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E-LOGBOOK SYSTEM FOR POSTGRADUATE RESEARCH STUDENTS

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E-Logbook System for Postgraduate Research Students

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E-LOGBOOK SYSTEM FOR POSTGRADUATE RESEARCH STUDENTS

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CHAPTER 1

INTRODUCTION

This chapter provides the background and rationale of the study. It also provides details about the electronic logbook, the current process used in the logbook manual by postgraduate research students, and the problems in the logbook manual. This chapter also discusses the objective, scope, and significance of the E-Logbook System for Postgraduate Research Students (ESPRES).

1.1 Background of Study

In recent years, there has been undeniable growth in information technology (IT), which continues to grow. IT industries that are constantly rising, providing a wide range of opportunities, and supplying new goods are also crucial in this development. Technology's rapid progress has altered the environment in numerous areas, including business, management, and education. An information system consists of components used to collect, store, and process data to offer information, knowledge, and digital products. Information systems are used by businesses and other organizations to carry out and manage operations, engage with consumers and suppliers, and compete in the marketplace (Vladimir Zwass, 2021). Computer hardware and software, telecommunications, databases and data warehouses, human resources, and procedures are the primary components of information systems. Information technology (IT) comprises hardware, software, and telecommunications, and it is increasingly interwoven in the operations and management of organizations.

Accords with the viewpoint of Vladimir Zwass, who asserted that information systems are frequently utilized to ensure the efficient operation of a process. This is the same notion as switching from a paper logbook to an electronic logbook, which was done to ensure that this change can improve the existing system, allowing it to produce the best possible results. Because of the availability of technology such as this, a process can be sped up, improving productivity. One of the motivations behind developing this technology nowadays is to reduce time and cost while producing the best results.

A logbook is an essential part of any research project, whether you are a research scientist or a student conducting research. Logbooks are used to record daily activities or meetings with supervisors from the first thing you do in starting a project to completion, including final results. Supervisors will monitor all student activities through this logbook to ensure their progress runs smoothly. The logbook will help you organize your thoughts and procedures. The logbook will be submitted with the project upon completion and will be graded with the project. A logbook usually serves as an official summary of a piece of research, and the official report will present a formal summary of the experimental findings. The logbook will be your primary source of documentation about what you did in the lab and your thought processes during data analysis and experiment planning.

The electronic logbook or eLogbook is a digital version of the traditional logbook that serves the same purpose as data recording. Previously, the user would manually record data in a logbook and generate a paper report. However, with the availability of eLogbook, they need only enter data into the system since the system will automatically compile a monthly report based on the data entered. Additionally, eLogbook can produce more precise computation results than traditional logbooks requiring users to calculate their data. Consequently, it can be observed that the

existence of eLogbook can overcome the problems encountered in traditional logbooks and enhance the functionality already present.

The E-Logbook System for Postgraduate Research Students (ESPRES) was designed for postgraduate research students at UiTM. The ESPRES is a web-based system that allows students to record all of their activities. This system will record all student meetings with supervisors and the number of hours spent in meetings. E-Logbook System for Postgraduate Research Students will provide a report for the number of meeting hours of students with the supervisor every month. It will notify students if the number of meeting hours is insufficient. This system will assist supervisors in more thoroughly monitoring students' progress.

1.2 Current Process

Currently, postgraduate research students still use the manual process to record their research activities. Usually, they will use Microsoft word as a platform for them to record every meeting done with the supervisor. Figure 1.1 below shows the current process that students will implement during their study period. Firstly, students will meet with the supervisor at least once a week to discuss research activities or progress. The medium used during the meeting is free, either physically or online. After that, students need to record each meeting detail in a logbook, including activities and the number of hours.

Next, students must calculate the total number of meeting hours with the supervisor. This is because each student must complete the meeting time set by the postgraduate studies. If the number of hours is not enough, then the student must suffice the number of hours. Afterwards, students submit their logbook reports to the supervisor for

review and verification. Lastly, after the supervisor confirms the information, it will be submitted to PPS (postgraduate studies) via google form to assess student progress.

