

Development of a Web-Based System for PSM Supervision

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Abstract

PSM supervision system is a web-based system that was developed to manage PSM supervision. It allows the student to select their potential supervisor from the system and can check the availability of the supervisor. The supervisor can track the progress of the student with the report submission features in the system. Waterfall model was used for the development of the system. This system was developed with technologies such as HTML, CSS, JavaScript, and PHP code which was written using Visual Studio Code. System testing which are test plans for each module and user acceptance testing (UAT) has been conducted for the system to ensure the system meets its requirements. Based on the testing, the feedbacks from the target user mostly shown that they satisfied with the functionality and interface of the system. In future, the system should added with more advanced features such as real-time chat between student and supervisor functionality.

1. Introduction

A Final Year Project (FYP) or PSM is one of the requirements for each undergraduate student in the university that needs to be done throughout the semester of the study in order to graduate [1]. Supervision plays an important role in thesis and research tasks to ensure the successful completion of the study [2]. PSM Supervision system is a system that the university should have to manage all the matters related to the supervision process between students and their supervisors. It includes selecting a supervisor, which is the first task in PSM implementation. Effective supervision will provide additional support to the students in facing challenges in their project implementation and in completing their system [3]. This system will allow the students to select the supervisor and apply for his or her supervision. The students can view the number of supervises for the supervisor and can apply for that supervisor only if the supervisor is available. The system will include features that allow students to submit their progress reports, which will help to solve the issue of supervisors not being able to monitor the students' work progress.

The objective of the project is to analyze and design a PSM supervision system for FSKTM UTHM. Besides that, it also aims to develop a web-based system for PSM supervision to manage the supervision matters on PSM that include students and supervisors. The last objective of this project is to evaluate and test the developed web-based system by target users. The web-based PSM Supervision system is designed for the use of undergraduate students who take the PSM 1 and PSM 2 courses and for lecturers in FSKTM for PSM course. The PSM coordinator for FSKTM is also involved in this system as administrator of the system. The system was developed and designed using the implementation of PHP, HTML, JavaScript, and CSS. All of these will be written using the Visual Studio Code. The database used in this project would be MySQL where it is managed by using phpMyAdmin. Table 1 shows the module included in the PSM Supervision system.

Table 1: *Module of the system*

Module	Explanation
User registration	Administrator can register students and supervisors
User login	Student, supervisor, and admin can log into system
Select supervisor	Student can select supervisor
Form submission	Student can submit form related to PSM
Progress report submission	Student can submit progress report
Generate report	Administrator can generate report
Notification	Users can receive notification
Book meeting	Student can book meeting with supervisor
Set due date	Administrator can set due date for report submission

2. Related Work

This section will discuss the work related to the PSM Supervision System. This discussion will include an analysis of the current system and a study of the existing system.

2.1 Current System Analysis

An analysis has been conducted on the current system used by FSKTM to manage PSM supervision. This analysis is important to improve the current system used by FSKTM to manage the supervision process between the students and the supervisors. With detailed information on how the current system works and the flow of it, enhancements and improvements can be made to the system. The analysis includes the system that FSKTM currently uses to manage all things related to PSM supervision. WhatsApp platform and eProject online are two systems that are currently being used by FSKTM to handle the PSM supervision.

WhatsApp Platform is one of the platforms used by FSKTM to manage PSM supervision. WhatsApp is a platform used for communication via text messages, images, and file sharing which makes communication easier and faster [4]. It is the most used platform by both students and supervisors. The students can ask the supervisor directly through the WhatsApp platform to request for their supervision. All discussion for the supervisor to accept the request is done through WhatsApp. This includes the proposed title by students, area of interest, skills that students have, and other matters related to the project. All announcements or reminders to be given to students will use WhatsApp as a platform for that purpose. Aside from that, supervisors also use WhatsApp to remind students to update the progress of their work for PSM.

The eProject Online is a system available on SMAP Online. All undergraduate students who take PSM courses can use this eProject Online. They can use the system once they have registered for the PSM course during the course registration. Students are required to fill in the details of their project, including project title, objectives, project scope, synopsis of the project, and expectations from the project. Students need to update their progress work and meeting discussion with the supervisor weekly.

2.2 Study on Existing System

A study on existing systems is a study that has been conducted on some existing systems with similar functionality to the proposed system. This analysis is to help in better understanding of the proposed system in terms of its functionalities. Three existing systems have been chosen for the purpose of this study. They are PSM2 Online [5], Online Project Evaluation and Supervision System (oPENS) [6], and Sistem Pengurusan Projek Akhir [7]. The comparison of the proposed system with the existing systems will be discussed in this section to compare its functionalities and features. Table 2 shows the comparison between the PSM Supervision System with the existing systems.

Table 2 Comparison with Existing System

System Features	PSM 2 Online	oPENS	Sistem Pengurusan Projek Akhir	PSM Supervision System
Select supervisor	×	×	×	√
Monitor progress	√	√	√	√
Form submission	×	√	×	√

Table 2 Comparison with Existing System (cont)

Comments on report	√	√	√	√
Book meetings	×	×	×	√
Get notification	×	√	×	√
List of supervisees	√	√	√	√
Notice board	×	√	×	√
List of all supervisors	√	×	×	√
Generate report	×	√	×	√
Evaluation	√	√	×	√

3. Methodology

In this project, the methodology that is used is the Waterfall Model. The details of the methodology, which includes the phases involved in it, which are the planning phase, analysis phase, design phase, implementation phase, testing, and deployment, will be discussed along with the activities involved in each phase. Besides that, the workflow of the system development will also be discussed in this chapter.

3.1 Waterfall Model

To develop a system, it is crucial to follow systematic procedures and processes in the development of the software. It is called the software development life cycle (SDLC) model [8]. In this SDLC model, there are various software development methodologies, including Agile, Scrum, and Waterfall models [9]. Figure 1 shows the phases involved in the Waterfall model.

