Applied Information Technology And Computer Science Vol. 3 No. 1 (2022) 732-747

AITCS

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/aitcs
e-ISSN :2773-5141

A Development of Assessment System for FSKTM Postgraduate Students

Nor Amirul Akmal Nor Azim[1], Nureize Arbaiy[1]*

[1]Faculty of Science Computer and Information Technology,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

*Corresponding Author Designation

DOI: https://doi.org/10.30880/aitcs.2022.03.01.049
Received 28 August 2021; Accepted 10 May 2022; Available online 31 May 2022

Abstract: Postgraduate programs by research are academic programs that require special assessment before a degree is given to students. At the Faculty of Computer Science and Information Technology, UTHM, the evaluation of research students is done at a certain time throughout the study. This assessment uses a printed form that will be distributed to panels and supervisors for the scoring process. The completed form will be returned to the graduate administration unit for analysis to obtain the final result. This process is repeated for all students undergoing assessments 1 and 2. Although this method is effective, with the advancement of digital technology and the addition of students, the process of implementing the collection of marks and calculation of the analysis of assessment results needs to be improved. Therefore, an assessment score management system for postgraduate programs has been proposed for its expansion to improve the efficiency of existing processes. This web-based system manages score entry and score analysis automatically. The system also handles information of students undergoing assessments 1 and 2 as well as the assessors involved. Prototype methodologies are used as project development guidelines, while project design is based on structured methods. Meanwhile, system development is realized using Sublime software and MySQL database. The programming languages used are Hypertext Preprocessor (PHP) and Hypertext Mark-up Language (HTML). It is anticipated that this developed system can help streamline the process of evaluation, scoring and analysis.

Keywords: Assessment System, Web-Based System, Education, Post-Graduate Assessment.

1. Introduction

Postgraduate programs by research is an academic program that requires special assessment before a degree is awarded to students. At the Faculty of Computer Science and Information Technology, UTHM, student's assessment is done at a certain period throughout the study. There are two formal assessment need to be accomplished by students namely; proposal assessment and thesis assessment. Evaluation of research proposals made at the faculty level is usually carried out in Semester 1 or 2. It

Corresponding author: nureize@uthm.edu.my

involves 2 panels of internal evaluators who implement the evaluation process using the proposal evaluation rubric set by the UTHM Graduate School. In this assessment, students need to present a research proposal that includes components such as research problems, research interests, objectives / objectives, scope, theoretical framework, methodology, proposed models, and expected findings. As a result of this assessment, students and supervisors need to take appropriate information and action to improve the performance and implementation of the research project [1]. The results of assessment 2 will determine the level of the thesis draft for the next stage which is the actual final thesis examination. The thesis draft that has satisfied the Faculty Examination Committee in all aspects of its evaluation, will be eligible to apply for the final thesis evaluation session (viva).

Assessment processes 1 and 2 use separate evaluation forms. This printed form will be distributed to evaluators and supervisors for the scoring process. Next, the completed form will be returned to the graduate administration unit for analysis to obtain the final result (marks). This process is repeated for all students undergoing assessments 1 and 2. Although this method is effective, but with the advancement of digital technology and the addition of students, the process of implementing the collection of marks and the calculation of the analysis of assessment results need to be improved. This is because, the available methods are very susceptible to time factors (slow), school losses and dropouts, and inefficient analysis and recruitment processes. inspections during the process of transferring data from form to spreadsheet software, as well as manual calculation errors should be noted. This is very important to improve the quality of the process as well as more efficient data management.

Thus, an assessment 2 score management system for postgraduate program has been proposed for its development to improve the efficiency of existing processes. Information management systems and databases to manage postgraduate student assessment information are needed to overcome problems that occur in the implementation of existing processes. Improving the function of automatic scoring system and data retrieval is expected to increase the efficiency of data management and the process of generating student assessment marks more effectively. This web-based system manages score entry and score analysis automatically. The system also handles information of students undergoing assessments 2 as well as the assessors involved. System database is provided to manage system data. Finally, this system is expected to improve the evaluation score calculation process and help management of the evaluation process more effectively.

This article is organized into five sections. The first part is an introduction describing the context of the project. The second section describes the analysis of the relevant work. In the third section, the methodology is explained. The implementation and testing of this system is described in the fourth section. In the last section, a conclusion with some instructions for future employment is given.

2. Related Work

An assessment system is a system used to help user make evaluation to other individuals. This assessment system has been in use since long time ago. It is a process of measurement and a process of feedback [1]. This is a control tool used by an organization to achieve a predetermined goal. Performance refers to the achievement of a task assigned to an individual. Performance means doing a task effectively and efficiently. Performance assessment is a process in which manager will evaluate and evaluate individual work results [3] – [5] by comparing based on predetermined standards, documenting comparative results and using results to provide feedback to those individuals to indicate where improvements are needed and why.

The problem is that students must print the assessment form and submit it to the supervisor and panel before the assessment session takes place. This leads to increased printing and storage costs as well as forms being exposed to the risk of being lost and damaged. Each printout of the assessment form requires a cost and the assessment form must be kept for reference resulting in increased storage space. The form retrieval process also becomes difficult due to the large number of forms. Then, once

the assessment is completed, the supervisor and panel must perform calculations manually to obtain the overall marks for each student assessed. This form calculation is prone to calculation errors and data re-entry errors from the form into the spreadsheet software.

As a solution, the FSKTM Assessment System for Postgraduate Students is proposed where it is a system that assists the process of managing assessment marks. The system is able to store evaluation scores, feedback and score calculation automatically. This web-based system simplifies supervisors and panel assessments without the need for physical forms printed from students. The system is also able to calculate the overall score automatically.

Based on the searches that have been done, there are several existing systems used on the internet will be compare to the proposed system [6]; [7]. The existing system studied including Developing Online Course and Lecture Evaluation System for UTP, Student Assessment System for Distance Education on Financial Management and an Interactive Student Evaluation System. The three existing systems are studied and compared to the features of the proposed system. This includes the modules contained in the Assessment System for FSKTM Postgraduate Students. Table 1 summarizes the comparison been made. The proposed system combines all five features into one system from a summary of comparisons between existing and proposed systems. The function and the modules for the current system is the same which is store information in the database and making calculations automatically.

