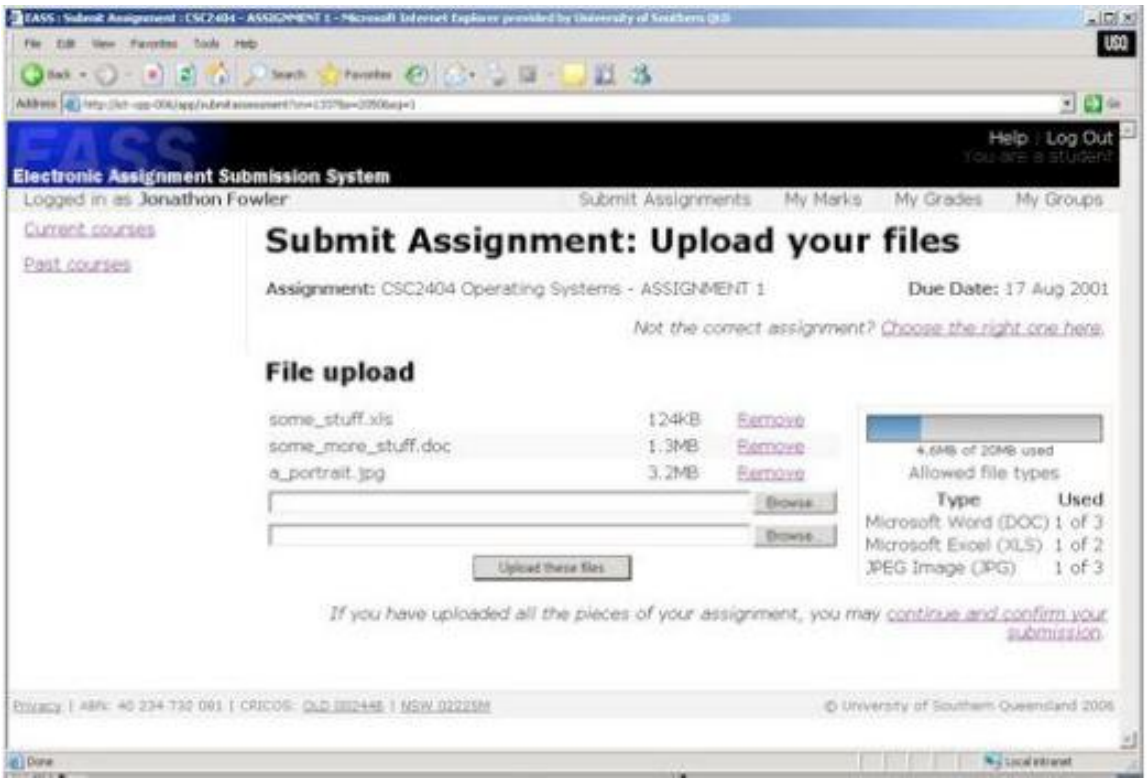

FIGURE 2.4 Graphical User Interface of an Assignment Submission System

Tolley [13] focused on the interaction between data management systems in educational institutions and the delivery of quality education. The significance of a more seamless and effective educational pipeline for students in school was emphasized. Tolley took a longitudinal cohort approach to data collection and analysis in order to reveal a much more meaningful picture of the dynamics within a school. Based on the longitudinal data held on each student in the cohort including demographics, achievement, perceptions, courses and programmes, etc, patterns or trends within various pathways which were taken by different student sub-groups within the cohort can be explored. A national education management system (EMIS) was proposed to manage the wealth of information held in a country's education system and use it to systematically organize information related to the management of education development and enact useful changes within the system.

On the other hand, Robling et al. [14] questioned the use of comprehensive learning management systems (LMSs), such as Blackboard and Moodle, for managing courses and enhancing student learning. Due to the application of LMSs, their limited features solely met certain needs specific to higher education. An online survey was conducted in this research to determine the nature of educators' use and attitudes toward LMSs. In total, the feedback from the survey indicated an interest in the development of a LMS. They adapted Algorithm Visualization (AV) tools and Program Visualization (PV) tools to evaluate targeted systems. While AV tools portrayed the behavior of an abstract description of software, PV tools show the behavior of a program written in a specific programming language by displaying the effect of individual operations.

In addition, the initial focus of Human-computer Interaction (HCI) was on the human characteristics that affected computer system design. [15] HCI is now a multidisciplinary science of design drawing from computer science, applied psychology, anthropology, sociology, ergonomics, and human factors. As an applied discipline, its foundations lie in the ethnographic concept of developing a rich contextual picture in which to place an expanded analysis framework with the activity and, the environment and cultures. [16] HCI had considered the genesis and dynamics of such a community of computer users, who may share a common interest in the use of computers illustrated with gamers, Mac users, or Microsoft users.

Another dimension was brought to human-computer interaction by the introduction of the Graphical User Interface (GUI) but there was a set of problems related to this dimension. System developers had to learn how to represent commands as icons, how to communicate their use on the screen and how to lay out the elements of a GUI. In particular, new users were initially unfamiliar with the images used for visual representation of commands and the methods to apply those commands in the direct manipulation paradigm. For this reason, large discrepancies often appeared between what the inexperienced user expected to occur and the actual outcome of their actions.

Motive, execution, and evaluation were three aspects considered as the theoretical resolution for this gap between expectation and outcome. [17] Particularly, motive provides the contextual impetus for undertaking an activity while execution is the operational possibilities implied by the artifact's affordances. Evaluation is a two-stage judgment on the outcome. The first stage is to determine if the execution stage has been performed as predicted and the second stage is whether the outcome satisfies the contextually situated motive. Both execution and evaluation rely on visual interpretation of the artifact's affordances and the contextual interpretation of the underpinning metaphor for the direct manipulation or GUI interface.

2.3 Review on the existing learning management systems (LMS) in Universiti Teknologi PETRONAS (UTP)

In Universiti Teknologi PETRONAS (UTP), there are currently two main academic systems: E-learning and PRISM. E-learning is a learning management system (LMS) for undergraduate academic activities. It is mostly used as a platform to enhance the communication between lecturers and students. Lecturers can access the system to upload lecture notes, assignments, or announcements for students to download and get information. E-learning is built on Moodle which is a free source e-learning software platform. Besides, PRISM is a student portal for both undergraduate and postgraduate students. Although a lot of functions are shown in the interface of the system, it is mostly used for course registration and receiving exam result slip.

However, there are many problems rising in these systems at the moment. Following the research work which has been conducted by Mr. Kamaludeen Usman Danyaro and Mr. Rabiu Ibrahim, collaborators of this project as well as PhD students in UTP, the paper-based management system is a real issue for both academic staffs and postgraduate students. They have to spend a lot of time and efforts to pursue all the procedures and keep track of their work. For E-learning, a vast amount of lecturers do not use it to communicate with students because they find it more complicated to work with the system than conventional methods such as e-mail or Short Message Service (SMS). On the other hand, most of postgraduate students have problems in PRISM. Based on the survey from UTP PG Yahoo Group (retrieved July 2012), they cannot register their accounts as well as upload their researches into PRISM because of system errors.

All related works stated that managing and assessing students' academic performance is crucial for educational institutions as the information can be managed systematically for immediate and future access without any risk of data loss. LMS can also be used to maintain students' performance throughout the course of study. These works has helped to strengthen the significance of this project with valuable outputs of many current systems. With similar approaches as the PhD management system of People[xs] Company, this project still adopted a wider scope which includes both submission process and assessment process.

CHAPTER 3
METHODOLOGY

3.1 Overview

This research project adopts Rapid Application Development (RAD)-based methodology. It involves system construction with repeatedly spiraling through the phases and relies on rapid prototyping rather than thorough planning and analysis phase. The analysis, design, and implementation phases are performed concurrently until completed. The first prototype is the first part of the system that user will use. With this approach, prototypes are utilized to their fullest potential.

Figure 3.1 below shows the framework of prototyping system development methodology.

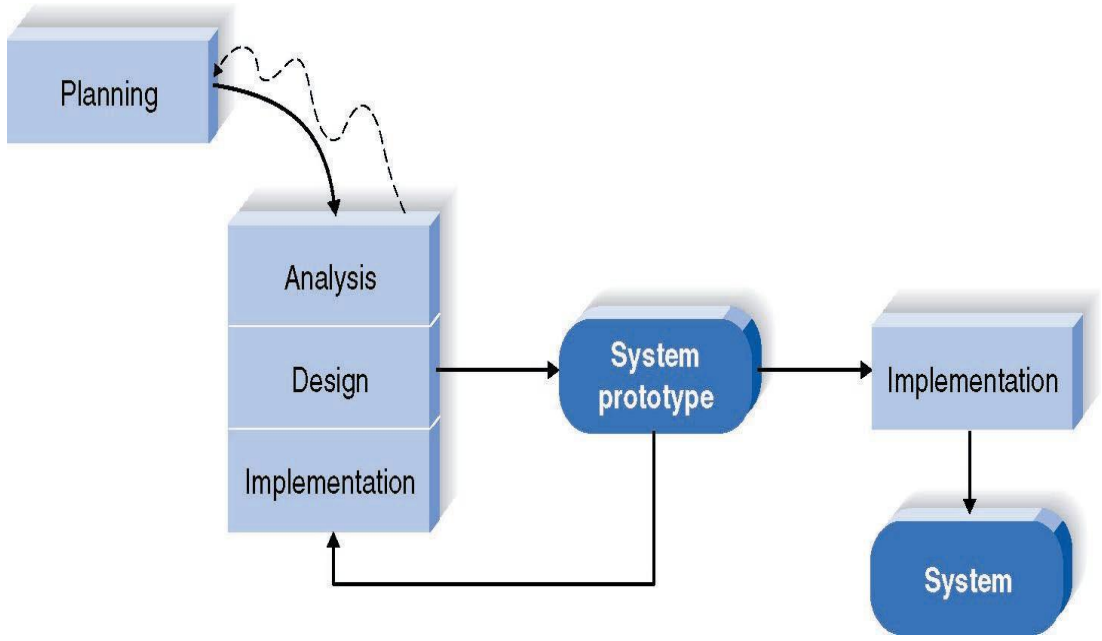

FIGURE 3.1: Framework of RAD prototyping methodology

Various levels of completeness and complexity of the proposed system as well as ease in changing requirements throughout the course of system development are of main advantages of this methodology. An iterative construction approach is employed to accelerate the requirement analysis and design phases and to also detect errors, programming and time constraints earlier in prototypes rather than later in a complete system model. As change is an expected factor during the development phase, this approach is at the most suitable usage.

For programming language, this research project is developed and implemented using PHP: Hypertext Preprocessor and Practical Extraction and Report Language (PERL). MySQL is employed as the database of the whole system, which includes all the necessary functions to perform data management, data mining and user input interaction. A highly customized algorithm is applied to fit the proposed predictive model with unique approach. The proposed system works as a web-based portal to be integrated with the Universiti Teknologi PETRONAS (UTP) main website. Targeted users are postgraduate students, academic coordinators, lecturers, and external examiners.

3.2 Project Activities

3.2.1 Planning Phase

- Research on the background of the preceding study and related works.

- Identify the problem and propose the solution.
  The problem statement of previous paper is re-evaluated based on new findings from the first activity.

- Emphasize the significance of the project.

- Clarify project scope, goals, and objectives.

Goals and objectives of the project are clarified to guide subsequent activities. Project scope is narrowed down specifically to suit project's needs, requirements, and constraints.

- Analyze project feasibility.

- Identify milestones and Gantt chart.

3.2.2 Analysis Phase

- Clarify analysis objectives.
  This analysis phase is to discuss and evaluate the rational and the justification behind this concept, the idea and its unique approach. The goal is to explain the authenticity and the cogency of the author's research, based on the validity of research data, measures and time taken to conduct the study.

- Analyze related works critically: scopes, used algorithms, and relative application to the scope of this study.

- Identify advantages of the proposed system and its approach.
  The author's approach to the identified problem leads to certain crucial advantages when applying the proposed model into the scope of this study, as compared to previous works.

- Prepare system requirements definition and summarize an overview of assessment materials for postgraduate research symposiums in Universiti Teknologi PETRONAS (UTP).

- Collect data to evaluate developed hypotheses.
  Research data is gathered by interviewing. The semi-structured interviews are used which means questions are predetermined, but the interviewer is free to ask for clarification. The postgraduate students are the main focus of the interview and the data will be collected in both qualitative and quantitative.

- Analyze collected data.

- Develop analysis models for the system:
    - Develop Activity diagram (functional model)
    - Develop Class diagram (structural model)

- Develop the algorithm to support the approach.

- Modify the latest version of the milestones and Gantt chart: update the Gantt chart with any modifications made.