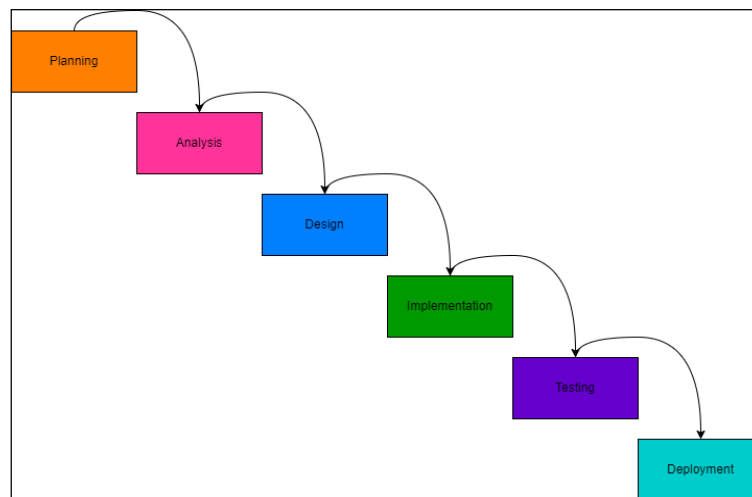


Figure 1 Phases in Waterfall Model

The planning phase for this project starts with the determination of the title of the project. A meeting with the supervisor is conducted through Google Meet to discuss the details of the project that is going to be developed. The proposal is then prepared, which includes the problem statement, objectives of the project, the scope of the project, and project planning. A Gantt chart is prepared to indicate the project planning. The Gantt chart is shown in Appendix A.

Next, in the analysis phase, the analysis and requirements gathering are conducted. In this phase, the analysis and gathering of requirements is conducted. To gather the requirements required for the implementation of the project, an interview has been conducted to understand the exact implementation of the PSM. Two interviews have been conducted with the chief coordinator of the PSM, Dr Radiah Binti Mohamad, and the coordinator for the BIW program, Dr. Norfaradilla Binti Wahid. A survey has also been conducted and distributed to the lecturers of FSKTM to identify their needs in PSM supervision.

The next phase is the design phase. The design is basically the overall architecture of what the user can do through the system. Drawing the overall flow of the system, which are the flowcharts of the system, is built to create a view of the processes held in the system. Besides that, all diagrams related to the structure of the system have also been developed. These diagrams include the context diagram (CD), data flow diagram

(DFD), and entity relationship diagram (ERD). In addition, the interface design of the system also takes place in this design phase.

The implementation phase would be the next phase of the model. This phase is a process of transforming the design into a fully functional system with the source code, including HTML code, CSS, and PHP [10]. All modules stated in the system design, which are to be developed in the PSM supervision system, are then started to be developed in real-world situations by using the skills and knowledge to write the codes and make them functional. The codes of the design are then added with some code to connect to the database.

The next phase is the testing phase. It is a crucial part of software development to ensure it works properly and meets the requirements of the user [11]. In this phase, all the functionalities and features of the system will be tested by the target user to ensure that they are functioning and working well. The system is then distributed to the target users to the system to conduct the testing of the system. In this case, it is the students, supervisors, and coordinator.

The last phase is the deployment phase. This is where the system is fully completed and ready to be used by end users. It is the phase of the final deliverable of the system. This indicates the end of the implementation of the system, which has gone through multiple phases to make it a functional system that can be used to ease real-world problems. The overall workflow of the development of the system is constructed. It is the summary of the activities in each phase in the Waterfall model, along with the output achieved at the end of the implementation of the phase. Table 3 shows the system development workflow for each phase of the project.

Table 3 System Development Workflow

Phase	Task	Output
Planning	<ul style="list-style-type: none"> <input type="checkbox"/> Proposed the project <input type="checkbox"/> Determine the project scope, objectives, project schedule <input type="checkbox"/> Do research on related topics to the system 	<ul style="list-style-type: none"> <input type="checkbox"/> Project proposal <input type="checkbox"/> Gantt chart
Analysis	<ul style="list-style-type: none"> <input type="checkbox"/> Study existing system <input type="checkbox"/> Conduct interview with coordinators of PSM <input type="checkbox"/> Conduct a survey to lecturers in FSKTM <input type="checkbox"/> Define hardware and software requirement 	<ul style="list-style-type: none"> <input type="checkbox"/> Comparison table <input type="checkbox"/> User requirements <input type="checkbox"/> Hardware and software requirement
Design	<ul style="list-style-type: none"> <input type="checkbox"/> Design interface <input type="checkbox"/> Design data flow <input type="checkbox"/> Design database 	<ul style="list-style-type: none"> <input type="checkbox"/> Wireframes <input type="checkbox"/> Flowchart <input type="checkbox"/> Database design <input type="checkbox"/> Context diagram (CD) <input type="checkbox"/> Data flow diagram (DFD) <input type="checkbox"/> Entity relationship diagram (ERD)
Implementation	<ul style="list-style-type: none"> <input type="checkbox"/> Write coding for each module <input type="checkbox"/> Execute codes <input type="checkbox"/> Connect to the database 	<ul style="list-style-type: none"> <input type="checkbox"/> Full system
Testing	<ul style="list-style-type: none"> <input type="checkbox"/> Conduct system testing <input type="checkbox"/> Distribute user acceptance test 	<ul style="list-style-type: none"> <input type="checkbox"/> User acceptance test <input type="checkbox"/> Result of testing
Deployment	<ul style="list-style-type: none"> <input type="checkbox"/> Finalize the design of the system <input type="checkbox"/> Deliver the system to the end user 	<ul style="list-style-type: none"> <input type="checkbox"/> Fully developed system

3.2 System Analysis and Design

This section will focus on the analysis and design of the PSM Supervision System. This section will discuss the diagrams involved in the design of the project. The diagrams include flowcharts, a context diagram, data flow diagrams, and an entity relationship diagram.

A context Diagram is a diagram that shows the connection between the system and external entities that are involved in the system [11]. This diagram helps in understanding the overview of the system, which involves the process flow in and out of the system. Figure 2 shows the context diagram of the system.