Table 1 : Comparison between existing systems

Features/System	Developing Online Course and Lecture Evaluation System for UTP	Student Assessment System for Distance Education on Financial Management	Interactive Student Evaluation System	Assessment System for FSKTM Postgraduate Students
Registration	Yes	Yes	Yes	Yes
Evaluation and Analysis	Yes	Yes	Yes	Yes
Panel Assignment	No	Yes	No	Yes
Data Management	Yes	Yes	Yes	Yes
Report	Yes	Yes	Yes	Yes
Database	dBase Plus	Microsoft SQL Server	VUW's campus Web server	MySQL
Programming	dBL	Style Sheets, PHP	HTML	PHP
System type	Web-based	Web-based	Web-based	Web-based

3. Methodology

In this project, the prototyping model was selected as the development guide. This prototyping model contains of four main phases namely the planning phase, the analysis phase, the design phase, and the implementation phase. The analysis phase, the design phase and the implementation phase are

work together. These phases are performed repeatedly until the system achieves the proposed requirements or objectives.

Table 2 : Software development phases and its activity

Phase	Task	Output
Planning	Selection of system title, problem identification, problem solving objectives and suggestions. Collection of information to determine the target users for the system.	1. Project proposal 2. Gantt chart
Analysis	Analysis of system requirements (functional needs and non-functional needs), analysing inputs and outputs, and structuring data system requirements.	1. System's Requirements 2. Hardware and software Requirements 3. User requirements 4. Data Flow Diagram 5. Entity Relationship Diagram
Design	Design system process modules, drawing flow charts, system databases, interfaces and test system modules.	1. System and user flowchart 2. Relationship schemes and data dictionaries 3. User interface
Implementation and Testing	Program writing based on system design. Testing module functionality and user acceptance.	1. Comments from users 2. Feedback and suggestions from users 3. Test cases

System analysis is an analysis of requirements for determining specification for the system. There is device requirement such as functional requirement in Table 3 and non-functional requirement in Table 4.

Table 3 : Functional requirement

No	Module	Function
1.	Registration Module	• The system should allow the new user to register before login. • The system should show error when duplicate username is entered. • The system should display an error message when empty field found. • The system should allow the user to login into the system using username and password that has been registered. • The system should allow user to input valid username and password to logged in as user. • The system should alert the user for invalid input.

		• The system should redirect to dashboard once the user successful login.

Table 3 : (cont)

No	Module	Function
2.	Evaluation and Analysis Module	• The system should allow the administrator, panel and supervisor to add/ update/ delete/ search the assessment. • The system should calculate the overall marks for each assessment. • The system should error when empty field found.
3.	Supervisor and Panel Assignment Module	• The system should allow the panel and supervisor to add/ update/ delete/ search the students. • The system should allow the panel and supervisor to assign the assessment for the students.
4.	Data Management Module	• The system should allow the administrator to add/ update/ delete/ search marks. • The system should allow the administrator to add/ update/ delete/ search analysis. • The system should allow the administrator to add/ update/ delete/ search panel and supervisor information. • The system should allow the administrator to add/ update/ delete/ search assessment rubric.
5.	Report Management Module	• The system should allow the panel and supervisor to generate statistical report.

Table 4 : Non-Functional requirement

No.	Requirement	Description
1.	Operational	• The system should be user friendly. • The system should be easily maintained and updated. • The system should be able to work on any web browser.
2.	Performances	• The interaction between the user and the system should not be more than 5 minutes. • The system should be able for use anytime.
3.	Security	• Only the administrator can store and manage marks, analysis, panel and supervisor information, evaluation rubrics. • User can only access their own account with user id and password.

System analysis is a systematic approach used to perform this system analysis. Figure 3.1 shows a context diagram that includes three entities namely panel, supervisor and administrator. Figure 3.2 shows the DFD Level 0 that contains the details flow of data for the whole system. There are several processes including registration and login, mark evaluation and assessment analysis, panel assignment, data management and report. For data storage, there are several tables including panel, supervisor, administrator, panel mark, supervisor mark, panel analysis, supervisor analysis and rubric.