3.2.3 Design Phase

- Clarify design objectives
    - Adopt a simple architecture on which the system will be built.
    - Design the system with straightforward functions and user-friendly interfaces using Systems Analysis and Design techniques.
    - Use PHP (Hypertext Preprocessor) programming language to code the designed system.
    - Develop a functioning prototype for testing purpose.

- Develop system architecture.

- Design Graphical User Interfaces (GUIs) and built-in system functions accordingly.

3.2.4 Testing and Implementation Phase

- Clarify testing and implementation objectives (prototype)
    - Test the designed functions and the performance of the prototype.
    - Conduct change management if needed.
    - Finalize the prototype and put it on hold for future full system development for actual launch on the UTP main website.

- Conduct functionality test.
- Conduct system performance test.
- Conduct scalability and performance tuning test.
- Finalize the prototype.

As for the scope and the initial requirements of this Final Year Project, a functioning prototype which is available for testing and demonstration) is sufficient. A fully developed system is not necessary at present, yet can be feasibly evolved from the prototype in the future. Therefore, the last step, which is launch phase, will be considered as future work.

3.2.5 Launch Phase

- Official launch in the UTP main website.
- Post-implementation analysis.
- Post-implementation review.
- System upgrading.

Figure 3.2 and 3.3 below shows milestones and Gantt chart which are developed to support monitoring project activities.

No.	Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Planning Phase														
1	Research on Preceding Studies														
2	Identify Problem and Propose Solution														
3	Clarify Scope, Goals, and Objectives														
4	Identify Milestones and Gantt Chart														
5	Submission of Extended Proposal														
	Analysis Phase														
6	Analyze Related Systems														
7	Prepare System Requirements														
8	Proposal Defense														
9	Collect Data to Evaluate Developed Hypotheses														
10	Analyze Survey Data														
11	Develop Analysis Models														
12	Submission of Interim Report														

FIGURE 3.2: Milestones and Gantt chart of the project in Final Year Project 1

No.	Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Design Phase															
1	Develop System Architecture															
2	Administration Process															
3	Symposium Submission Process															
4	Collaboration Process															
5	Evaluation Process															
6	Submission of Progress Report															
7	Design Graphical User Interfaces															
8	Internal System Review															
9	Finalize System Prototype															
	Implementation Phase															
10	Pre-SEDEX															
11	Functionality Quality Assurance															
12	Scalability & Performance Tuning															
13	Submission of Dissertation															
14	Viva															
15	Documentation															
16	Submission of Final Dissertation															
	Launch Phase															
17	Official Launch in UTP Website															
18	Post-Implementation Analysis															
19	Post-Implementation Review															
20	Upgrading															

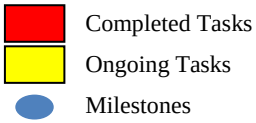

FIGURE 3.3: Milestones and Gantt chart of the project in Final Year Project 2

3.3 Tools Requirements

3.3.1 Hardware

- Computer with average specification (Intel Core 2 Duo T6500, 320GB HDD, 4GB DDR2, etc)
- Server with good performance and stability.
- Good Internet connection allowing remote access to the server.

3.3.2 Software

The prototype will be developed using:

- Operating system: Windows or Linux
- Server side: Apache
- Database: MySQL
- Scripting language: PHP (Hyper Preprocessor) and PERL (Practical Extraction and Report Language)

CHAPTER 4
RESULTS AND DISCUSSIONS

4.1 Data Analysis

The semi-structured interview method allow the author greater control over the sample of respondents. This method is less formal than structured interview method, so it is a better way to catch the point of view of postgraduate students, and getting inside information. There are two main sources of information: Master of Science (MSc) students and Doctor of Philosophy (PhD) students. To meet the requirements of the data gathering, the author also collected data from online sources such as PG UTP Yahoo Group. A lot of questions and problems were raised and discussed between postgraduate students in Universiti Teknologi PETRONAS (UTP). Furthermore, a face-to-face interview was applied with postgraduate students of Computer & Information Sciences (CIS) Department.

The interview was mostly divided into three sections: comments of postgraduate students on the form and research submission processes, their problems in using current information technology systems, and the prospect of a centralized management and assessment system for postgraduate research symposiums. During the research period, eleven postgraduate students including eight MSc students and three PhD students were interviewed.

For the first section of the interview structure, the responses from the postgraduate students were quite negative. Most of them, especially MSc students, commented that the submission processes were complex and took time. Nguyen Viet Dung, a Vietnamese MSc student in CIS Department, emphasized that the research symposium submission process was timing consuming because it must be evaluated through many rounds by both supervisor and examiner.

In the second section of the interview, PRISM is the system that postgraduate students are required to use. However, they are quite dissatisfied with the system due to the lack of integration and stability. There are many errors in the system including even basic functions such as registration or research submission process. As a result, the proposed idea of a web-based portal for managing and assessing the postgraduate research symposium was supported greatly. The postgraduate students prefer a flexible but stable system that can provide the convenience and help them actually diminish the workload of paper-based submission.

4.2 Framework of the system

4.2.1 System Architecture

The system architecture has three layers:

- ✓ Presentation Layer: This layer contains the user oriented functionality responsible for managing user interaction with the system.
    - o User Interface: provides and control human interactions from the users.
    - o Parameter/Data Inputs: the users need to provide respective input parameters or data such as submission forms, evaluation forms, and management decisions.
    - o Results Display/Visualization: the outputs need to be summarized and converted into understandable forms such as summary pages.

- ✓ Application Layer: This layer pulls out the logic from the presentation layer and controls the system's functionality by performing detailed processing.
    - o Data Manager – manages the data in the database tier and controls the data flows.

- ✓ Database Layer: This layer provides access to data hosted within the boundaries of the system, and data exposed by other network systems.

- Data Sources: include the information of postgraduate students, lecturers, academic staffs, and research symposiums which have been submitted.
- Data Access: this component abstracts the logic required to access the underlying data stores. Common data access functionality is centralized in order to make the system easier to configure and maintain.

Figure 4.1 below illustrates how the system works:

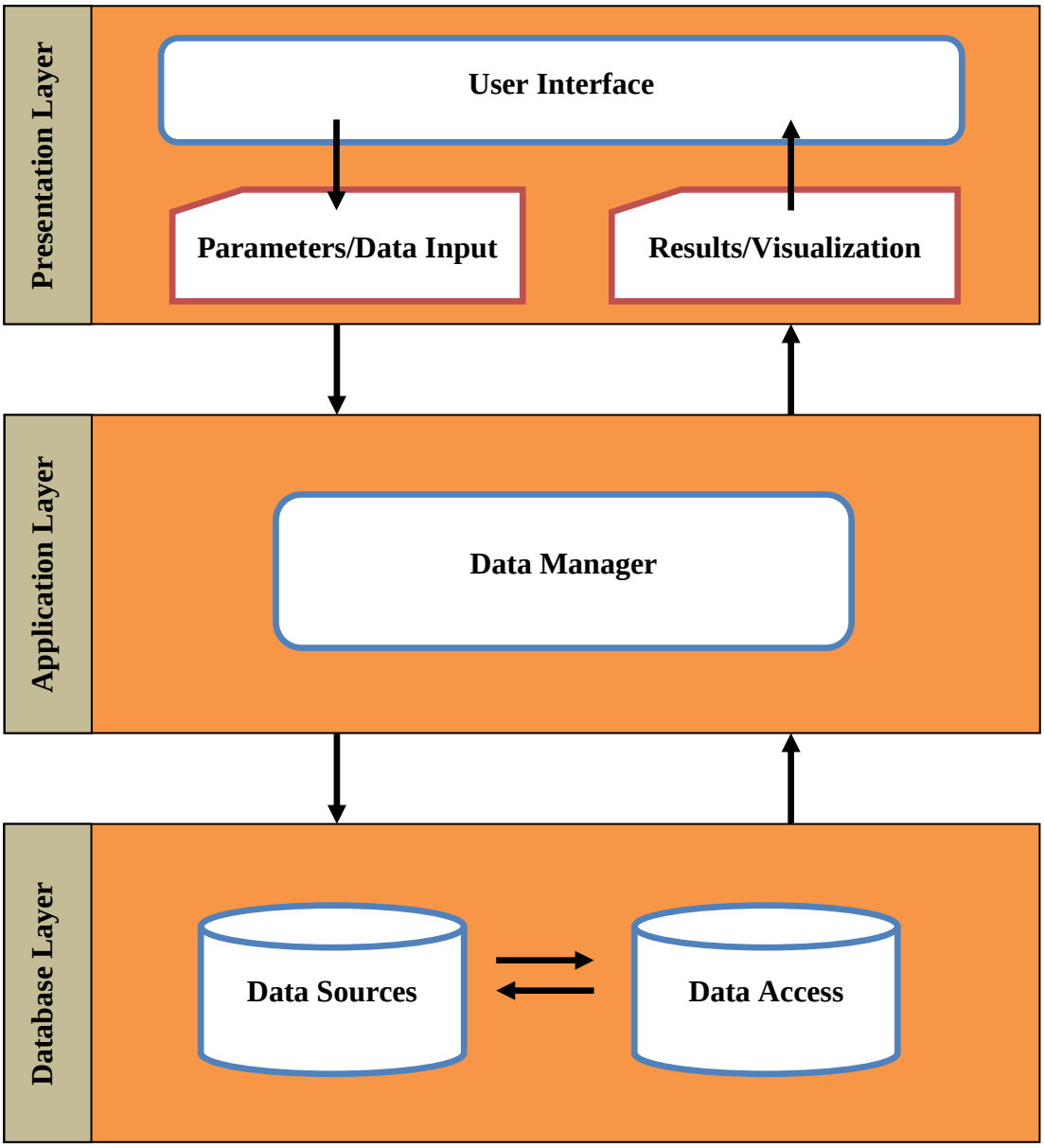

FIGURE 4.1 Three Layers of System Architecture

4.2.2 Activity Diagrams

Activity diagrams are used to model the behavior in a process independent of objects. In many ways, activity diagrams can be viewed as sophisticated data flow diagrams that are used in conjunction with structured analysis. They portray the primary activities and the relationships among the activities in a process.

The Web-based management and assessment system for postgraduate research symposium involves multiple stakeholders and users with different level of privileges.

These figures below show the activity diagram functional models which illustrate activity flows of the system administrators, postgraduate students, supervisors, and academic colaborators in the system:

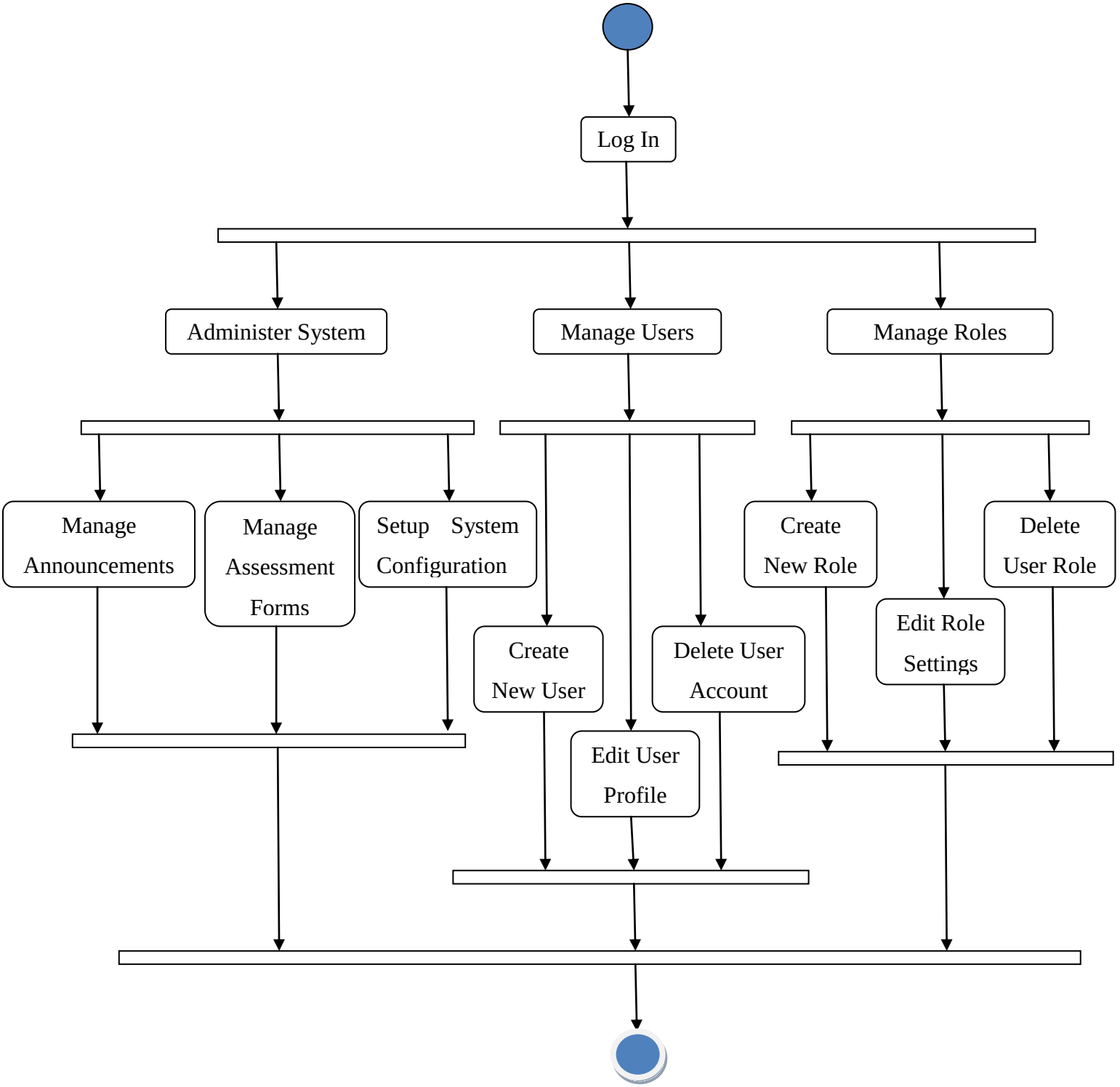

FIGURE 4.2 Functional Activity Diagram for System Administrator

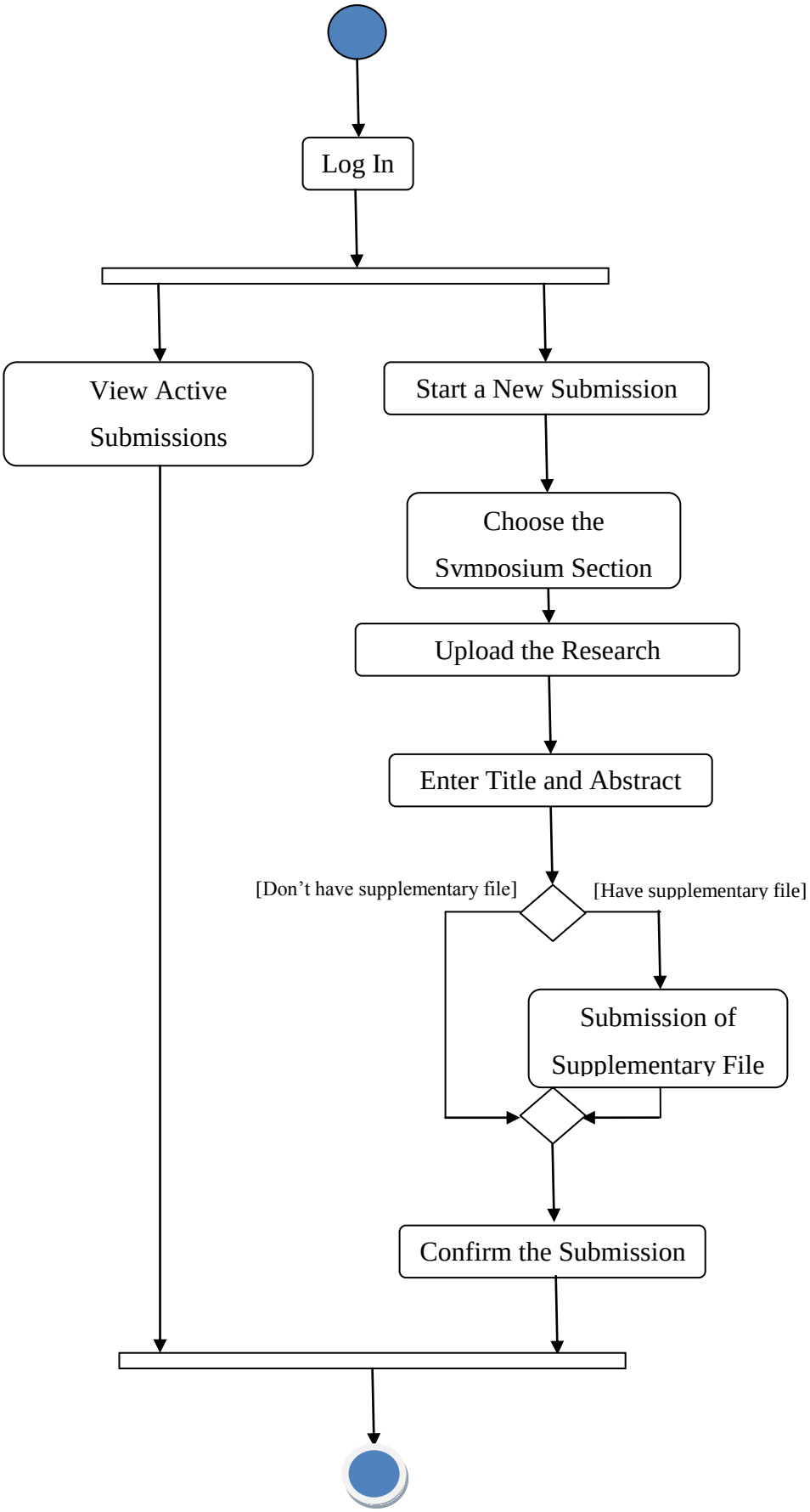

FIGURE 4.3 Functional Activity Diagram for Postgraduate Students

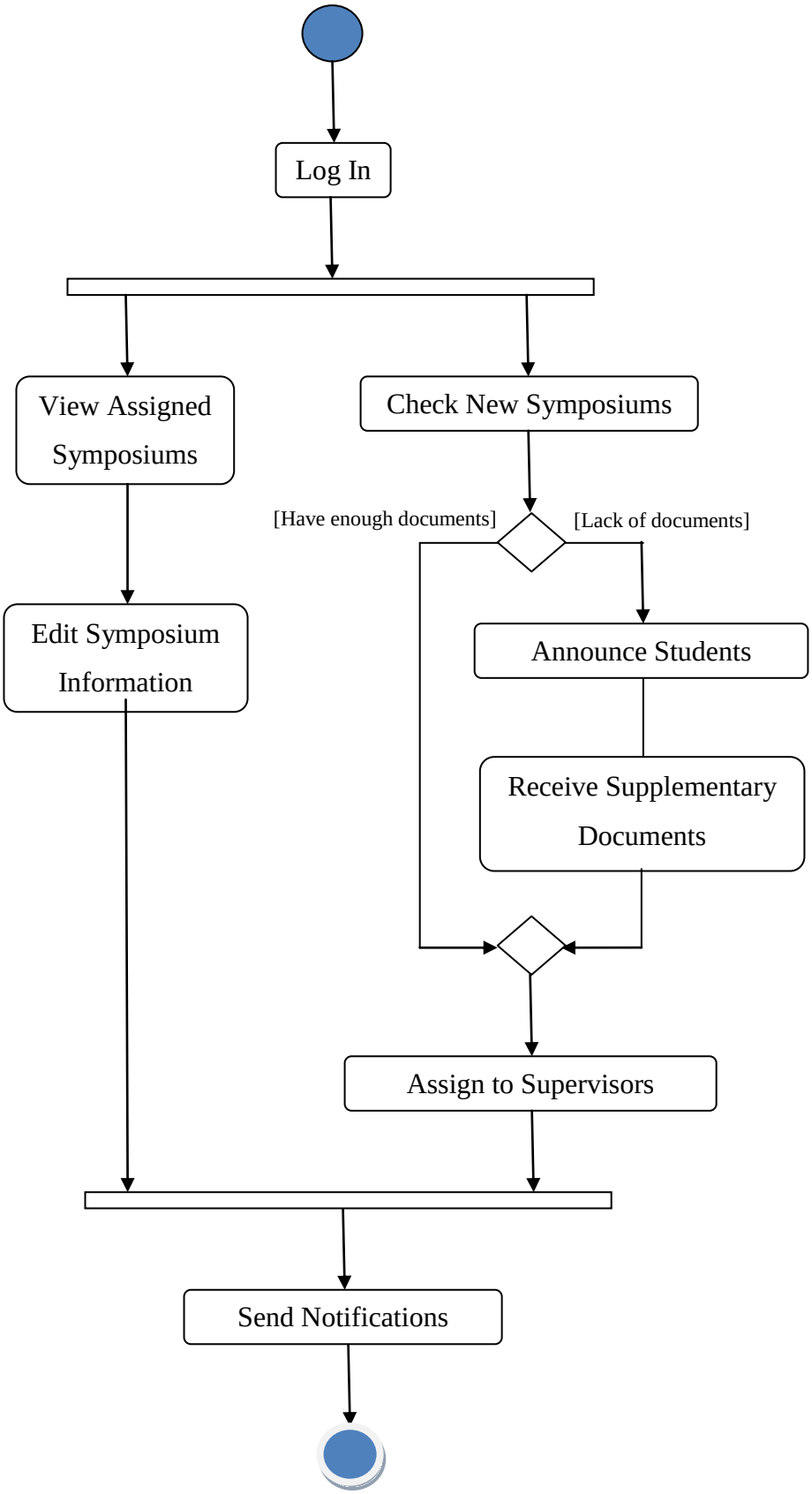

FIGURE 4.4 Functional Activity Diagram for Postgraduate Coordinators

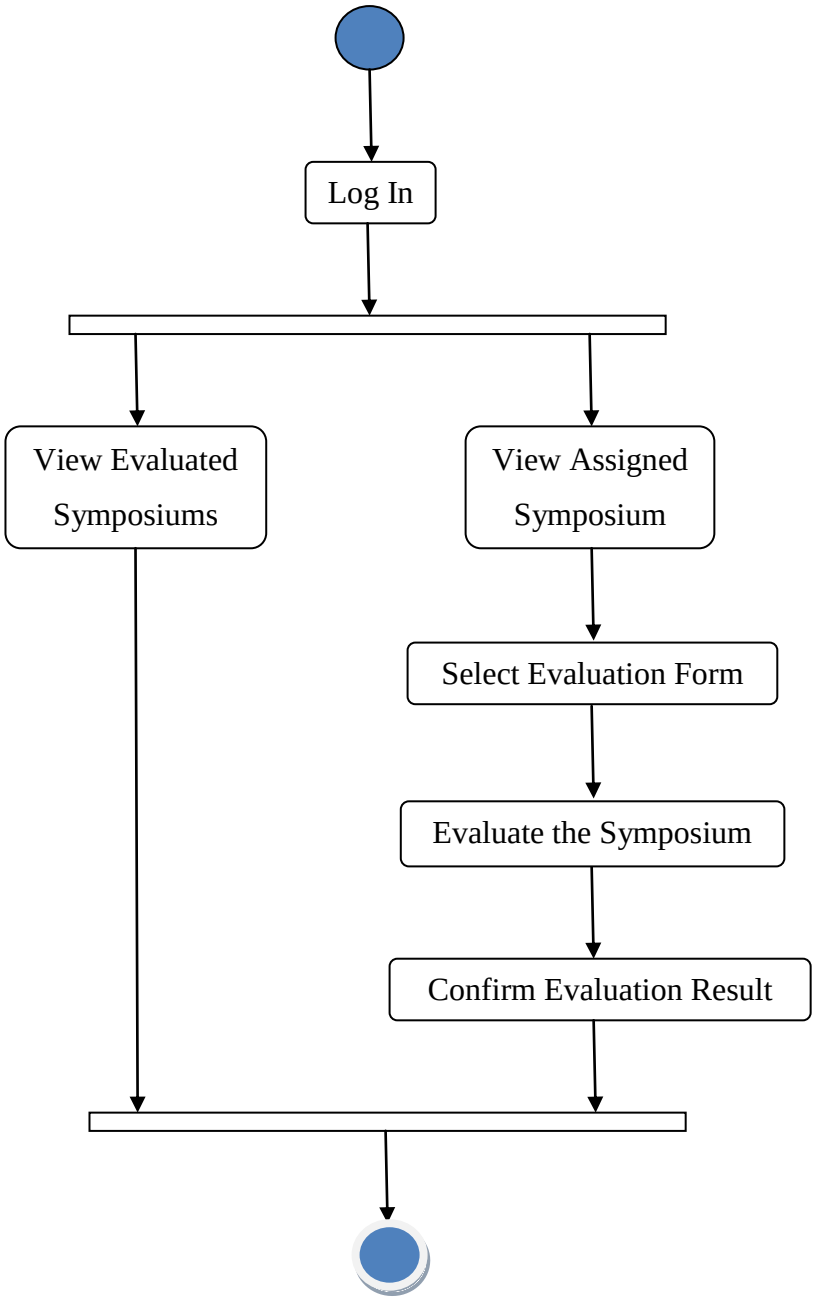

FIGURE 4.5 Functional Activity Diagram for Supervisors or Examiners

4.2.3 Use-Case Diagrams

A use-case digram illustrates in a very simple way the main functions of the system and the different kinds of users that will interact with it.