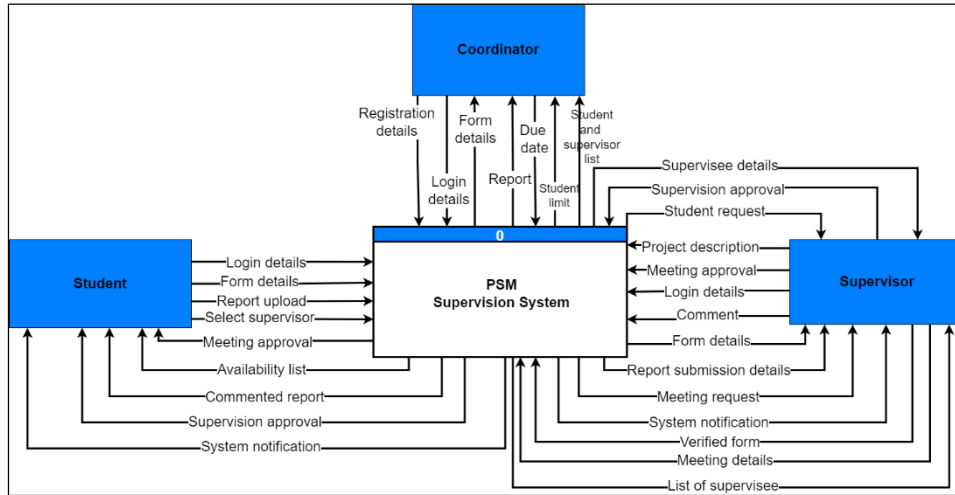


Figure 2 Context Diagram

A data flow diagram is a graphical diagram used to create, develop, and present the model of the system [12]. It contains four critical elements to be included, which are processes, data flows, data stores, and external entities [13]. The context diagram shows the whole processes involved in the system, while the data flow diagram will divide the processes into sub-processes within the system, which will be more detailed. Figure 3 shows the DFD level 0 of the proposed system.

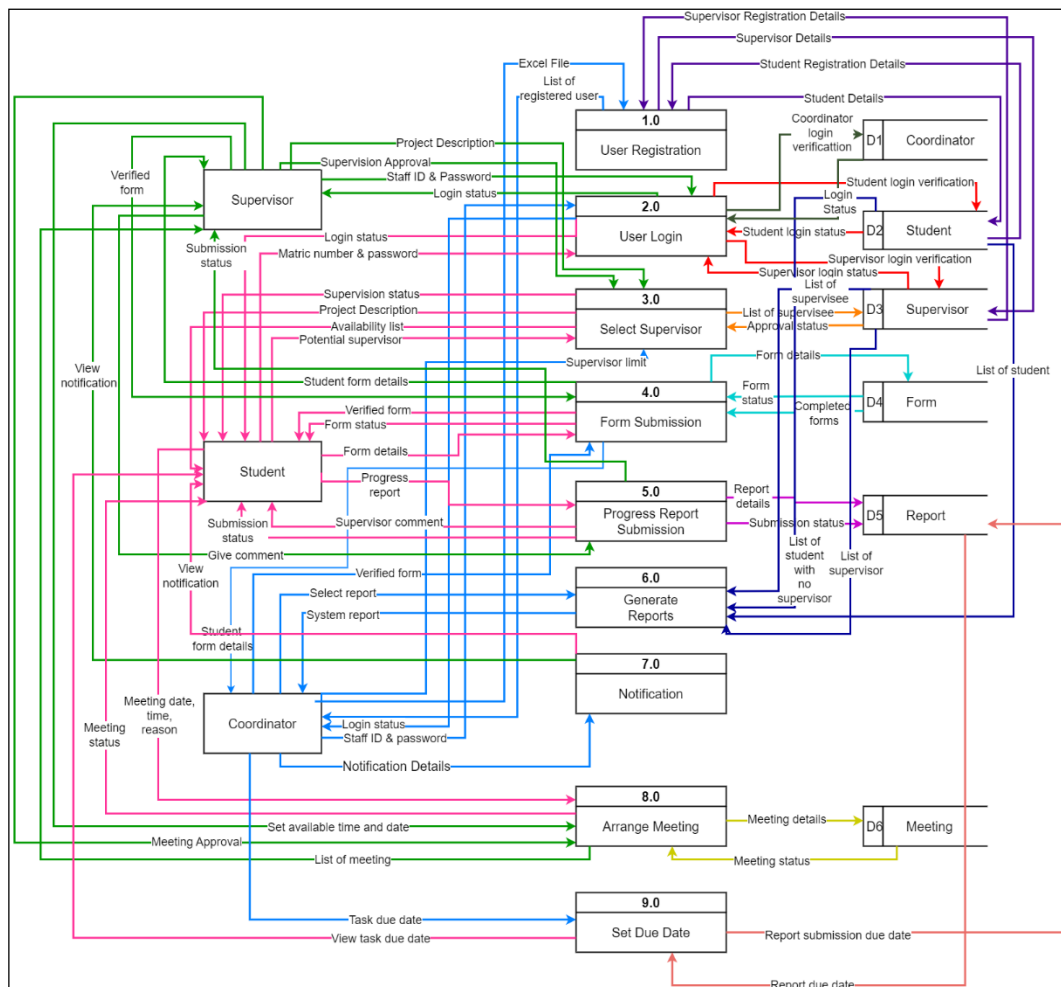


Figure 3 Data Flow Diagram (DFD) level 0 of the System

A flowchart is a diagram that shows the flow of a process in sequence. As for the system flowchart, it will show the process that will happen in the system starting from the user's login to the system. This flowchart will help in

better understanding the process that will occur in the system as it is represented in the form of a diagram with some specific symbols that represent different types of processes, which makes it easier to view and understand the whole process of the system. The flowcharts included in this section are for students, supervisors, and coordinator. Figure 4-6 show the flowcharts for all users in the system which include all the processes that they can do in the system.