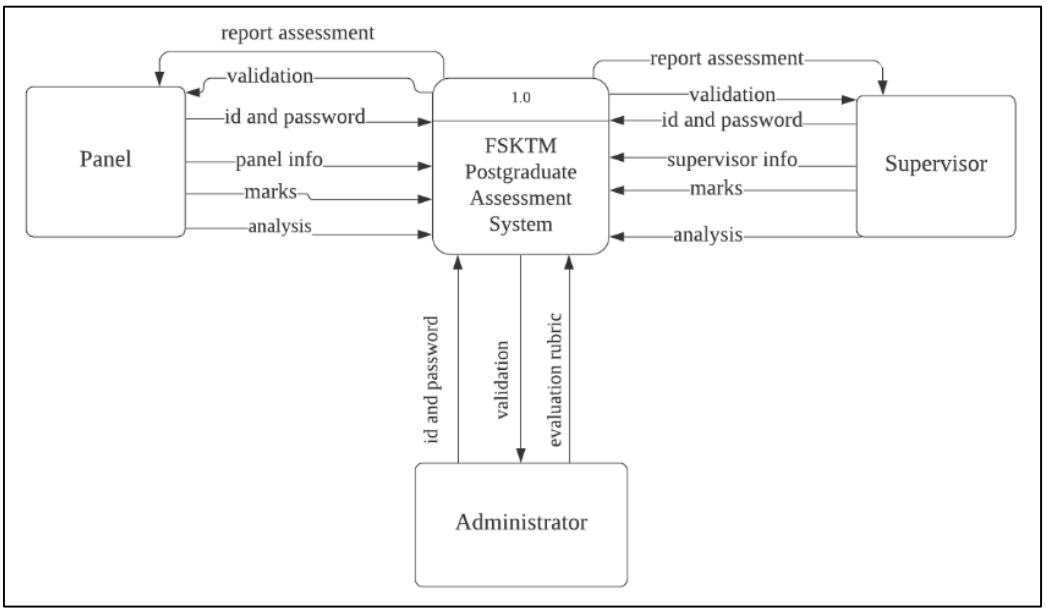


Figure 3.1: Context diagram

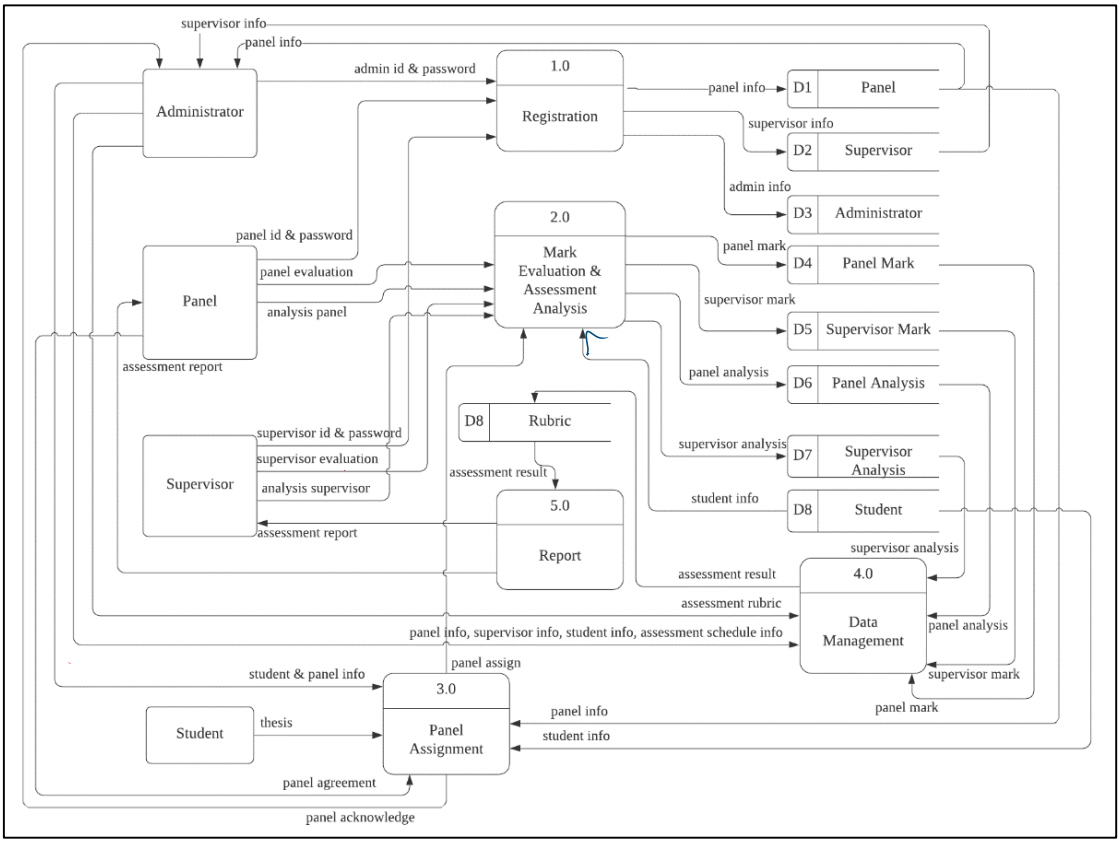


Figure 3.2: Data flow diagram

Figure 3.3 shows the entity relationship diagram of Assessment System for FSKTM Postgraduate Students. This is the sketch of the relationship between the entities that involved in this system. The several entities including administrator, supervisor, panel, supervisor evaluation, panel evaluation, assessment, rubric and analysis.

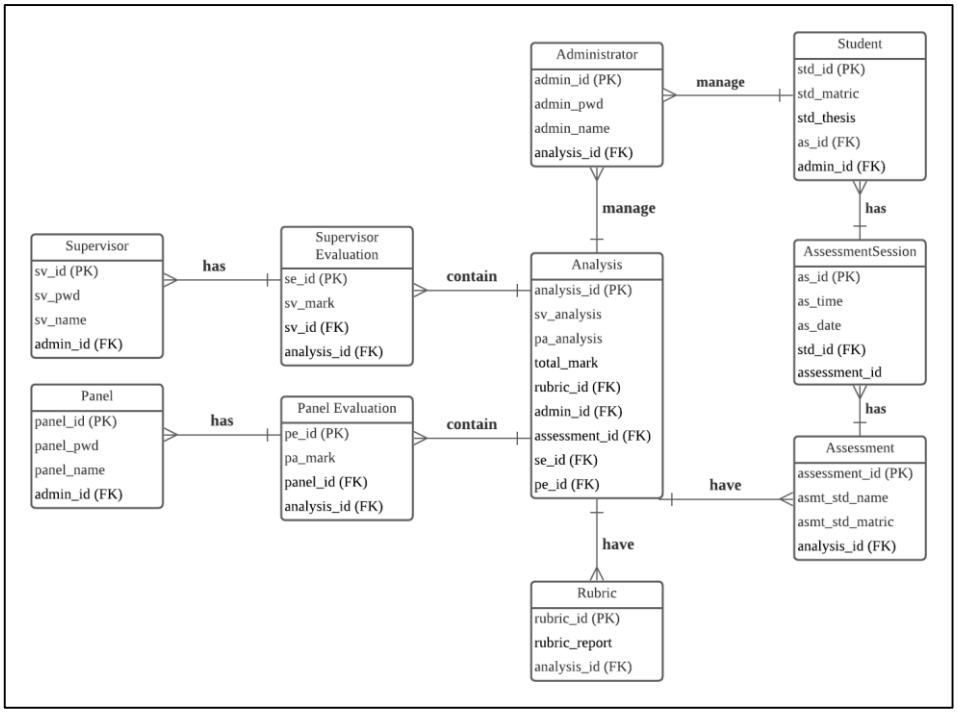
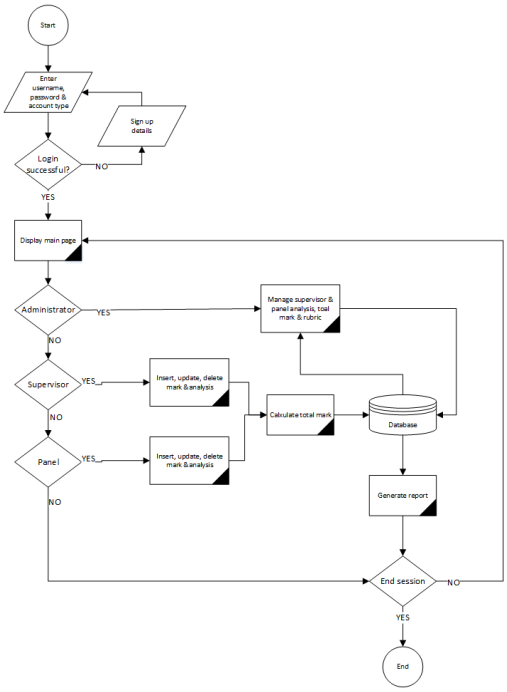