Figure 4.2 presents a use-case diagram for the management and assessment system.

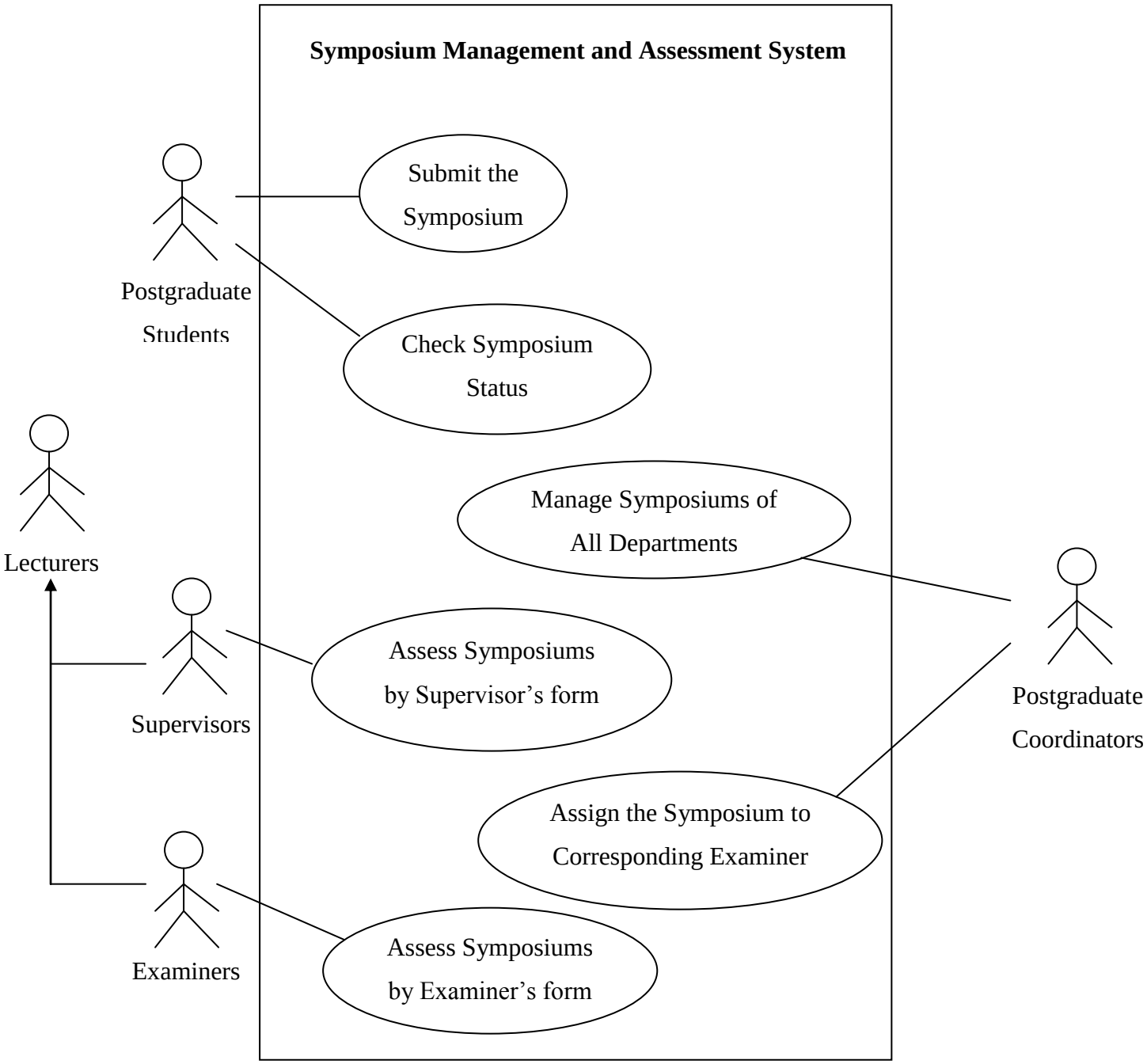

FIGURE 4.6 Use-Case Diagram for the Management and Assessment System

4.3 Graphical User Interface (GUI) Design

The user interface is an essential part of the system with which the users interact. It includes the screen displays that provide navigation through the system, the screens and forms that capture data, and the reports that the system can extract. The human-computer interface layer defines the way in which the users will interact with the system and the nature of the inputs and outputs that the system accepts and produces.

Figure 4.6 shows the five steps of user interface design process.

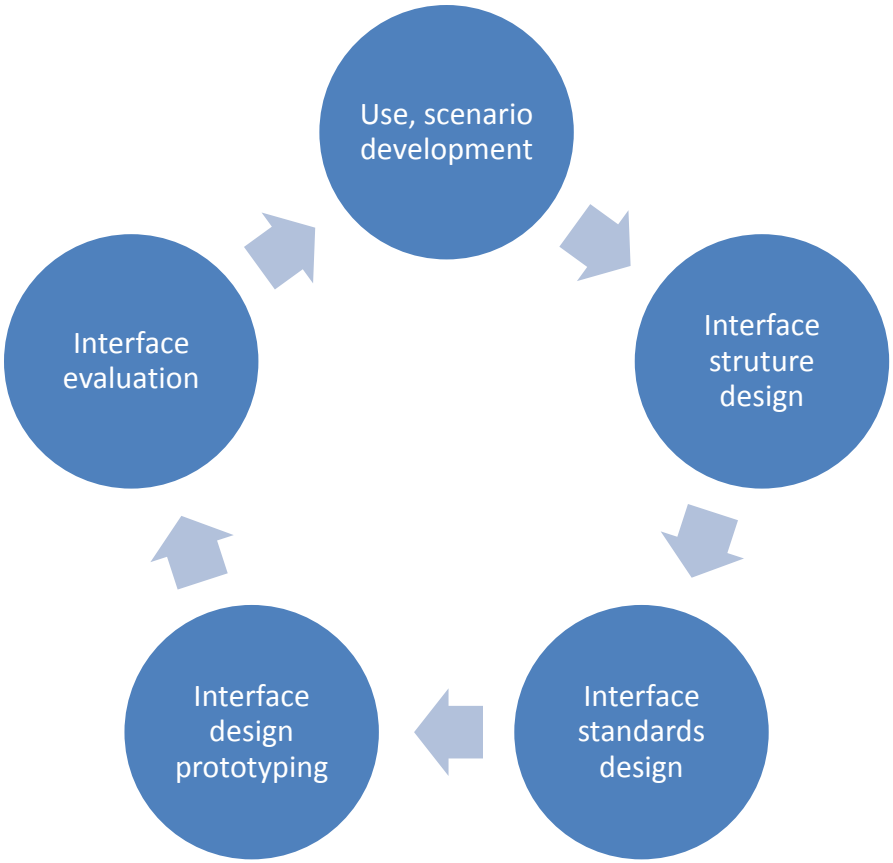

FIGURE 4.7 User Interface Design Process

1. The activity and use cases diagrams are examined to develop use scenarios that describe commonly employed patterns of actions the users will perform so the interface enables user quickly and smoothly perform these scenarios.
2. The interface structure is developed to define the basic components of the interface and how they work together to provide functionality to users.

3. Some standardized Web formats are designed to become the interface standards for the system. They are the basic design elements on which interfaces of the system are based.
4. An interface design prototype is created for each of the individual interfaces in the system. The prototype is built using Web pages created in HTML (Hypertext Markup Language).
5. Interface evaluation is used to determine if the individual interfaces are satisfactory and how they can be improved before system is complete. Some potential users are involved in the evaluation process.

The user interface includes three fundamental parts.

1. Navigation Mechanism – the way in which the user gives instructions to the system and tells it what to do.
2. Input Mechanism – the way in which the system captures information.
3. Output Mechanism – the way in which the system provides information to the user.

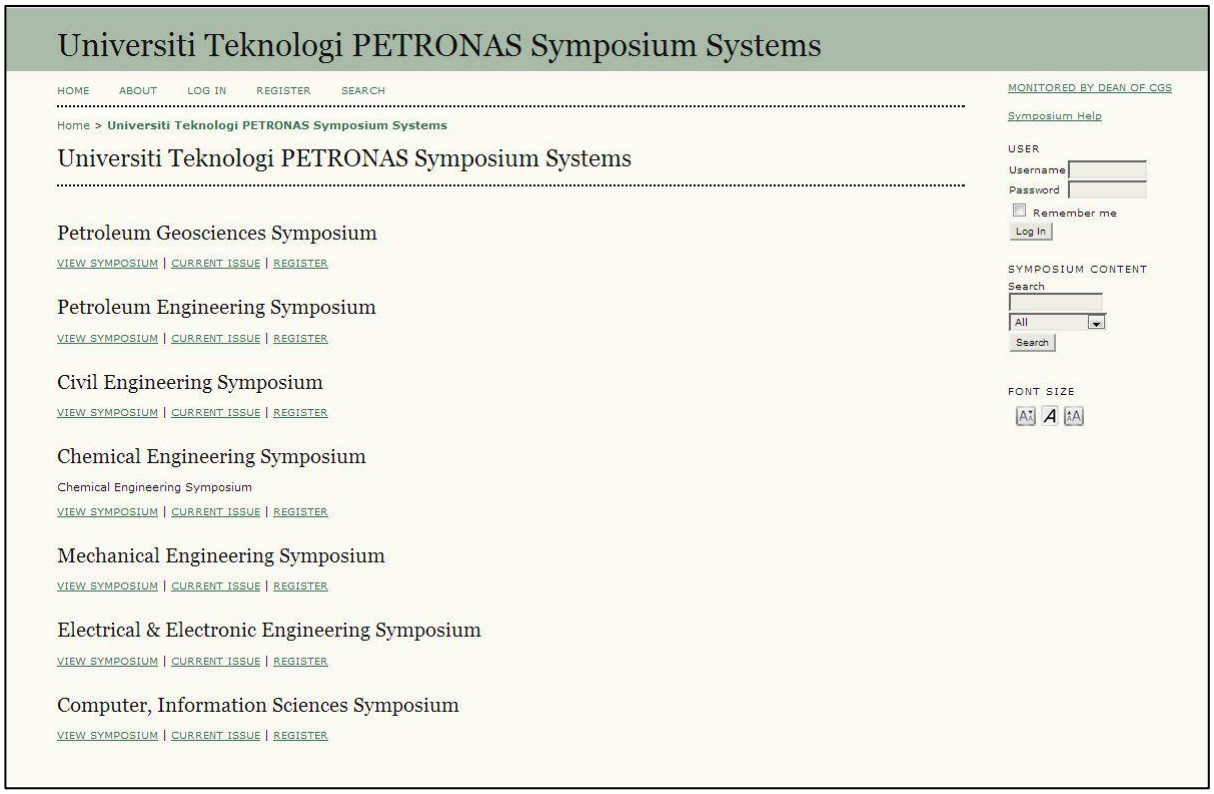

FIGURE 4.8 An Interface Design Prototype for the Home Page of the System

Multiple layout areas are used in the system. Figure 4.7 presents an interface design prototype for the home page of the system. The home page screen has two main navigation areas, each of which is organized to provide different functions and navigation within different parts of the system. The top area provides the standard website navigation and command controls that change the contents of the entire screen. The navigation area on the left edge navigates between departments and changes all content to their specific symposiums.

Besides, forms and reports also employ content awareness principle to make the user aware of the information it contains with the least amount of effort on the user's part. All areas are clear and well defined so that it is difficult for the user to become confused about the information in any area. Then users can quickly locate the part of the form or report that is likely to contain the information they need. The areas are marked using lines, colors, and headings. Figure 4.8 below shows an interface design prototype for the research symposium submission process of postgraduate students.