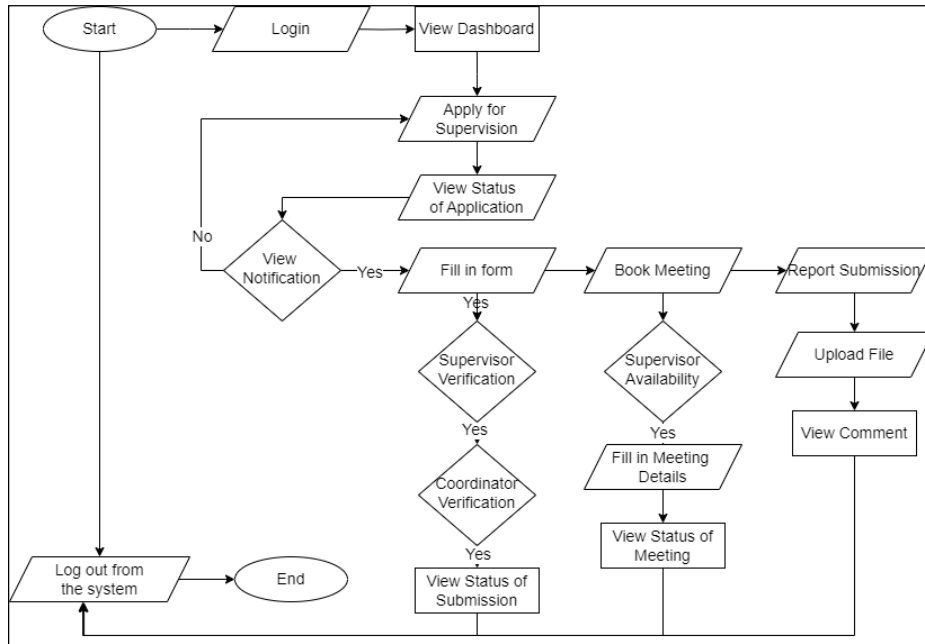


Figure 4 Flowchart of the System (Student)

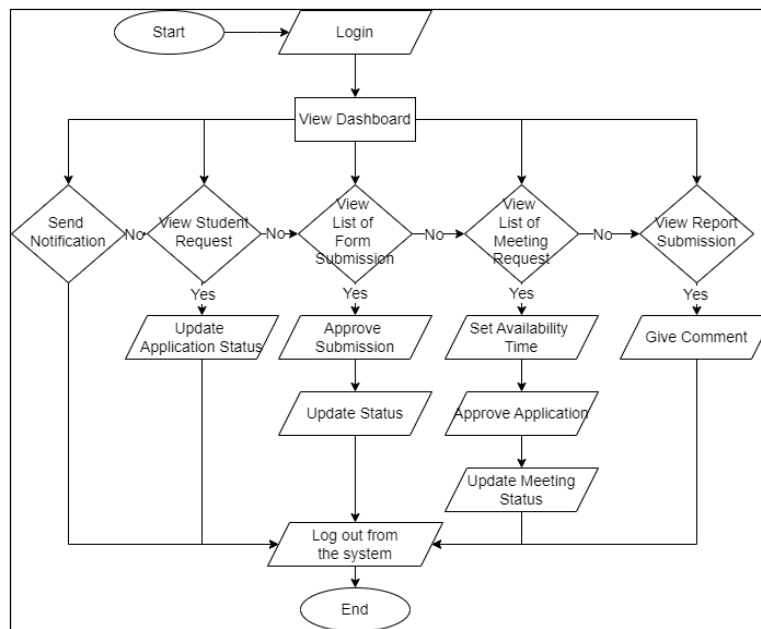


Figure 5 Flowchart of the System (Supervisor)

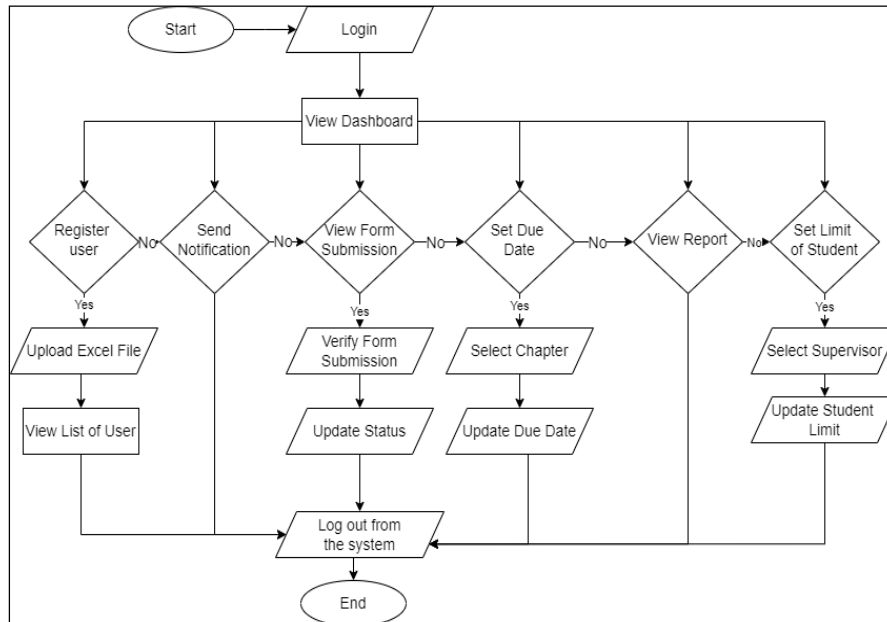


Figure 6 Flowchart of the System (Coordinator)

An entity relationship diagram (ERD) is a diagram of conceptual design in database modeling [14]. There are three key points in constructing the ERD, which are the entity, attribute, and relationship [14]. In this section, a diagram of the ERD was constructed to show the model of the database, which consists of the elements to be in the database of the system. The Entity Relationship Diagram is presented in Appendix B of the paper.

Interface design is the wireframe of the system. This wireframe helps the developer draft the layout of the system [15]. The same design will be used in the development of the system, which includes the implementation of the coding. Figure 7 shows the interface design for user login and user registration of the system.