Figure 3.3: Entity relationship diagram

The system flowchart is the process flow when user use the system. Figure 3.4 shows the process flow of evaluation mark from the supervisor and panel, and management data for the administrator. Figure 3.5 shows the process flow for the administrator. Then, Figure 3.6 shows a process flow for supervisor and panel. Supervisors and panels need to follow this process to conduct assessments for students.



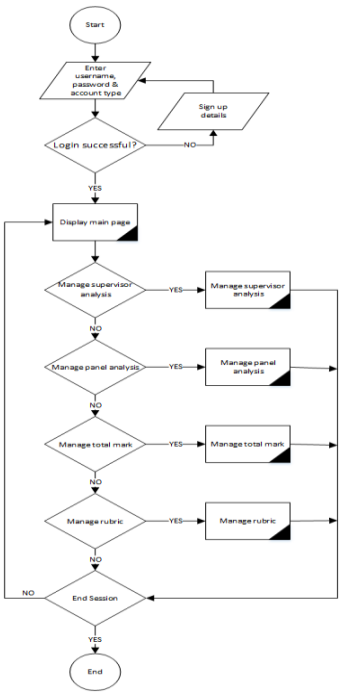


Figure 3.4 : Flowchart of assessment system for FSKTM postgraduate students

Figure 3.5 : Flowchart of administrator process flow

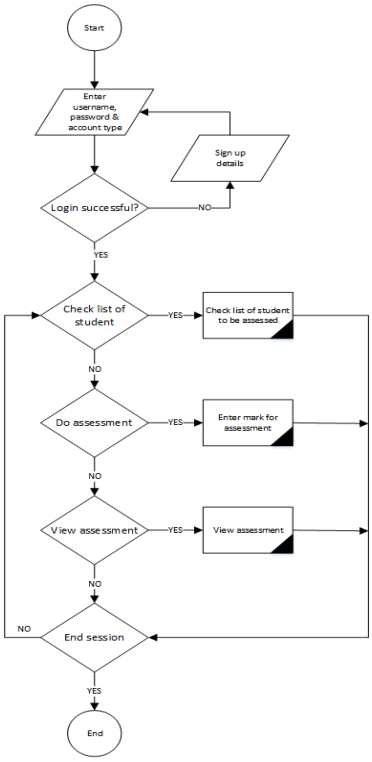


Figure 3.6: Flowchart of supervisor and panel process flow

Figure 3.7 shows the main page for the system. There is the page where the user will see first before access the system. For the main page, there is a sign-up button for first user and sign in button for user who has an account.

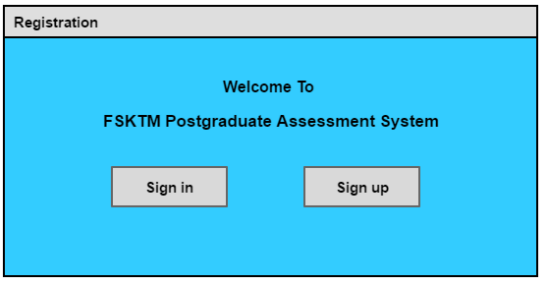


Figure 3.7 : Main page

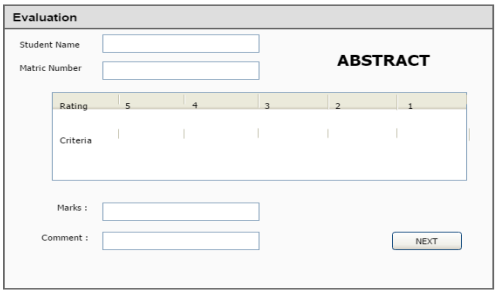


Figure 3.8 : Evaluation page for supervisor and panel

Figure 3.8 shows the evaluation page for supervisor and panel. In this page, the student name, matric number and the first part of thesis will be appearing. Supervisor and panel need to fill the marks and comment on the text box. Then, supervisor and panel need to click 'NEXT' to continues the evaluation for other parts of thesis.

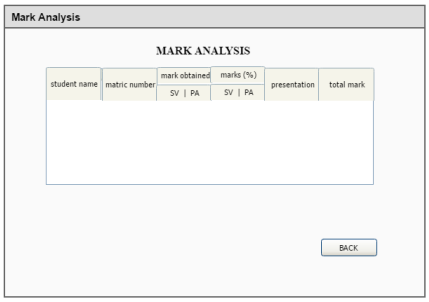


Figure 3.9 : Mark Analysis Page

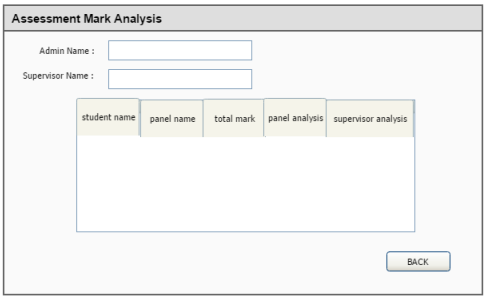


Figure 3.10 : Assessment Mark Analysis Page

Figure 3.9 shows the page of mark analysis. This page is to show all the current marks from supervisor and panel for each student and also the total mark will automatically calculate. Figure 3.10 shows the page of assessment mark analysis for administrator. In this page, administrator can manage supervisor name, student name, panel name, total mark, panel analysis and supervisor analysis.