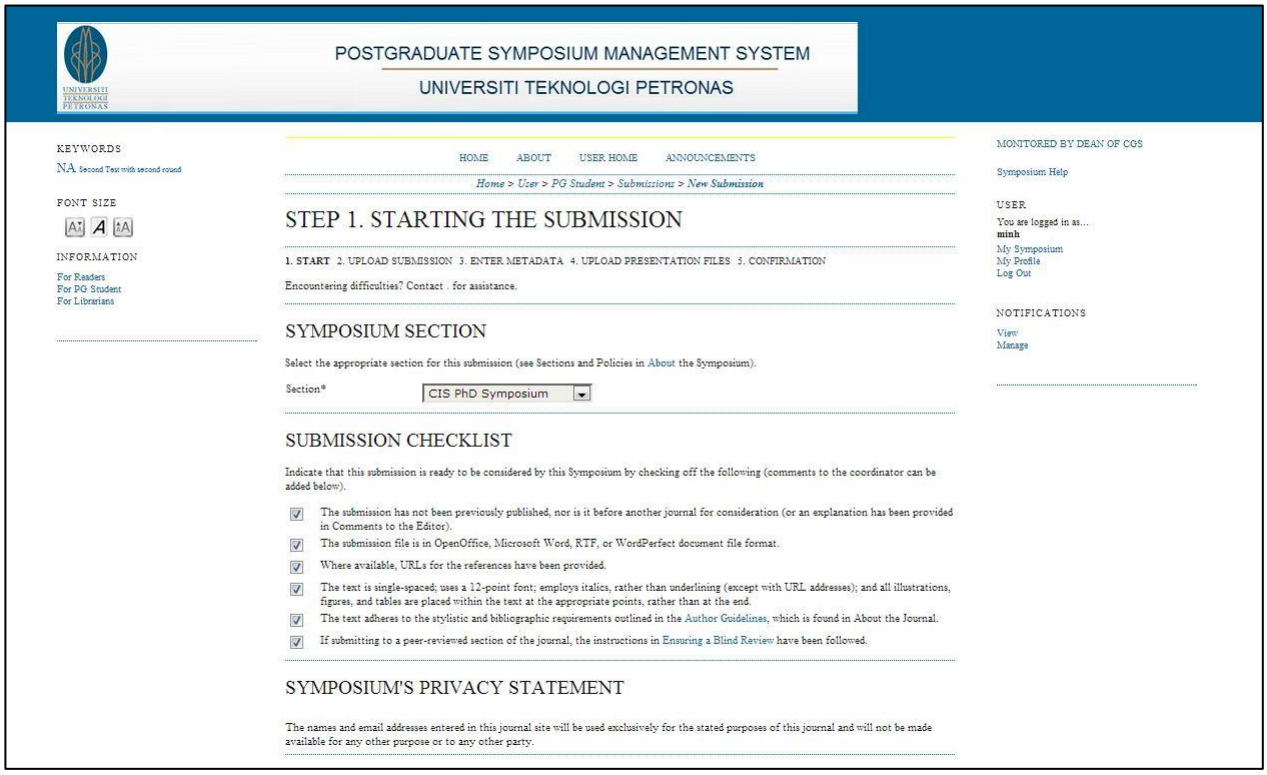

FIGURE 4.9 An Interface Design Prototype For the Starting Page of the Research Symposium Submission Process

Moreover, space is at a premium on forms and reports, and there is the temptation to squeeze as much information as possible onto a page or a screen. All forms and reports are provided a minimum amount of white space that is intentionally left blank. In general, academic staffs as well as postgraduate students prefer interfaces with low density, often less than 50 percent of the interface occupied by information.

The design of text is also important. All text is in the same font and about the same size for the same level. Users can change the size of the text to be suitable with their eyes' vision. Changes in font and size are used to indicate changes in the type of information that is presented such as headings, and status indicators. Besides, Serif fonts which are the most readable for printed reports, particularly for small letters, are used for the extracted reports in the system. Sans serif fonts are the most readable for computer screens and are used for headings in printed reports. All capital letters are only used for titles.

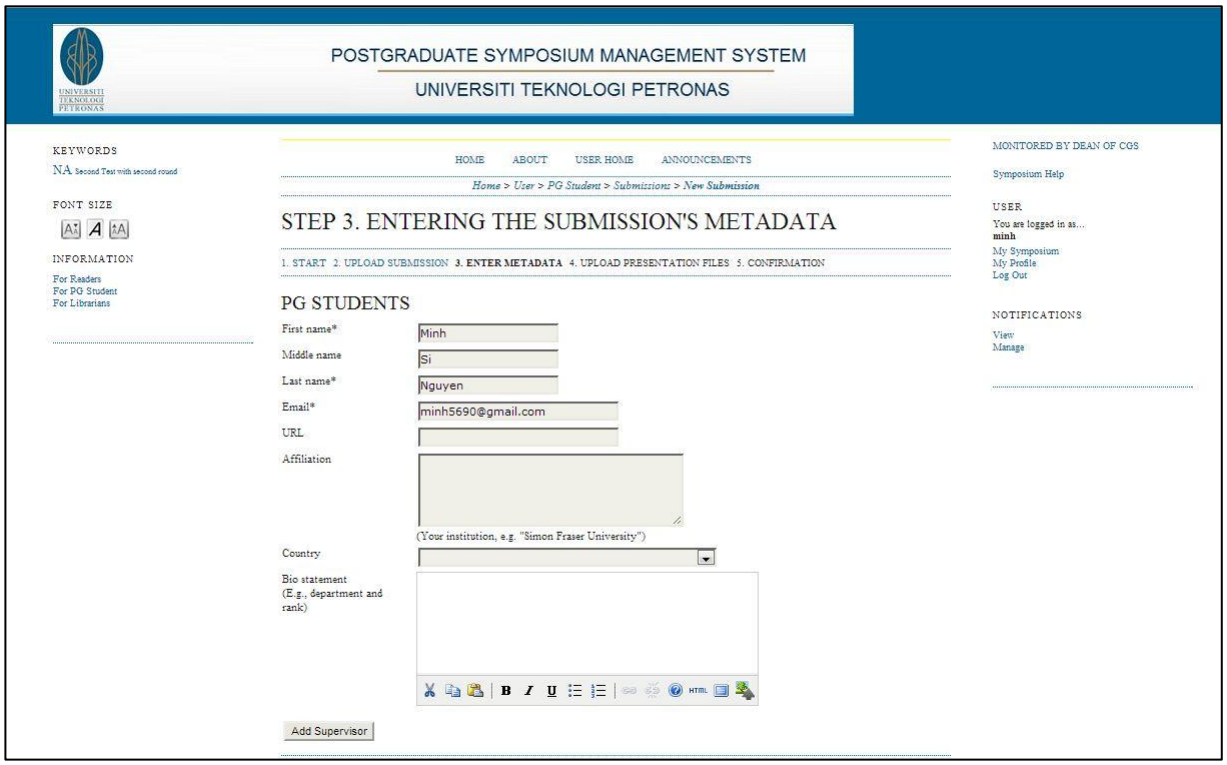

FIGURE 4.10 An Interface Design Prototype for the Submission Form

Color and patterns are used carefully and sparingly and they serve their specific purposes to provide pleasant readability. They are also used to strengthen the

message. Color is used to separate and categorize items, such as showing the difference between headings and regular text, or to highlight important information. Therefore, colors with high contrast are used such as black and white. In general, black text is shown on a white background that is the most readable.

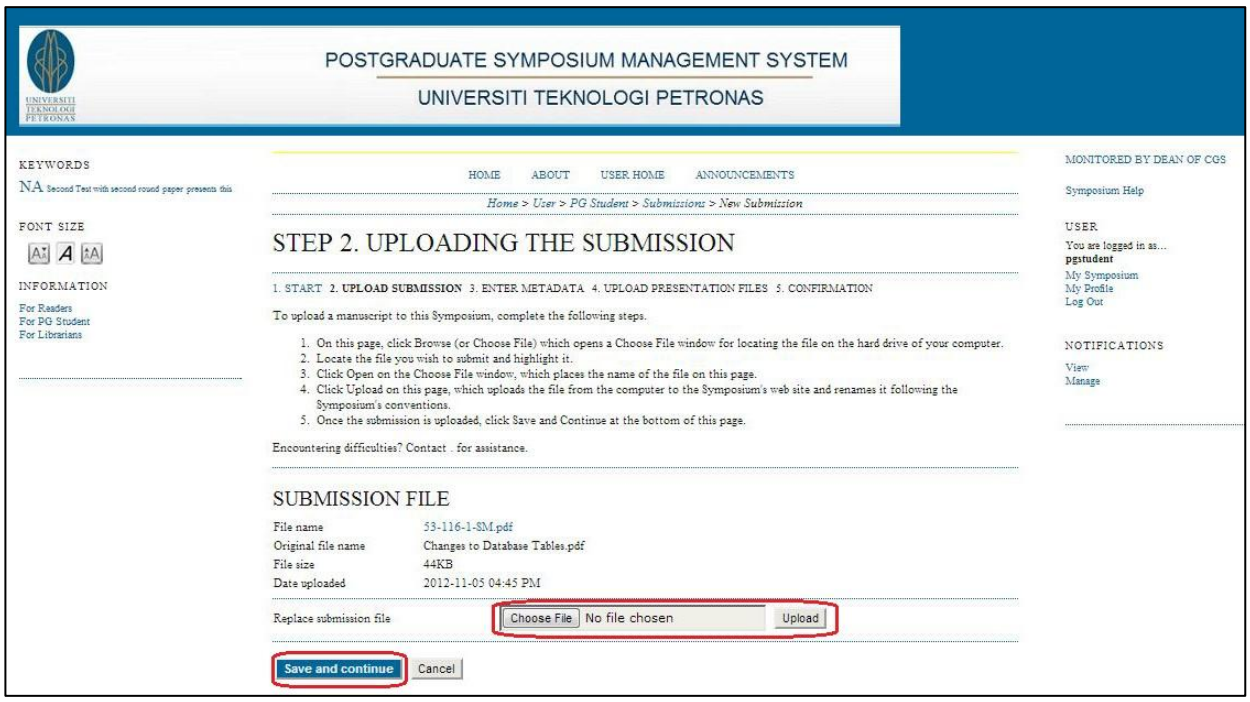

FIGURE 4.11 An Interface Design Prototype for the Submission Process

In figure 4.10, the progress of the submission can be observed on the screen for user awareness. Especially, the location and the words used for navigation are selected according to Community of Practice (CoP) considerations. To relate the text-content of the screen to the navigation, the terms used in the progress bar and command buttons are also used in the content section on each of the screens. Error message content and system status to users also apply this common terminology concept.

In order to minimizing user error, the commands are contextually constrained to provide consideration. In figure 4.10, the box "Replace submission file" below the summary of the submission file is only available after a file is attached. Prior to a file being attached, there is an upload box "Upload submission file". All the screens used in the postgraduate research symposium submission process apply similar considerations of user familiar terminology, binding text content to commands for ease of navigation and constraints to guide the user through the process.

Consistency in design is the single most important factor in making a system simple to use because it enables users to predict what will happen. With consistency, users can interact with one part of the system and then know how to interact with the rest. Consistency is ensured by making all parts of the system work in the same way. Most of the users are familiar with the Web, so the system has been built on Web technologies which can reduce the amount of learning required by user. In this way, the user can reuse Web knowledge, thus significantly reducing the learning period for a new system.

4.4 System Evaluation

Both management and assessment processes involved in the pilot test with a small number of postgraduate students and lecturers. The students were contacted by their lecturers and asked to participate in the pilot test. To determine the user satisfaction when using the web-based management and assessment system for postgraduate research symposium, a questionnaire was developed.

The questionnaire comprised ten questions. Six were multiple choice questions utilizing a scale and the other four questions were open ended. The questionnaires were undertaken immediately after using the new system. Eleven Doctor of Philosophy (PhD) students, three Master of Science (MSc) students, two Computer & Information Sciences (CIS) lecturers, and one CIS executive completed the survey during the pilot test.

The questions were used to assess overall system acceptance, usefulness, functionality, utility, usability, distributed cognition, interaction design, and the support provided. Terms and concepts were explained in the briefing session which was held before the pilot test. The questionnaire rating scale of one to five covers the range of responses from a strong negative to a strong positive response respectively.

The guide for interpreting the scale is:

- 1 – Poor
- 2 – Fair
- 3 – Good
- 4 – Very Good
- 5 – Excellent

The average score for each testing section is shown on the table below:

No.	Section	Average Score	Highest Score	Lowest Score
1	Identification of functions	4.18	5	2
2	Execution of the test cases	3.82	4	3
3	Comparison of actual and expected outputs	4.00	4	3
4	Response time of important functions	4.09	5	3
5	Organization of the menu items and functions	3.73	5	2
6	Process flow of the system	3.82	4	1

TABLE 4.1 The Summary of the Score for the Pilot Test

Based on table 4.1, the identification of functions that the system is expected to perform receives the highest score of 4.18. The participants are quite satisfied with the classifying and clarity of functions in the system. They do not find difficulties in understanding the terms and the navigation of each function.

In contrast, the organization of the menu items and functions is evaluated with the lowest score of 3.73. The postgraduate students have struggles on the management process of their research symposiums. It takes time for them to find the functions they need and they have to ask the developers for more instructions. There are some suggestions to highlight the main menu items and functions for a better visualization.

The open responses were classified according to the same Technology Acceptance Model (TAM) criteria used to analyze the closed survey questions. There were twelve positive comments and five negative comments.