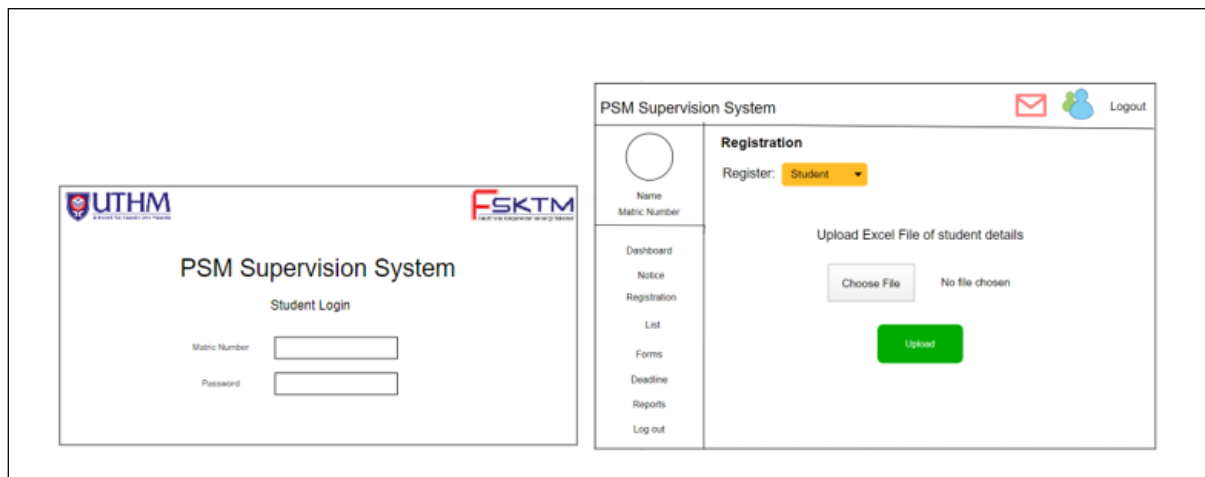


Figure 7 Interface Design for Login and Register

4. Implementation and Results

PSM supervision system is developed by using variety of technologies including HTML, CSS, JavaScript, AJAX, and PHP. The database that has been utilized in the system is the MySQL database where it can be handled using phpMyAdmin. It is divided into several modules and functionalities including user management module, select supervisor module, form submission module, book meeting module, and report submission module.

4.1 System Implementation

For the user management module, user registration and user login are the functions that are involved in this module. User registration is done by the administrator where the administrator can upload excel file which contains the data of the students and supervisors to register both students and supervisors. User login is where all users in the system can login by using their username and password. Figure 8 shows the login page of the

system and Figure 9 shows the registration page by the administrator. The users can log into the system with their username, password, and their role in the system. For user registration, the administrator of the system will register both students and supervisors to the system by uploading an excel file that contains the information of both.

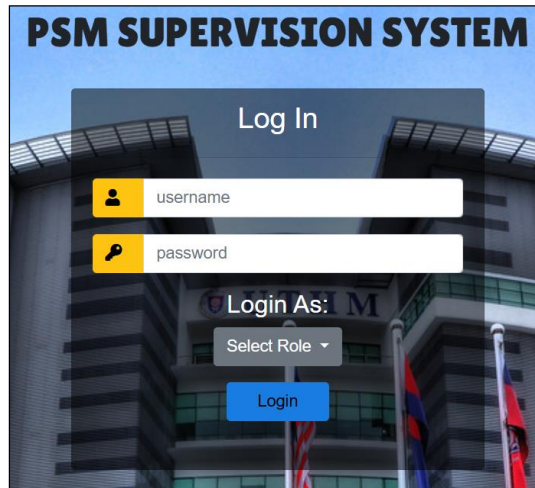


Figure 8 Login page of the system

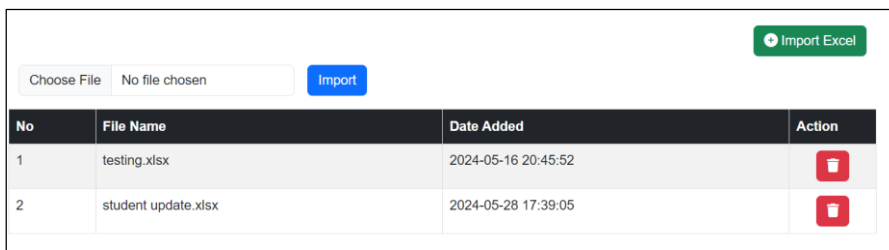


Figure 9 Registration page on the admin side

Figure 10 shows the page of the select supervisor which is for the student side. It allows the student to select their potential supervisor. The student can only select the supervisor from their respective program which aligns with the requirements of PSM implementation in FSKTM. The students are unable to select the supervisor who has reached the number of students under supervision. In addition, the page allows the student to view the project description from the supervisor which includes the type of project and area of interest. Figure 11 shows the page for supervisor side where the supervisor can view the list of requests from the students and can take appropriate action to the requests.

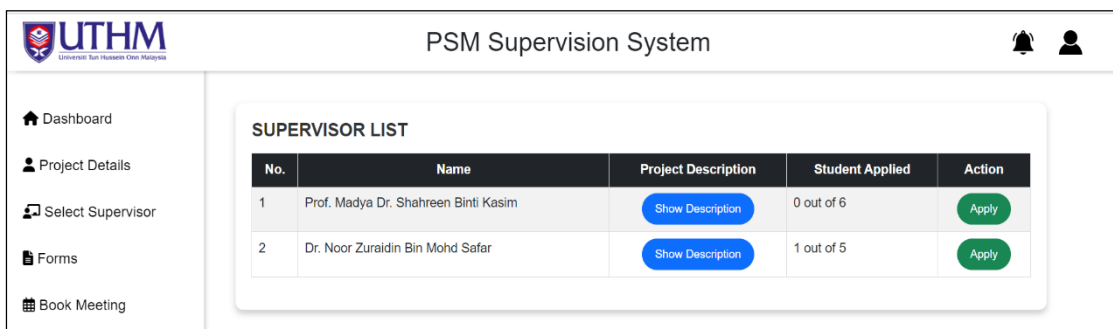


Figure 10 Select supervisor page for student

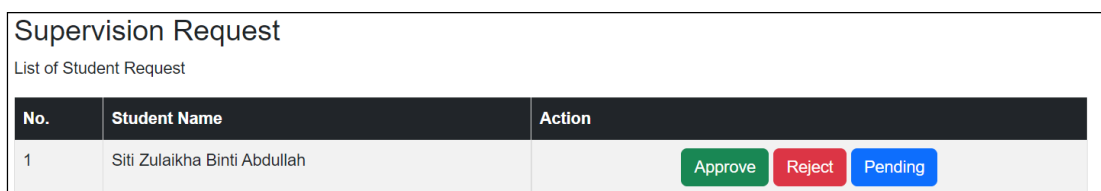


Figure 11 List of request for supervisor page

Figure 12 shows the page of the form submission by the student. The student can submit three forms in the system which are form A, B, and K. When the student successfully submits the form, the supervisor will receive the submission from the student. The supervisor can field in the form for their part and then the administrator will receive the approved form from the supervisor. The administrator can fill in the form for their part and the status of the form submission will be completed. The status of the submission will be displayed in the system. Figure 13 shows the fields that the student needs to fill in the form before they can submit the form.