4. System Implementation and Testing

The section describes the system implementation process and the system testing for the Assessment System for FSKTM Postgraduate Students.

4.1 Implementation

System implementation involves all processes that include coding, system development, and programming activities to create the developed modules.

4.1.1 Login module

Figure 4.1 shows the interface for login into the system. This login process includes four categories of users which is administrators, supervisors, panels and students. Users are asked to enter a username and password. If successful, the main screen is displayed. Figure 4.2 shows the code.

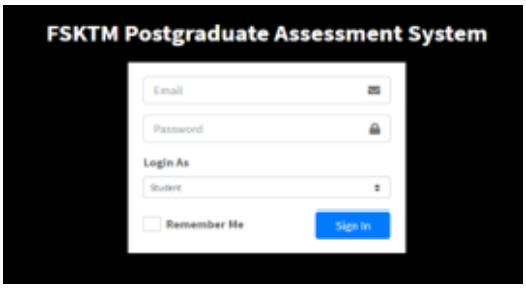


Figure 4.1 : Login page

```
function login(){
    extract($_POST);
    $type = array("student","panel","supervisor","admin");
        $qry = $this->db->query("SELECT *,concat(firstname,' ',lastname) as name FROM {$type
            "' ");
    if($qry->num_rows > 0){
        foreach ($qry->fetch_array() as $key => $value) {
            if($key != 'password' && !is_numeric($key))
                $_SESSION['login_'.$key] = $value;
        }
            $_SESSION['login_type'] = $login;
        return 1;
    }else{
        return 2;
    }
}
function logout(){
    session_destroy();
    foreach ($_SESSION as $key => $value) {
        unset($_SESSION[$key]);
    }
    header("location:login.php");
}
```

Figure 4.2 : Program code for login

4.1.2 Dashboard Interface

Figure 4.3 shows the main page for administrator. There are several functions which is the administrator can monitor the list of administrators, supervisors, panels, students and also student's task, assessment from panel and supervisor and full student result. The same homepage layout is also made for panels, supervisors and students. However, the function is slightly different based on the role of the user.

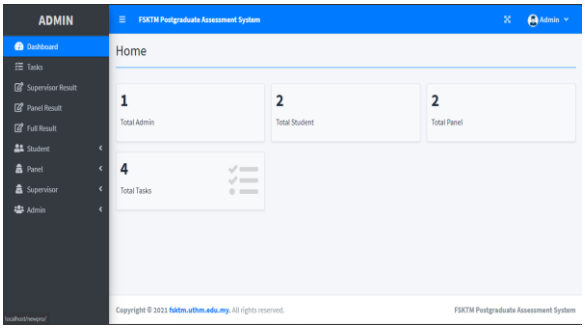


Figure 4.3 : Administrator dashboard

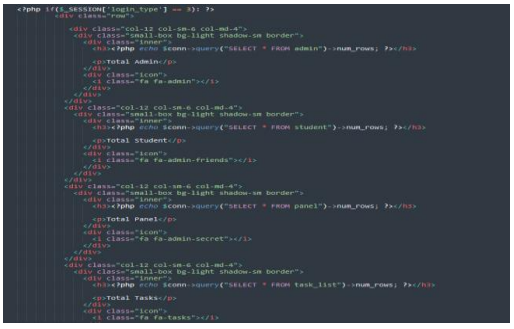


Figure 4.4: Program code

There are two functions for supervisor and panel page which is the supervisor and panel can monitor the student's task and assessment for supervisor and panel give an evaluation for the student's task. Then, Figure 4.5 shows the main page for student. There is a function for student sent their task which is report for evaluation. Figure 4.6 shows the code.

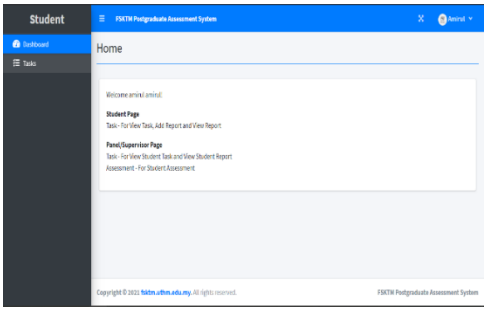


Figure 4.5 : Student's main page

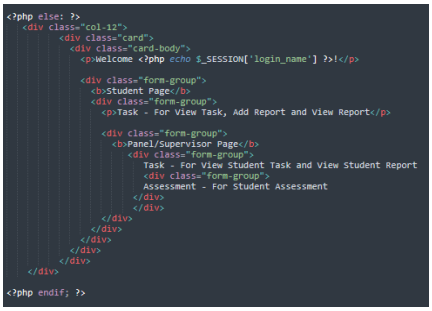


Figure 4.6: Program code

4.1.3 Registration Module

Figure 4.7 shows the example of registration page module for administrator. If the users do not have the account, administrator need to register them first before they can use the system. Figure 4.8 shows the code. The same concept of interface layout is used for student, panel and supervisor administration.

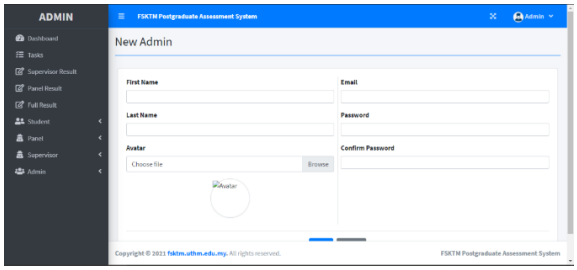


Figure 4.7 : Registration page

Figure 4.8: Program code for registration

4.1.4 Evaluation and Analysis Module (Supervisor and Panel)

Figure 4.9 and Figure 4.10 show the interface of evaluation and analysis module for supervisor and panel. If supervisor and panel want to give the marks or analysis about the assessment, they need to click 'assessment' at the sidebar to access the assessment form for evaluate student's task. The code segment for module is shown in Figure 4.11 and 4.12.