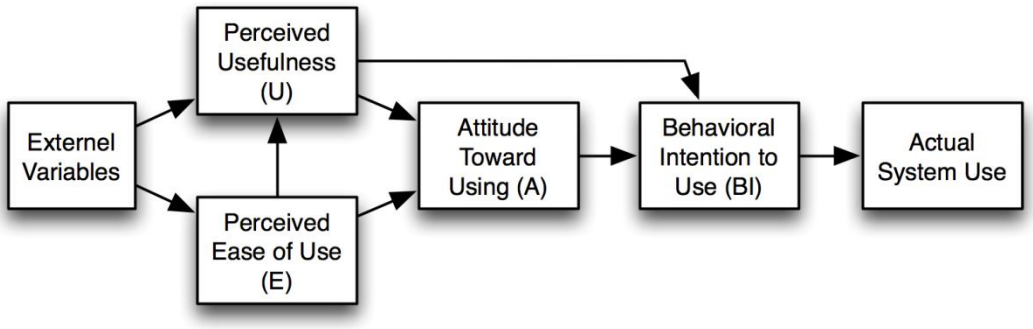

FIGURE 4.12 The Technology Acceptance Model Diagram

The negative responses for the new system focused on postgraduate students getting confused about the management process for each research symposium on a particular semester. They were not sure how to view a research symposium which had been completely evaluated on previous semester.

The negative interaction responses related to issues that were considered in the interaction design and interface design. Since the issues were considered, the interface and functionality were provided, but the postgraduate students did not discover it. As the pilot was a first look scenario without training, this type of production paradox response was expected.

There were a number of positive system acceptance statements supporting the new portal. Most of the participants agree that the system always react in the way they expect. Regardless of minor problems, the system is good and can be applied for the further objectives.

The results of the pilot study were positive. After the pilot test, the postgraduate students and lecturers response to it was such that it should be incorporated into the learning management system (LMS) as part of the core university system used by all departments and divisions. The system modeling of the management and assessment

processes resulted in changes to those processes. Subsequently, there would be a reduction in the incidence of loss and misplacement of non-electronically formatted research symposiums and progress reports, a reduction in complexities for academic coordinators to handle and schedule the postgraduate research symposiums.

All the main suggestions and amendments the developers have made after the pilot test are summarized below.

No.	Suggestions From Participants	Amendments From Developers
1	The margin of the text is too close and makes the participants uncomfortable to read.	The margin of the text has been increased and a function to allow the users modifying the size of the text is added.
2	Notification errors should be enhanced to identify the position of error for user to recognize.	The enhancements in error message for submission process have been made to be more user-friendly and accurate.
3	The status of the research symposium should be updated following the process of evaluation.	The status of the research symposium has been updated after the submission process.
4	The checklist on the submission process should be reduced to enhance the ease of use.	The checklist has been reduced from six to two conditions which are more concise.
5	The maximum size of the file to be uploaded should increase while some of researches have video files.	The developers have asked IT & Media Services Department to increase the maximum size to be uploaded.

TABLE 4.2 The Amendments of the System Based on the Suggestions from the Pilot Test

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The work of managing and evaluating postgraduate symposium is increasingly focused in the emerging attention of Universiti Teknologi PETRONAS (UTP). This project has successfully prepared to develop a management and assessment system which serves as a relatively convenient portal for postgraduate students, academic staffs, lecturers, and external examiners to utilize fully their time and efforts for managing and assessing research symposiums in UTP.

With straightforward and fully-functioning design, the system fulfills the project's objective of delivering a suitable web-based application for the uses of academic staffs and postgraduate students. Three main functional requirements, which are research symposium submission, research symposium management, and research symposium assessment, had been designed properly.

If the proposed system is developed following the methodology and implemented in real education environment, it promises to support greatly educators to systematically manage and assess postgraduate students' research symposiums. Ultimately, the system contributes to help educators mitigate the administration workload and achieve education management system's objectives.

A highly-centralized algorithm structure was constructed to facilitate the system design. Especially, the author managed to create a web-based model for a high level of interaction and optimization.

5.2 Limitations

Partly due to technical, economical, and timely constraints, following are some limitations existed within the system:

- Embedded database management functions are stopped at very basic level which are adding, deleting, updating, searching, and sorting.
- The scope is limited to the management and assessment processes for postgraduate research symposiums of University Teknologi PETRONAS (UTP).

5.3 Recommendations

Future works suggest more testing sessions such as Alpha testing, and Beta testing. A more advanced system design is able to be developed, which has more complex functions of live interaction embedded into the system. Furthermore, the interface and functions embedded into the system could be completed to satisfy the current requirements and solve the root causes of postgraduate problems.

Besides, the scope of the project can also be extended to other domains which may include Final Year Project for undergraduate students and other education institutions, with proper adjustment relating to the algorithm structure for each particular case.

REFERENCES

[1] Universiti Teknologi PETRONAS. (2011). Graduate studies program handbook.

[2] Universiti Teknologi PETRONAS. (2012). Postgraduate information package

[3] About the university. Retrieved June 26, 2012, from http://www.utp.edu.my/index.php?option=com_content&view=article&id=49&Itemid=27

[4] Universiti Teknologi PETRONAS. Retrieved June 26, 2012, from http://en.wikipedia.org/wiki/Universiti_Teknologi_Petronas

[5] Zaharin Mat Noor,(2009). UTP forges ahead into the future. Retrieved June 26, 2012, from http://education.bernama.com/index.php?sid=exclusive_content&id=375421

[6] O'Brien, J. A., & Marakas, G. M. (2009). Management information system (9th ed.). New York: McGraw-Hill.

[7] Zhang, J., Liu, Y., & Song, J. (2009). The scientific research management system of colleges. School of Science. Wuhan University of Science and Engineering.

[8] Gotel, O., Scharff, C., & Wildenberg, A. (2007). Extending and contributing to an open source web-based system for the assessment of programming problems. Department of Computer Science, Seidenberg School of Computer Science and Information Systems, Pace University.

[9] Helmick, M. T. (2007). Integrated online courseware for computer science courses. Department of Computer Science and Systems Analysis, Miami University.

[10] PhD management system. Retrieved June 26, 2012, from http://www.peoplexs.com/pxsen/index.cfm/solutions/phd-management-system/

[11] Hutchins, E. (1995). Distributed Cognition. Cambridge. Massachusetts: Massachusetts Institution of Technology Press.

[12] Lehane, P. (2010). Designing interactions for the collective user experience. University of Southern Queensland.

[13] Tolley, H., & Shulruf, B. (2009). From data to knowledge: The interaction between data management systems in educational institutions and the delivery of quality education. Faculty of Arts. University of Auckland.

[14] Robling, G., Malma, L., Clancy, M., Joy, M., Kerren, A., Kerhonen, A., et al. (2008). Enhancing learning management systems to better support computer science education. Department of Computer Science. TU Darmstadt.

[15] Carroll, J. (2003). HCI Models, Theories and Frameworks: Towards a multi-disciplinary science. Morgan Kaufman, Elsevier Science, San Francisco, USA.

[16] Bodker, S. (1991). Through the Interface, a human activity approach to user interface design. Lawrence Erlbaum Association, Hillsdale, New Jersey, USA.

[17] Norman, D. (1988). The Design of Everyday Things. New York: Doubleday.

[18] Mannino, M. V. (2001). Database Application Development and Design (2nd ed.). New York: McGraw-Hill/Irwin.

[19] Dennis, A., Wixom, B. H., & Tegarden, D. (2010). Systems analysis and design with UML: An object-oriented approach (3rd ed.). New Jersey: John Wiley & Sons, Inc.

[20] PERL. Retrieved June 26, 2012, from http://vi.wikipedia.org/wiki/Perl

[21] Whitten, J., & Bentley, L. (2005). Systems analysis and design methods (7th ed.). New York: McGraw-Hill.