No.	Form Name	Action	Status
1.	Form A	Open	Not Submitted
2.	Form B	Open	Not Submitted
3.	Form K	Open	Not Submitted

Figure 12 Form submission page

Form A (Supervisor Approval Form)

Note:

- Part A: To be filled by the student.
- Part B: To be filled by the student.
- Part C: To be filled by the supervisor.
- Part D: To be filled by the JK PSM section.

Part A: Student Profile

Name: Matric Number:

IC Number: Phone Number:

Program: Session/Semester:

Email: Year:

Figure 13 Field in form submission page

Figure 14 shows the page of the booking meeting with the supervisor. The name of the supervisor is displayed on the page to show the name of the supervisor that the student selected. The student can select available times and dates of the supervisor. The student can only select the time that the supervisor is available. The supervisor can set their availability date and time and the button of that specific date and time will be disabled in student page. Figure 15 shows the form to book the meeting where the student needs to add their reason for the meeting. Figure 16 shows the list of requests from the students and the supervisor can take appropriate action to that request.

Meeting

Supervisor:

Book Meeting

Day	Date	Time							
Sun	Jun 9	<input type="button" value="09:00"/>	<input type="button" value="09:30"/>	<input type="button" value="10:00"/>	<input type="button" value="10:30"/>	<input type="button" value="11:00"/>	<input type="button" value="11:30"/>	<input type="button" value="12:00"/>	<input type="button" value="12:30"/>
		<input type="button" value="14:00"/>	<input type="button" value="14:30"/>	<input type="button" value="15:00"/>	<input type="button" value="15:30"/>	<input type="button" value="16:00"/>	<input type="button" value="16:30"/>	<input type="button" value="17:00"/>	<input type="button" value="17:30"/>
Mon	Jun 10	<input type="button" value="09:00"/>	<input type="button" value="09:30"/>	<input type="button" value="10:00"/>	<input type="button" value="10:30"/>	<input type="button" value="11:00"/>	<input type="button" value="11:30"/>	<input type="button" value="12:00"/>	<input type="button" value="12:30"/>
		<input type="button" value="14:00"/>	<input type="button" value="14:30"/>	<input type="button" value="15:00"/>	<input type="button" value="15:30"/>	<input type="button" value="16:00"/>	<input type="button" value="16:30"/>	<input type="button" value="17:00"/>	<input type="button" value="17:30"/>

Figure 14 Book meeting submission page

Figure 15 Book meeting form page

List of student meeting request				
No	Matric Number	Student Name	Details	Action
1	AI210107	Wan Nor Fatini Binti Wan Fauzi	Details	Accept Reject

Figure 16 List of student meeting request page

Figure 17 shows the page of report submission by the student. The due date of the submission will be shown on the page for the reference of the student to submit the report. The supervisor can give their comments on student submissions by uploading comment files to the system. The student can view and download the comment from the supervisor.

Student Report Submission				
List of Progress Report				
No	Chapter	Action	Due Date	
1	Chapter 1	Upload	2024-06-13	
2	Chapter 2	Upload	2024-07-29	
3	Chapter 3	Upload	No due date	
4	Chapter 4	Upload	2024-06-29	
5	Chapter 5	Upload	No due date	
6	Chapter 6	Upload	No due date	

Figure 17 Report submission page

4.2 System Testing

System testing is one of the essential components in system development life cycle. The testing of the system has been conducted to ensure the system works as intended and as planned. A test plan and user acceptance testing are the tests that are involved in this system testing.

4.2.1 Test Plan

A test plan is a document that describes test strategy, estimation, and deliverables which are used to test a software. For the PSM Supervision system, test plans are conducted to test the expected and actual results of each of test cases to the system. Table 4-8 show the test plans that have been conducted to the system.

Table 4 Test plan for user management module

Function	Test Case	Expected Result	Actual Result
Register	Incorrect excel file type	An alert message is displayed indicate incorrect file format.	Pass
	Complete information of student and supervisor	All information inserted into the database successfully.	Pass
	Student and supervisor data already exist	Skip the insertion of the data into the system.	Pass
	Show data of the registered student and supervisor	Data of the student and supervisor shown in table in the system.	Pass
	Delete excel file	Excel file deleted and data from the file also deleted.	Pass
Login	Complete registration	Data displayed in the database successfully.	Pass
	Incorrect username and password	Error message is displayed.	Pass
	Incorrect role selected	Error message is displayed indicate no user found.	Pass
Change password	Click login button	Redirect to dashboard page based on role.	Pass
	Incorrect current password	Error message is displayed indicate that current password is not match with password in database.	Pass
	New password does not match with confirm password	Error message is displayed indicate that the confirm new password entered not match with new password.	Pass

Table 5 Test plan for select supervisor module

Function	Test Case	Expected Result	Actual Result
Select supervisor	Incorrect list of supervisors displayed	List of supervisors displayed are from the same program of the student.	Pass
	Apply button after reach limit	Apply button disabled when the supervisor reaches the limit of students.	Pass
	Correct project description	Correct project description displayed in the table for each supervisor.	Pass
	Incorrect students apply counter	The counter will increase only when the application approved by supervisor.	Pass
	Display application status	Status of application displayed based on supervisor action.	Pass
Student application request	Correct list of student request	List of student request for specific supervisor displayed correctly.	Pass
	Take action to request	The supervisor can take action accordingly to student request where they can accept or reject the application request from the students.	Pass
	Status updated correctly	Status updated correctly in student page according to the action from supervisor.	Pass

Table 6 Test plan for form submission module

Function	Test Case	Expected Result	Actual Result
Submit form	Incomplete data input	An alert message appears to indicate the field that need to be filled.	Pass
	Unable to send multiple times for a specific form	Button will be disable if the student already submits each of the form.	Pass
Approve form	Approve form submission	Supervisor can approve the form by fill in the form for their part.	Pass
Form field	Appropriate field included in the form	Form field to be fill align with the role of the users.	Pass
	Form submission status	Status of the form submission shown successfully based on approval from supervisor and coordinator	Pass