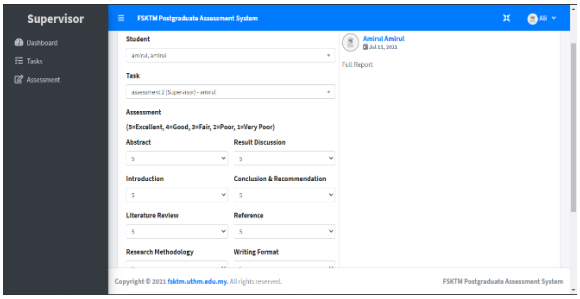


Figure 4.9 : Evaluation and analysis module for supervisor

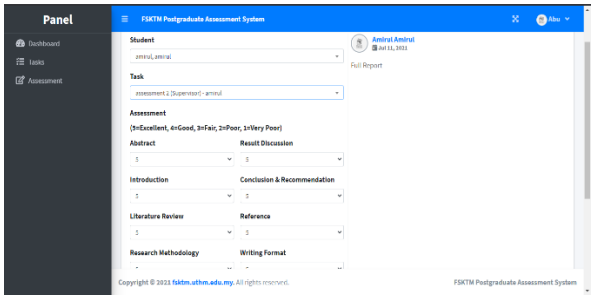
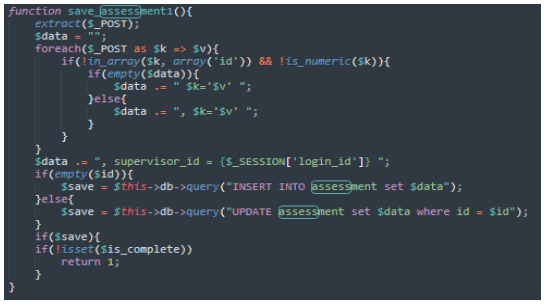


Figure 4.10 : Evaluation and analysis module for panel



```
function save_assessment1(){
    extract($_POST);
    $data = "";
    foreach($_POST as $k => $v){
        if(!in_array($k, array('id')) && !is_numeric($k)){
            if(empty($data)){
                $data .= " $k='$v' ";
            }else{
                $data .= ", $k='$v' ";
            }
        }
    }
    $data .= ", supervisor_id = {$_SESSION['login_id']} ";
    if(empty($id)){
        $save = $this->db->query("INSERT INTO assessment set $data");
    }else{
        $save = $this->db->query("UPDATE assessment set $data where id = $id");
    }
    if($save){
    if(!isset($is_complete))
        return 1;
    }
}
```

Figure 4.11 : Program code for supervisor evaluation and analysis module

```
function save_assessment(){
    extract($_POST);
    $data = "";
    foreach($_POST as $k => $v){
        if(!in_array($k, array('id')) && !is_numeric($k)){
            if(empty($data)){
                $data .= " $k='$v' ";
            }else{
                $data .= ", $k='$v' ";
            }
        }
    }
    $data .= ", panel_id = {$_SESSION['login_id']} ";
    if(empty($id)){
        $save = $this->db->query("INSERT INTO assessment set $data");
    }else{
        $save = $this->db->query("UPDATE assessment set $data where id = $id");
    }
    if($save){
    if(!isset($is_complete))
        return 1;
    }
}
```

Figure 4.12 : Program code for panel evaluation and analysis module

4.1.5 Supervisor and Panel Assignment Module

Figure 4.13 shows the interface of assignment module. Only administrator can assign the student to the supervisor and panel. If the administrator wants to make the assignment, they need to choose supervisor and panel while filling in student information. Program code is shown in Figure 4.14.

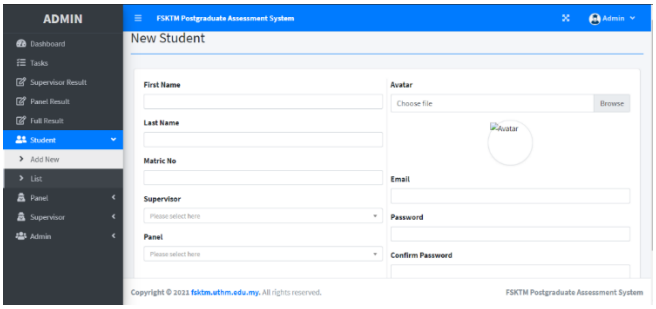


Figure 4.13 : Interface of assign student to supervisor and panel

Figure 4.14 : Program code for assignment module

4.1.6 Data Management Module (Administrator)

There are several function of data management module for administrator. Figure 4.15 show the functions for administrator to add, view, edit and delete the administrator, supervisor, panel and student. The code segment is shown in Figure 4.16.

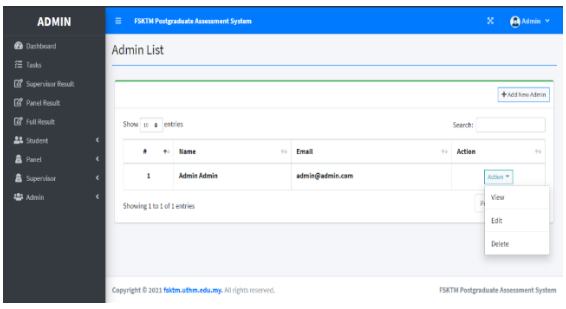


Figure 4.15 : Interface for manage administrator profile

Figure 4.16 : Program code for update information

Figure 4.17 shows that administrator also can assign task to the student for submit their report to supervisor and panel for evaluation. The code segment is in Figure 4.18.

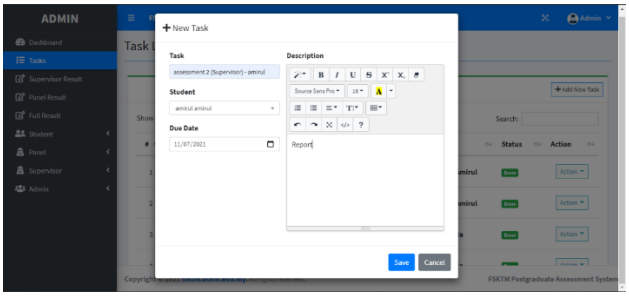


Figure 4.17 : Interface for task assignment

```
function save_task(){
    extract($_POST);
    $data = "";
    foreach($_POST as $k => $v){
        if(!is_array($k, array('id')) && !is_numeric($k)){
            if($k == 'description')
                $v = htmlentities(str_replace("'","&#x2019;",$v));
            if(empty($data)){
                $data .= " $k='$v' ";
            }else{
                $data .= ", $k='$v' ";
            }
        }
    }
    if(empty($id)){
        $save = $this->db->query("INSERT INTO task_list set $data");
    }else{
        $save = $this->db->query("UPDATE task_list set $data where id = $id");
    }
    if($save){
        return 1;
    }
}
function delete_task(){
    extract($_POST);
    $delete = $this->db->query("DELETE FROM task_list where id = $id");
    if($delete){
        return 1;
    }
}
```

Figure 4.18 : Program code for task assignment

Then, administrator also can view supervisor and panel mark result for assessment of student's task shows in Figure 4.19 and Figure 4.20. The code segment in Figure 4.21.