APPENDIX A – User Interfaces

FIGURE A-1: Main Page for User Log In

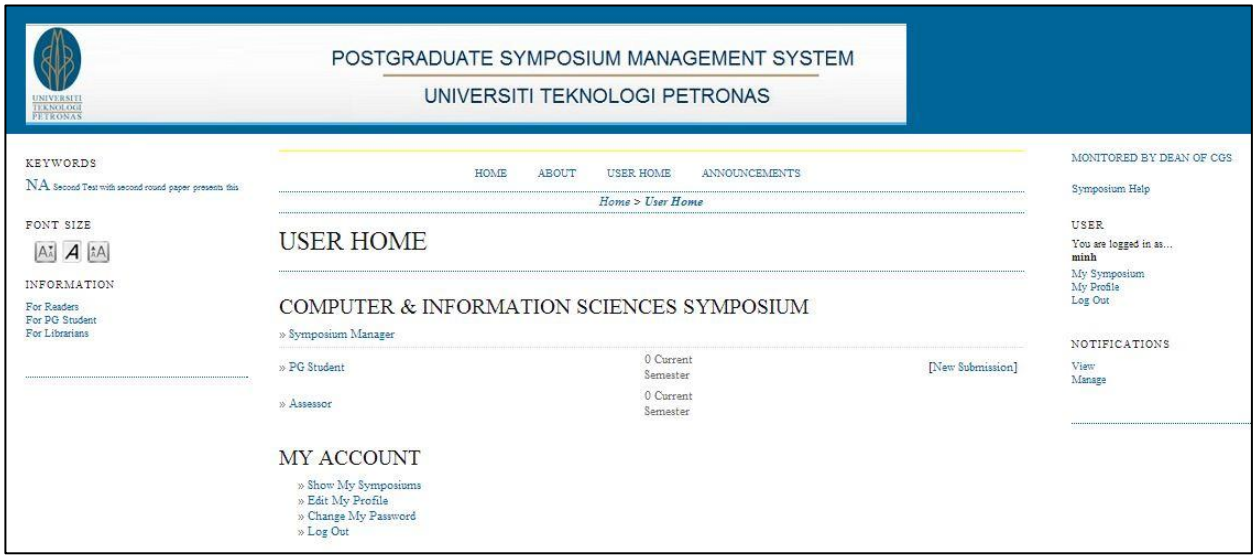

FIGURE A-2: User Home Page

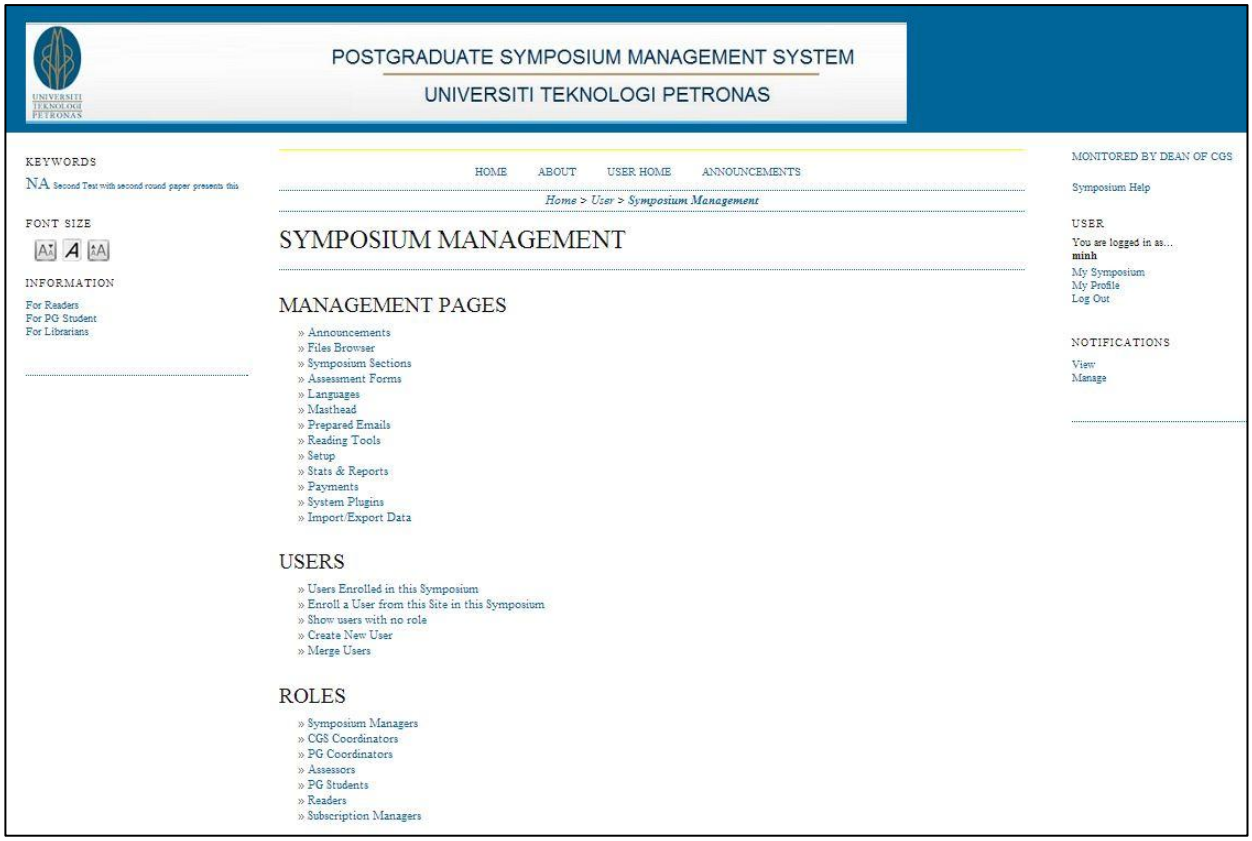

FIGURE A-3: Home Page for System Administrator

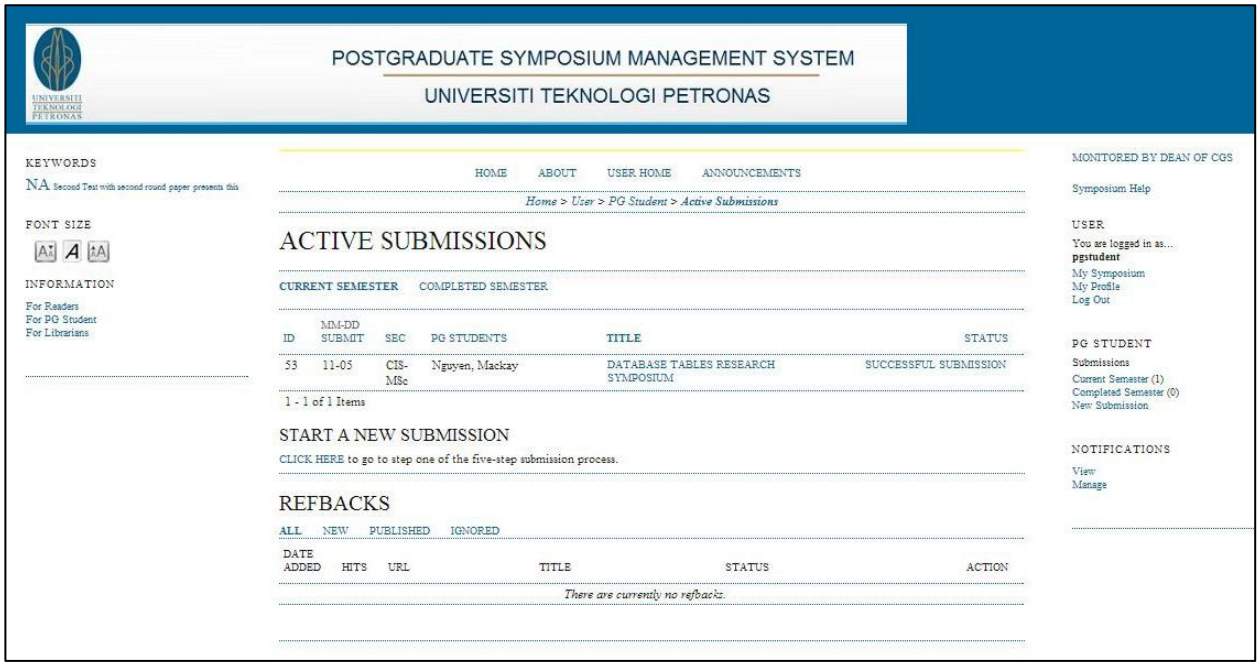

FIGURE A-4: Home Page for Postgraduate Student

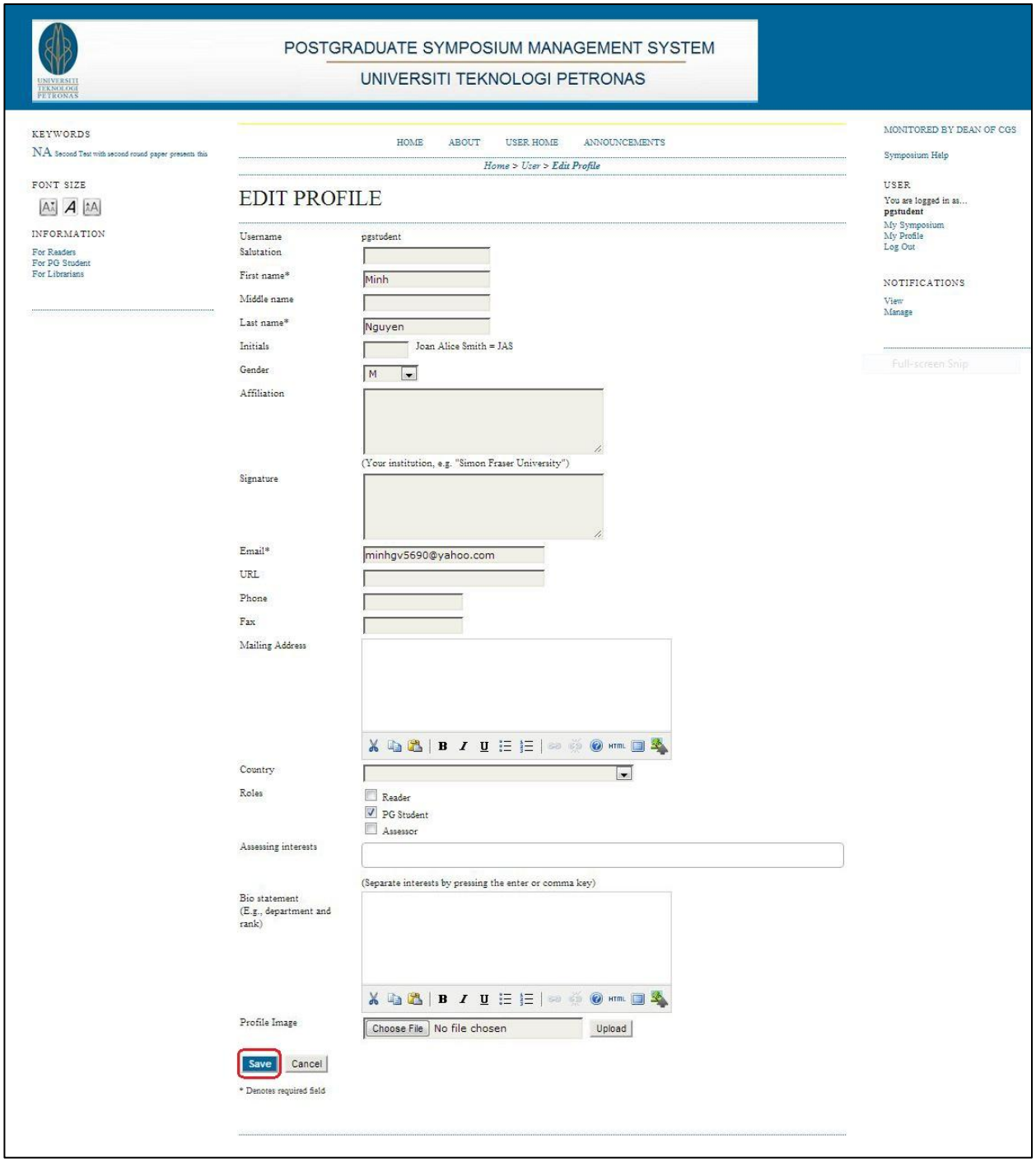

FIGURE A-5: Edit Profile Page for Postgraduate Student

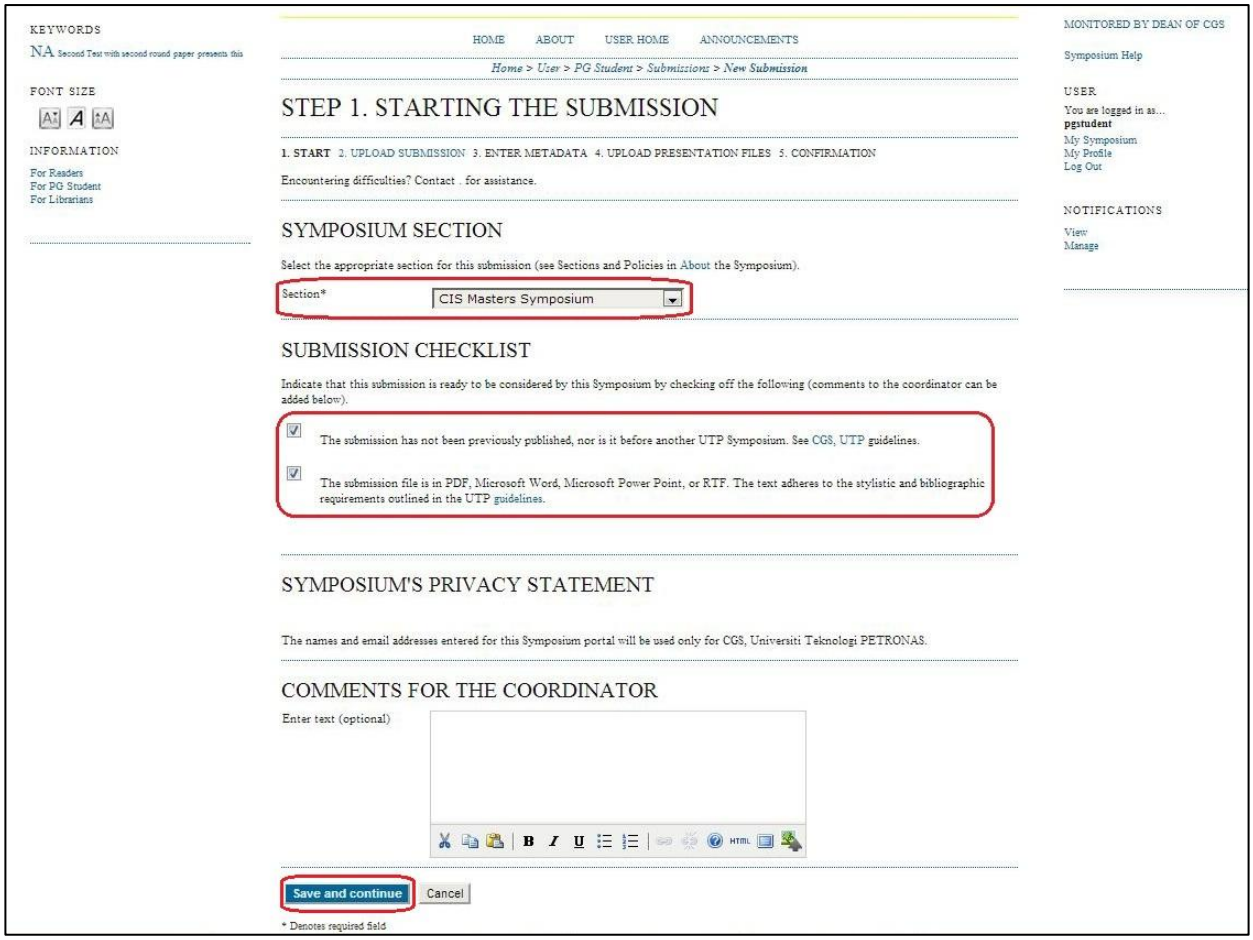

FIGURE A-6: Starting the Submission

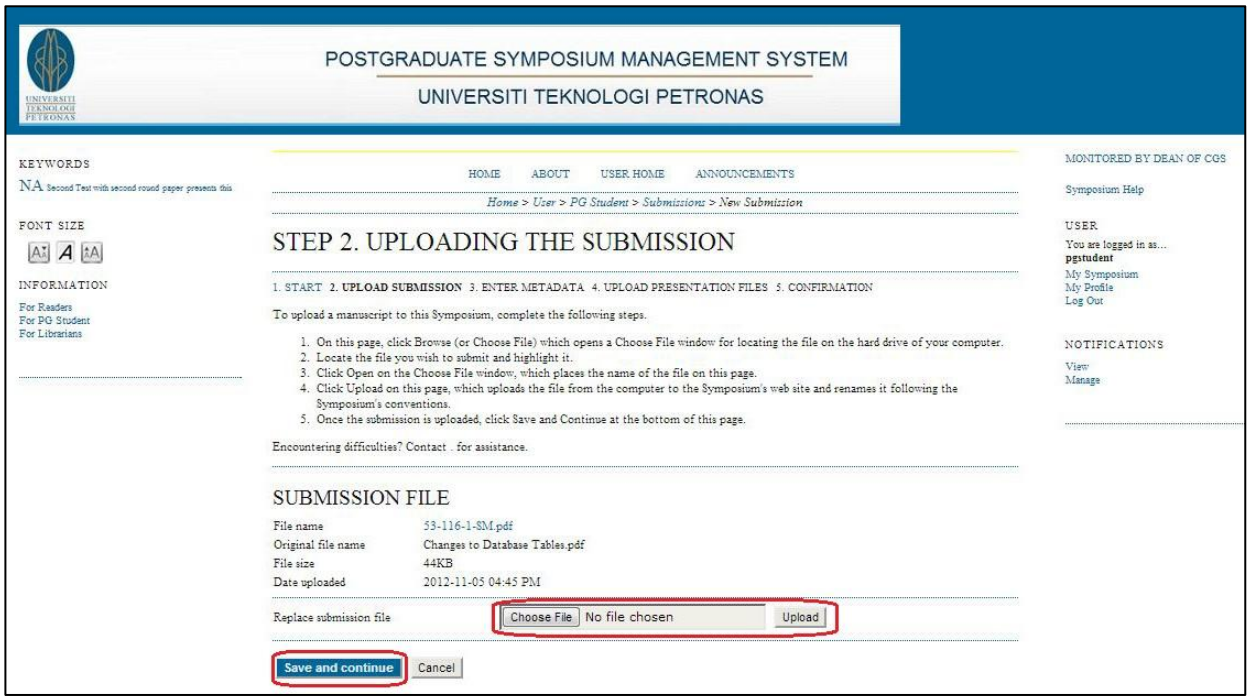

FIGURE A-7: Uploading the Submission

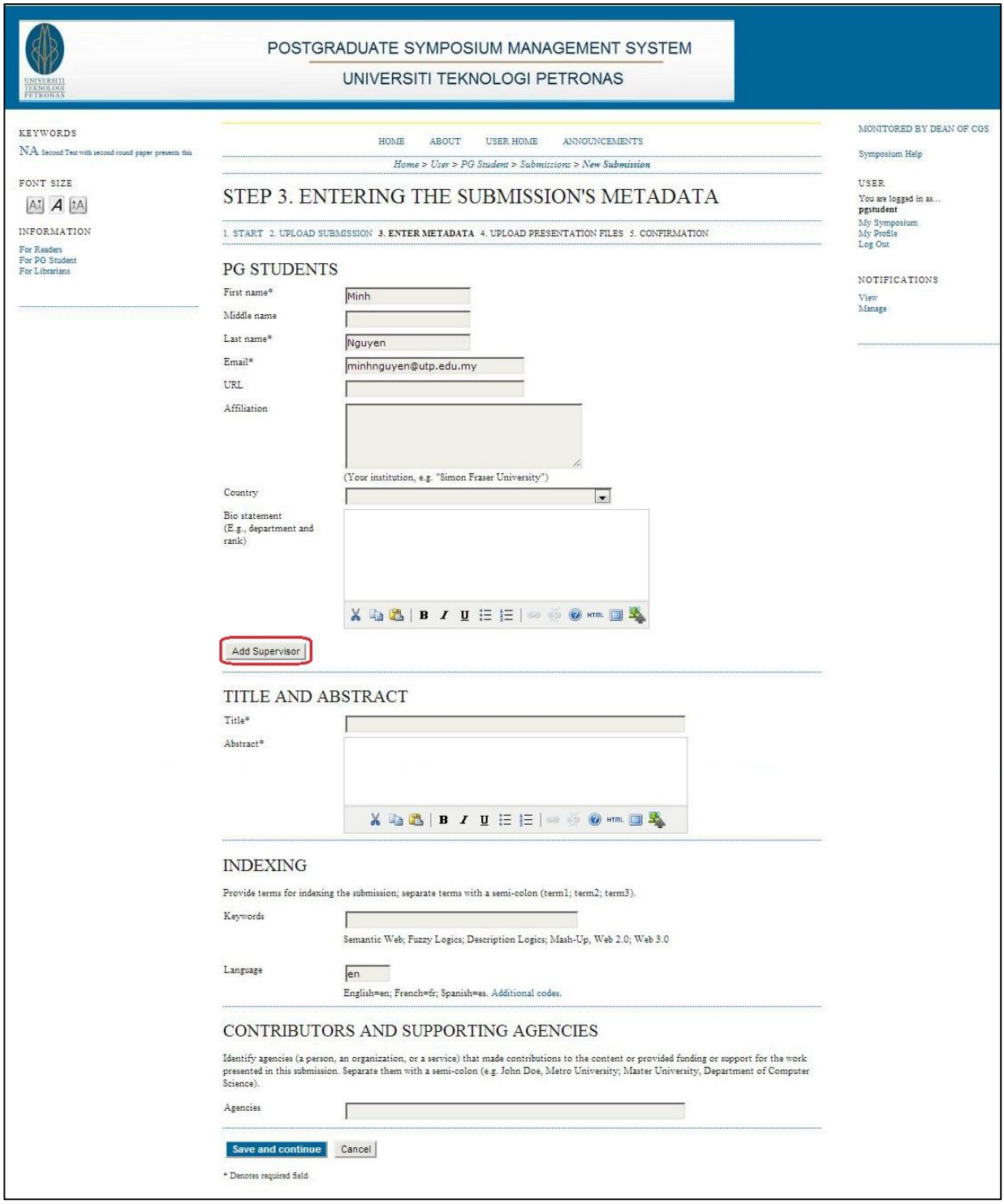

FIGURE A-8: Entering the Information of the Submission

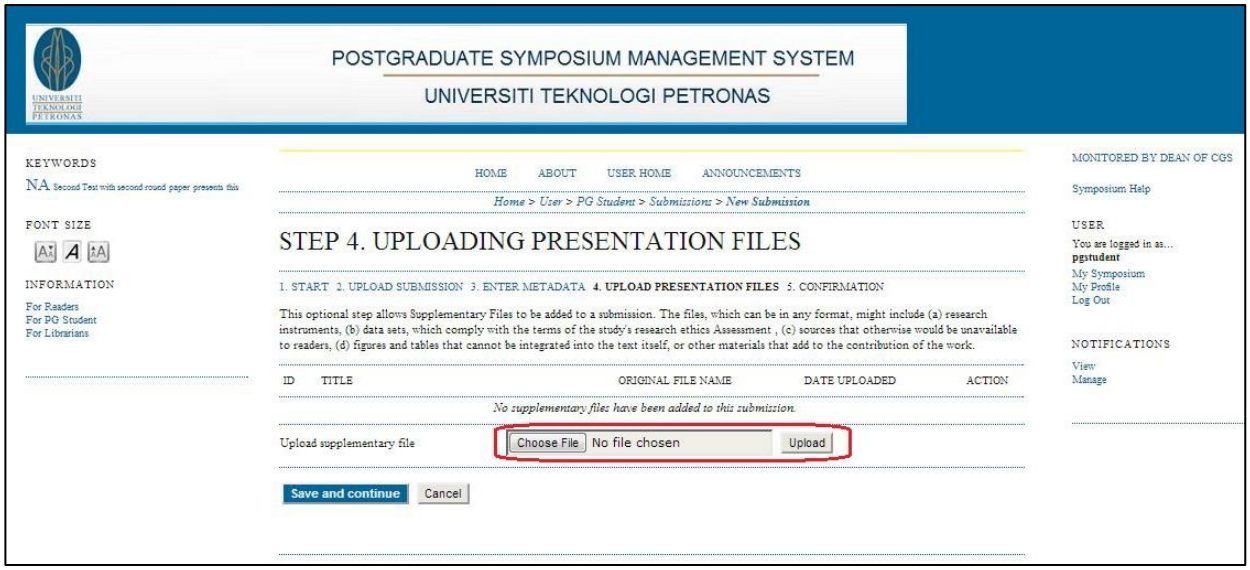

FIGURE A-9: Uploading Presentation Files

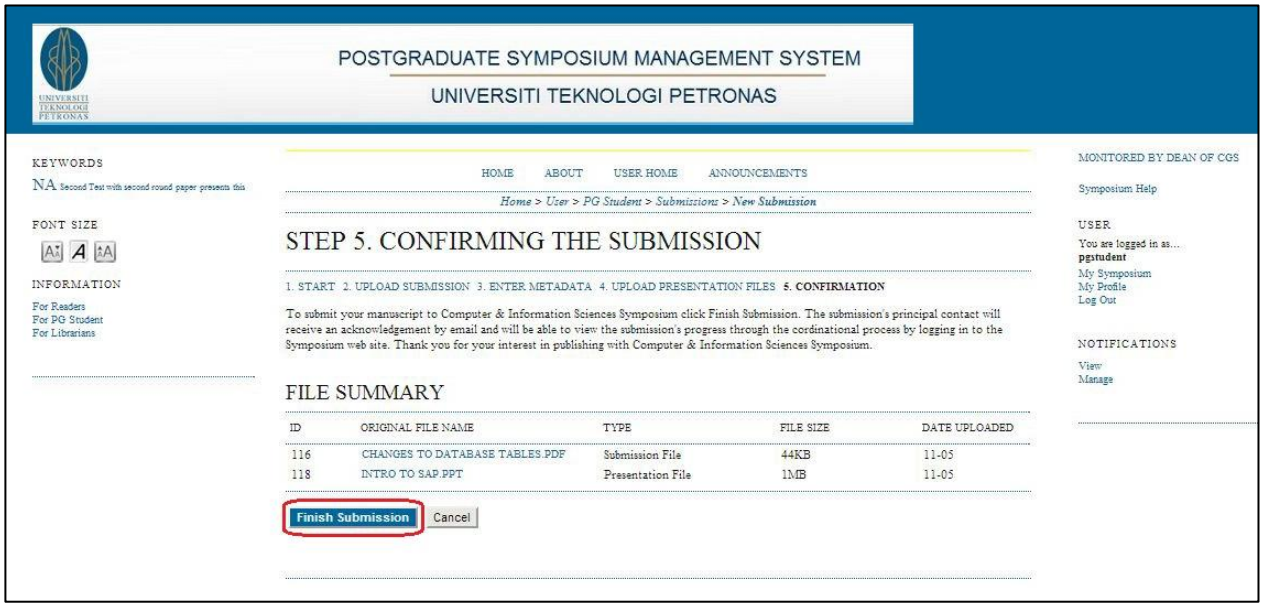

FIGURE A-10: Confirming the Submission

FIGURE A-11: Announcement for Submission Completion

APPENDIX B – Questionnaire for Pilot Test

QUESTIONNAIRE RELATED TO WEB-BASED MANAGEMENT AND ASSESSMENT SYSTEM FOR POSTGRADUATE RESEARCH SYMPOSIUM

Name (Optional): _____

Program: _____

Testing Role: _____

Since this is beta version system, we are interested in learning about any problems with the system or of any improvements you may suggest. Please circle the choice that best describes your opinion.

Scale:	**1**	**2**	**3**	**4**	**5**
	Poor	**Fair**	**Good**	**Very Good**	**Excellent**

1. The identification of functions that the system is expected to perform.	1	2	3	4	5
2. The execution of the test case.	1	2	3	4	5