Table 7 Test plan for book meeting module

Function	Test Case	Expected Result	Actual Result
Book meeting	Select date and time correctly	Date and time automatically displayed when the button clicked.	Pass
	Supervisor availability date and time	Supervisor availability date and time displayed correctly on student page.	Pass
	Meeting status	Status of the meeting displayed correctly.	Pass
Meeting request	List of requests	All requests from student displayed correctly.	Pass
	Meeting approval	Supervisor can approve or reject student request.	Pass
	Button disability	Button disable when the supervisor confirms unavailability.	Pass

Table 8 Test plan for report submission module

Function	Test Case	Expected Result	Actual Result
Report submission	Upload report	Student can upload report successfully.	Pass
	View comment	Student can view and download the comment from supervisor.	Pass
	Delete submission	Submission deleted successfully.	Pass
	View due date	Due date displayed accordingly.	Pass
Submission list	View list of submission	All submissions by students under specific supervisor displayed.	Pass
	Download submission file	Submission files from students can be download.	Pass
	Upload comment file	Comment file uploaded successfully.	Pass

4.2.2 User Acceptance Testing

User acceptance testing (UAT) is another type of testing that can be done to test the system functionality. It is the last phase of testing the software development because after this testing is done, the developed system can be released to the target users. This testing is to help the developer of the system to test their system to the target user to ensure the usability and functionality of the developed system. The user acceptance testing has been conducted by using the Microsoft Form which includes the involvement of 15 users from FSKTM. Figure 18 and

Figure 19 show the results of the survey done using the Microsoft Form where two different perspectives are system interface and system functionality. Figure 18 shows the result of the survey for system interface and Figure 19 shows the result of the survey for system functionality.

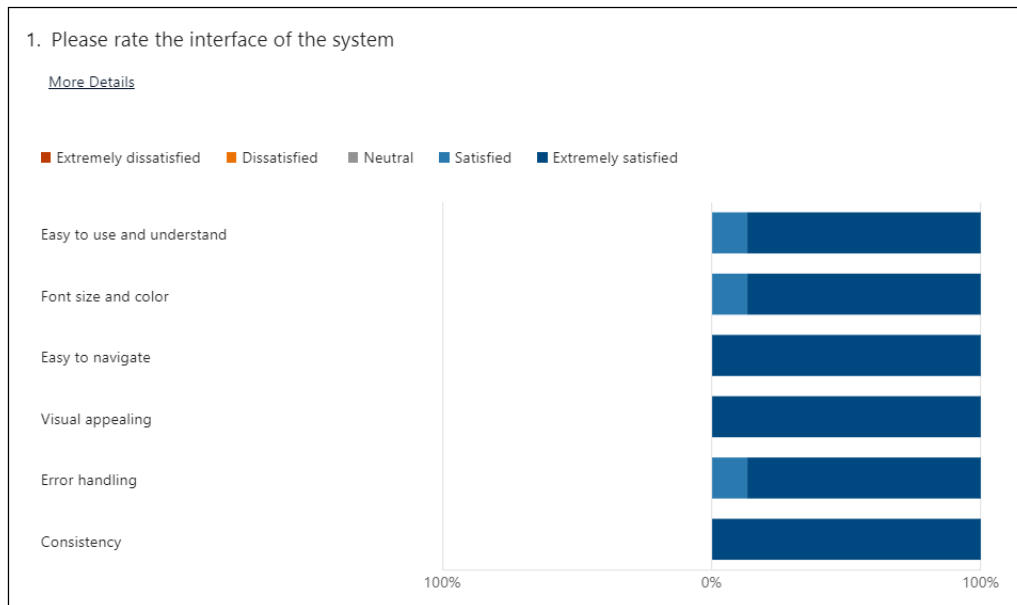


Figure 18 Result of user acceptance testing for system interface

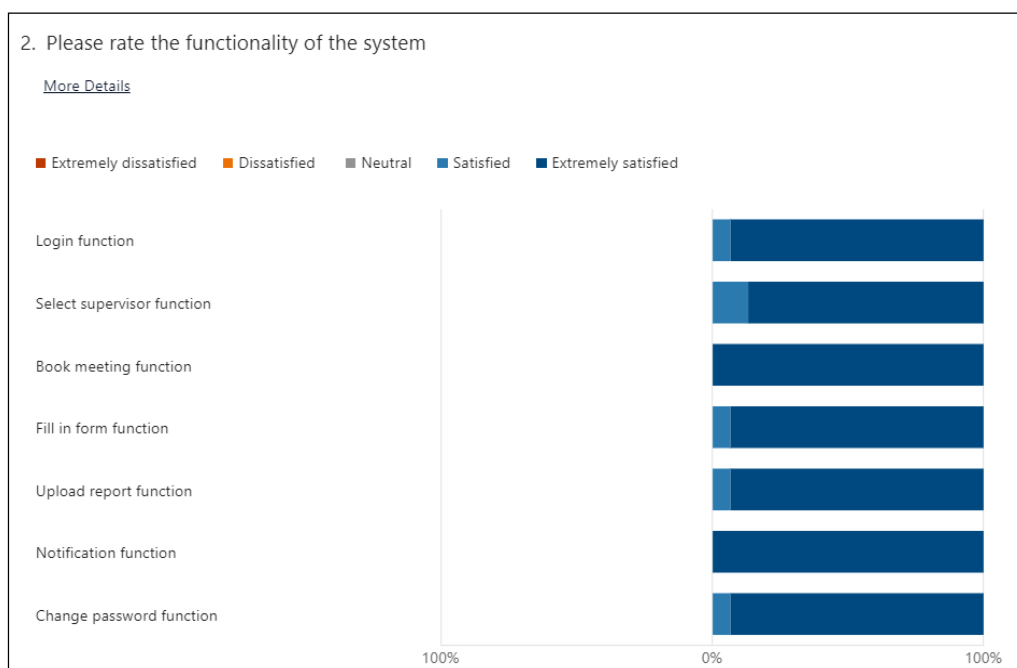


Figure 19 Result of user acceptance testing for system functionality

5. Conclusion

In conclusion, PSM supervision system has been successfully developed. The PSM students, supervisors, and the PSM coordinator in FSKTM can implement the system for PSM purposes. This system should allow the student to select the supervisor in an efficient and effective way. The problem faced by the supervisors in the implementation of the PSM, which is to monitor students' progress, can be solved with the development of this system as it has the features to track the progress of the student by report submission by chapter to the system. Besides that, it would be beneficial for the PSM coordinator to gather information on PSM students and supervisors which includes the list of students taking the PSM course, the list of supervisors, and a list of students who do not yet have a supervisor. In addition, the system should help students and supervisors to manage meetings between them as it provides the features of meeting booking, which means that the student can book a meeting to meet the supervisor