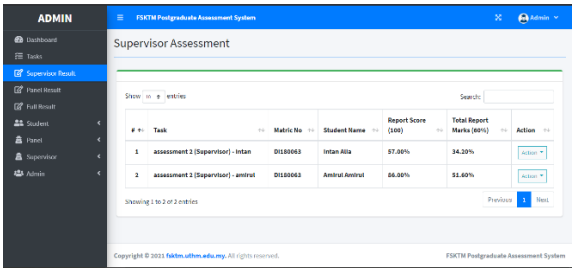


Figure 4.19 : Evaluation page

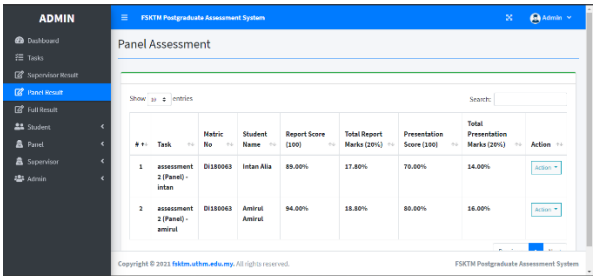


Figure 4.20 : Panel evaluation score results

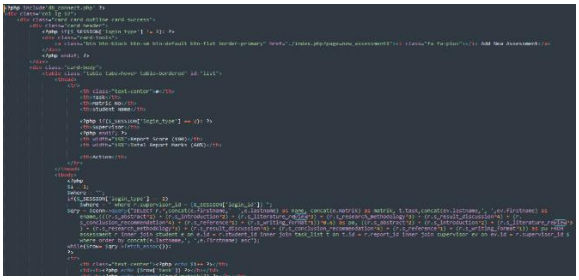


Figure 4.21 : Program code

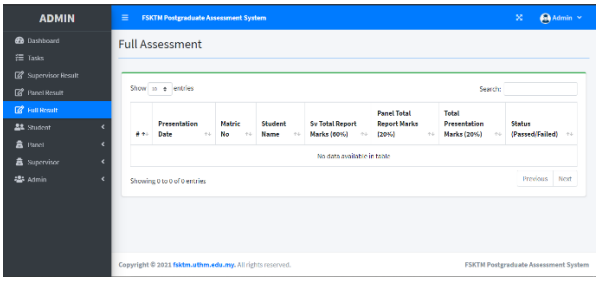


Figure 4.22 : Full assessment result

Finally, Figure 4.22 shows the full result for the assessment to student's task and administrator can see either the student passed or failed. The status generates automatically. The code segment is as in Figure 4.23.

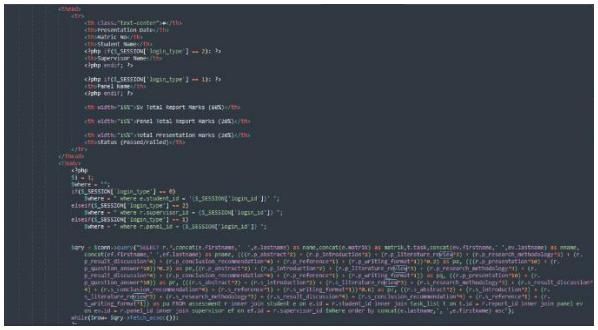


Figure 4.23: Program code for view full mark result.

4.1.7 Report Management Module

Figure 4.24 shows the summary report of assessment from supervisor and panel. Administrator, supervisor and panel can view the assessment report that supervisor and panel make to evaluate student's task. The code segment is shown in Figure 4.25.

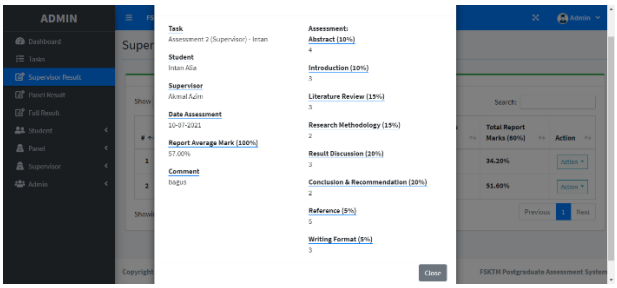


Figure 4.24 : Assessment report

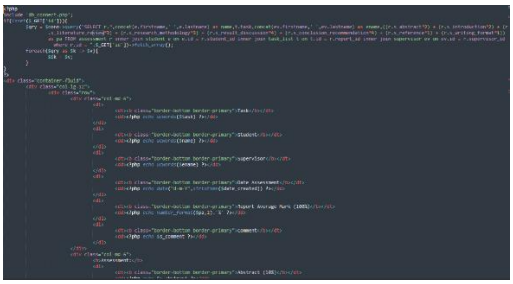


Figure 4.25 : Program code for assessment report

4.2 Testing

The testing phase is carried out to check the extent to which the effectiveness of this system works in accordance to the system requirements required by the postgraduate management unit. This testing aims to ensure that the modules on the system function properly without errors. This test case involves all the modules available in the Assessment System for FSKTM Postgraduate Students which is the Registration Module, Evaluation and Analysis Module, Panel Assignment Module, Data Management Module and lastly, Report Management Module. Table 5 includes a list of tests performed for the login process by users. There are seven types of testing performed. The purpose of this test is to check if the registration session is totally function or not.