3. The comparison of actual and expected outputs.	1	2	3	4	5
4. The response time of important functions.	1	2	3	4	5
5. The menu items were well organized and functions were easy to find.	1	2	3	4	5
6. The process flow of the system	1	2	3	4	5

7. Did the system always react in the way you expected? If not, please describe the problem:

_____

_____

8. Is there anything you would like to change about the system?

_____

_____

9. Would you interested in participating in another system test for the development team?

Yes/No

10. Any other suggestions:

_____

_____

** END OF QUESTIONNAIRE **

Thank for your time and efforts

Prepared by:

NGUYEN SI MINH

Computer and Information Sciences Department

Universit Teknologi PETRONAS

Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia

APPENDIX C – List of Participants in Pilot Test

No.	Name	Position
1	Low Tang Jung, Dr.	CIS Lecturer
2	Helmi Bin Md Rais, Dr.	CIS Lecturer
3	Muhaiyuddeen Bin Shaik Allauddin, Mr.	CIS Executive
4	Amos Bajeh, Mr.	PhD IT Student
5	Ishan, Mr.	PhD IT Student
6	Azfar, Mr.	PhD IT Student
7	Lai Chan Yet, Ms.	PhD IT Student
8	Sameha Zarif, Mr.	PhD IT Student
9	Nabila Lau, Ms.	PhD IT Student
10	Sobri, Mr.	PhD IT Student
11	Abubakar Aminu, Mr.	PhD IT Student
12	Prem Kumar Bhaskar, Mr.	PhD IT Student
13	Ibrahem Dooba, Mr.	PhD IT Student
14	Rabiu Ibrahim Fasaha, Mr.	PhD IT Student
15	Kamaludeen Usman Danyaro, Mr.	PhD IT Student
16	Maymuna Hashim, Mr.	MSc IT Student
17	Hanieh, Mr.	MSc IT Student
18	Semiha, Ms.	MSc IT Student