through the system. This makes it more convenient for the students as they do not need to approach the lecturer directly to ask for a meeting. The supervisor can set their availability time for the meeting and the student only can book a meeting on the day and date the supervisor is available. Despite the numerous advantages of the system, it exhibits certain limitations. These limitations include adaptability of the system by different universities and faculties. This is because the PSM Supervision system was currently developed and designed for FSKTM of UTHM use only whereas if other parties want to adopt the system for their organization, it would be challenging to adapt with the current workflow of the system. The other limitation of the system is to ensure the sensitive data of the students and supervisors are protected as it involves a large number of data being stored in the database of the system. The last limitation of the system is to handle large number of data being inserted into the database of the system where if the data is not being handled properly, it will cause the system to be compromised. In the future, the system should be integrated with more advanced features such as the integration of Artificial Intelligence (AI) to the system to enhance the efficiency of the system. Besides that, in the future, the system should be implemented with chat features between the supervisors and students as it will make it easy for the students to communicate with their supervisor. Finally, adopting this PSM Supervision system will allow an effective and efficient approach to manage the PSM supervision which offers viable solution to the problem of current system implementation.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

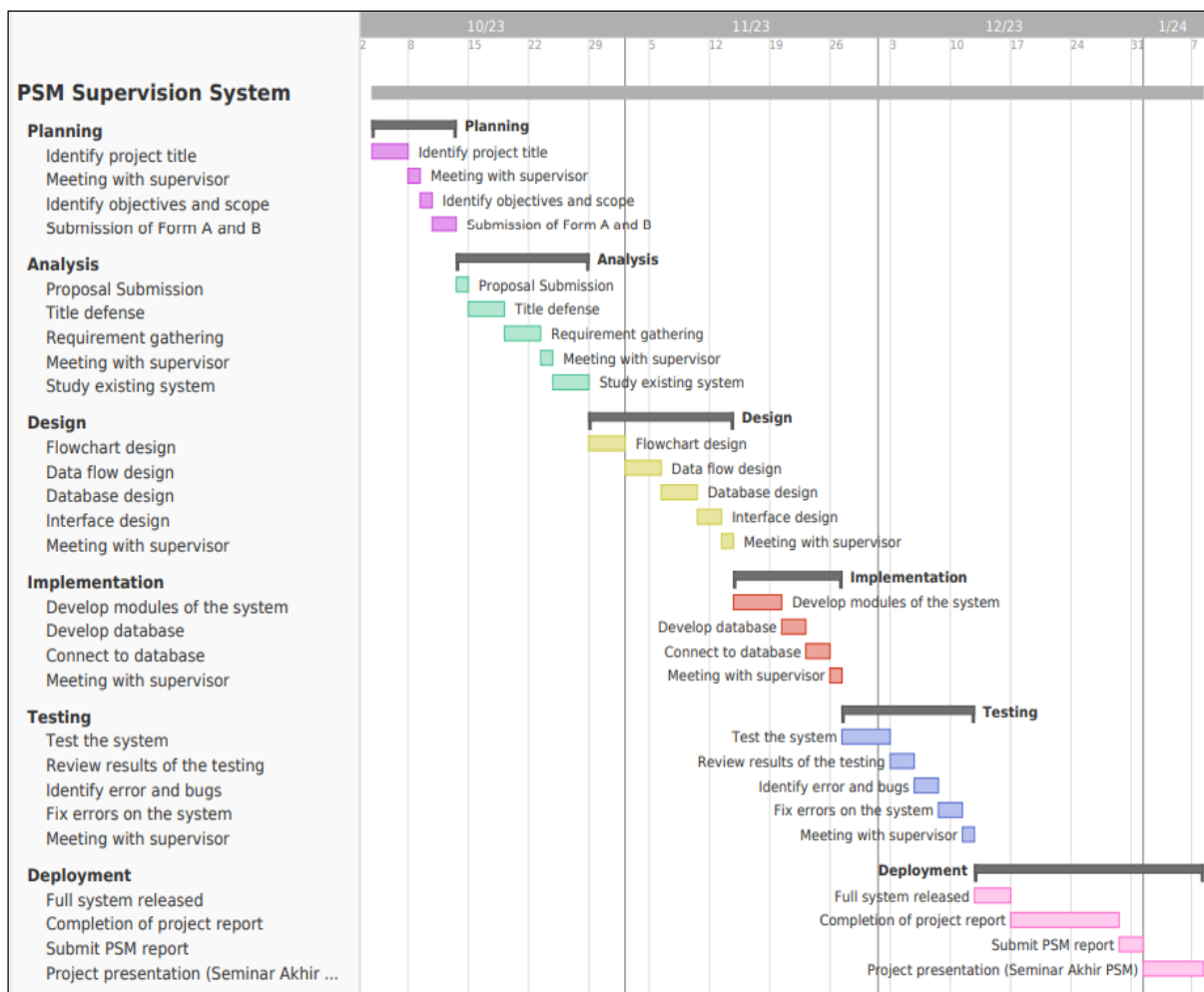
*The authors confirm contribution to the paper as follows: **study conception and design:** Wan Nor Fatini Binti Wan Fauzi, Nayef Abdulwahab Mohammed Alduais; **data collection:** Wan Nor Fatini Binti Wan Fauzi; **analysis and interpretation of results:** Wan Nor Fatini Binti Wan Fauzi, Nayef Abdulwahab Mohammed Alduais; **draft manuscript preparation:** Wan Nor Fatini Binti Wan Fauzi, Nayef Abdulwahab Mohammed Alduais. All authors reviewed the results and approved the final version of the manuscript.*

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Appendix A: Gantt Chart



Appendix B: Entity Relationship Diagram