Table 5: Functional testing registration module

No	Test Cases	Description	Results
TEST_100		User Registration	Pass/Fail
1.	TEST_100_002	The system should show error when duplicate username is entered.	Passed
2.	TEST_100_003	The system should display an error message when empty field found.	Passed
3.	TEST_100_004	The system should allow the user to login into the system using username and password that has been registered.	Passed
4.	TEST_100_005	The system should allow user to input valid username and password to logged in as user.	Passed
5.	TEST_100_006	The system should alert the user for invalid input.	Passed
6.	TEST_100_007	The system should redirect to dashboard once login successful.	Passed

Table 6: Functional testing evaluation and analysis module

No	Test Cases	Description	Results
TEST_200		Evaluation and Analysis	Pass/Fail

1.	TEST_200_001	The system should allow the administrator, panel and supervisor to add the assessment.	Passed
2.	TEST_200_002	The system should allow the administrator, panel and supervisor to update the assessment.	Passed
3.	TEST_200_003	The system should allow the administrator, panel and supervisor to delete the assessment.	Passed
4.	TEST_200_004	The system should allow the administrator, panel and supervisor to search the assessment.	Passed
5.	TEST_200_005	The system should calculate the overall marks for each assessment.	Passed
6.	TEST_200_006	The system should error when empty field found.	Passed

Table 6 shows the list of tests performed for the evaluation and analysis module. There were six tests performed. The purpose of this testing is to test the effectiveness in evaluation and analysis for the assessment into the system.

Table 7: Functional supervisor and panel assignment module

No	Test Cases	Description	Results
TEST_300		Panel Assign	Pass/Fail
1.	TEST_300_001	The system should allow the panel and supervisor to add the students.	Passed
2.	TEST_300_002	The system should allow the panel and supervisor to update the students.	Passed
3.	TEST_300_003	The system should allow the panel and supervisor to delete the students.	Passed
4.	TEST_300_004	The system should allow the panel and supervisor to search the students.	Passed
5.	TEST_300_005	The system should allow the panel and supervisor to assign the assessment for the students.	Passed

Table 7 shows the list of tests conducted for the panel assignment module. There are five types of testing performed. The purpose of this testing is to test the effectiveness in add, update, delete and assign student to supervisor and panel in the system.

Table 8: Functional testing data management module

No	Test Cases	Description	Results
TEST_400		Categories and products	Pass/Fail
1.	TEST_400_001	The system should allow the administrator to add marks.	Passed

2.	TEST_400_002	The system should allow the administrator to update marks.	Passed
3.	TEST_400_003	The system should allow the administrator to delete marks.	Passed
4.	TEST_400_004	The system should allow the administrator to search marks.	Passed
5.	TEST_400_005	The system should allow the administrator to add analysis.	Passed
6.	TEST_400_006	The system should allow the administrator to update analysis.	Passed
7.	TEST_400_007	The system should allow the administrator to delete analysis.	Passed
8.	TEST_400_008	The system should allow the administrator to search analysis.	Passed

Table 8: (cont)

No	Test Cases	Description	Results
9.	TEST_400_009	The system should allow the administrator to add panel and supervisor information.	Passed
10.	TEST_400_010	The system should allow the administrator to update panel and supervisor information.	Passed
11.	TEST_400_011	The system should allow the administrator to delete panel and supervisor information.	Passed
12.	TEST_400_012	The system should allow the administrator to search panel and supervisor information.	Passed
13.	TEST_400_013	The system should allow the administrator to add assessment rubric.	Passed
14.	TEST_400_014	The system should allow the administrator to update assessment rubric.	Passed
15.	TEST_400_015	The system should allow the administrator to delete assessment rubric.	Passed
16.	TEST_400_016	The system should allow the administrator to search assessment rubric.	Passed

Table 8 shows the list of tests conducted for the data management module. There are sixteen types of testing performed. The purpose of this testing is to test the effectiveness in add, update, delete the marks, analysis, panel details, supervisor details and student details in the system. Table 9 shows the list of tests for report management modules. There is one type of testing performed. The purpose of this testing is to test the effectiveness in the report management process.

Table 9: Functional Testing Report Management Module

No	Test Cases	Description	Results
TEST_500		Generate Report	Pass/Fail
1.	TEST_500_001	The system should allow the panel and supervisor to generate statistical report.	Passed

5. Conclusion

The Assessment System for Postgraduate Students FSKTM is an assessment system that can record marks systematically and calculate the total marks automatically. the evaluation process involves two panelists and a supervisor who evaluate the student's thesis draft report. The system is built to improve the use of printed forms on existing processes.

Acknowledgment

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support and encouragement.

References

[1] Mimi M. Recker, "The existing sytem of evaluation system," *An Interactive Student Evaluation System*, 2020.

[2] Hartshorn, R., Lambert, R., Algozzine, B., McAlpin, V., Algozzine, M., Norris, L., "A Comparison of Web-Based and Paper-Based Course Evaluations at UNC Charlotte," *The Center for Educational Measurement and Evaluation and the Center for Teaching and Learning, 2011*.

[3] Bridgeman, B. and Schaeffer, G., "A comparison of gender differences on paper-and-pencil and computer-adaptive versions of the Graduate Record Examination," *Paper presented at the annual meeting of the American Educational Research Association, San Francisco, California*, 1995.

[4] Maryam, A., Alireza, S., Ahmad Reza, N., & Azizollah, A, "The Examination of Strength and Weakness of Online Evaluation of Faculty Members Teaching by Students in the University of Isfahan," *Higer Education Studies*, pp. 38-43, 2012.

[5] Judy Donovan, Ed.D., Cythia E. Mader, Ph.D., John Shinsky, Ph.D, "Constructive student feedback: Online vs. traditional course evaluations," *Journal of Interactive Online Learning*, pp. 283-296, 2006.

[6] Bowles, C., 2010, "Computer Software suite101". Retrieved 15 April, 2012, from Advantages and Disadvantages of Open-Source Operating Systems: https://suite101.cohttp://chris-bowles.suite101.com/is-open-source-a-viable-alternative-for-the-average-user a272314

[7] CampCodes, 2020. Retrieved 21 December 2020, from Online Faculty Evaluation System using PHP/MySQLi: https://www.campcodes.com/projects/php/5807/online-faculty-evaluation-system-using-php-mysqli/