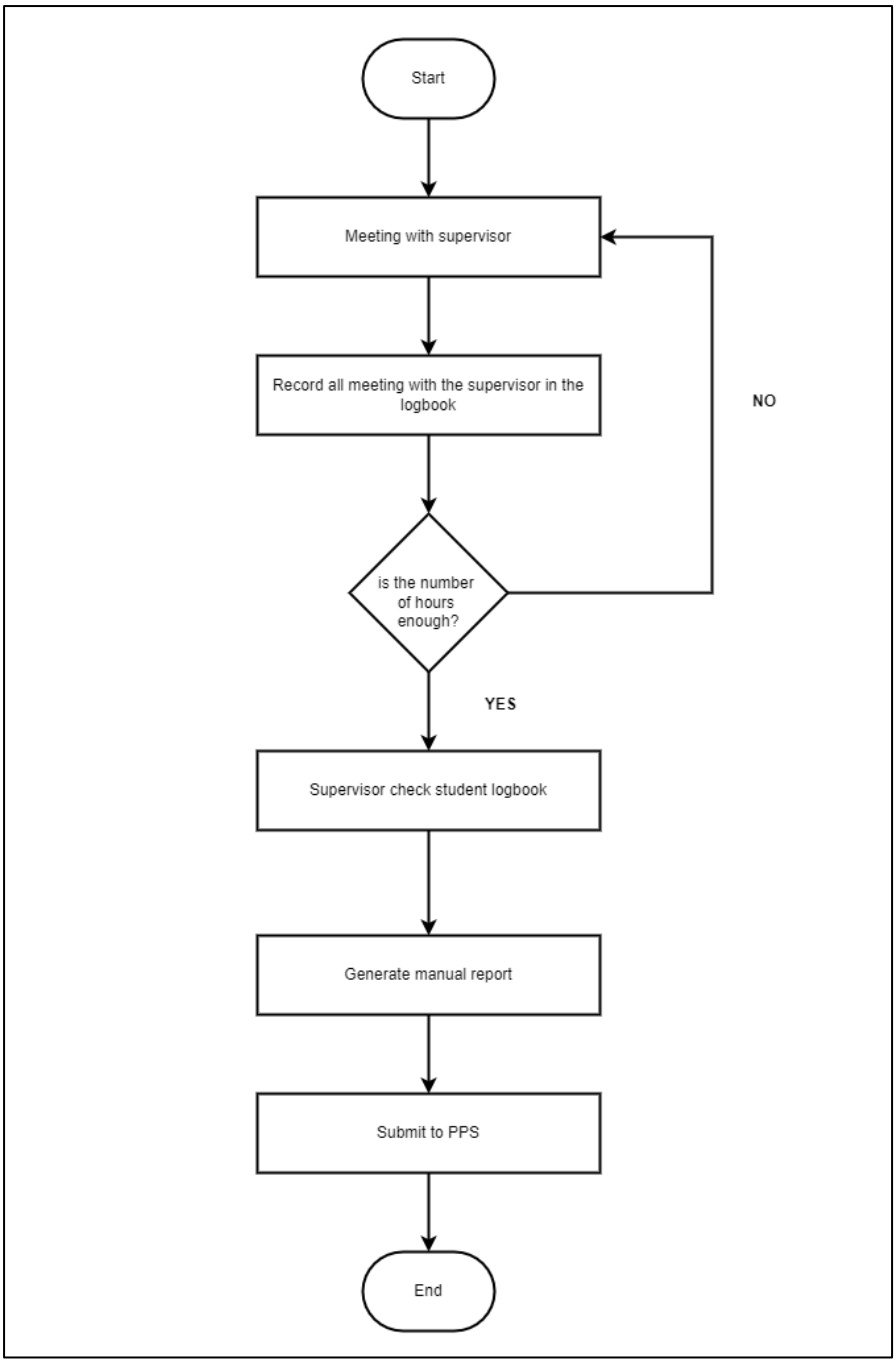

Figure 1.1 Flowchart of the current process

1.3 Problem Statement

Based on the current process, the method used by UiTM postgraduate students in recording all their meetings with the supervisor in the logbook, there are some problems. The first problem is that postgraduate students at UiTM still record all their meetings with supervisors manually. Students will record all the details such as the date, time, activity and duration of the meeting in Microsoft word. They have to keep the document for quite some time before it is submitted to the supervisor. It can lead to other problems where if students do not back up the file and lose the document due to certain factors, this situation will give problems to students because they need to re-create the logbook and re-record all the meetings they have done.

The next problem is that there is no systematic monitoring mechanism to see the progress of postgraduate students. This makes it difficult for supervisors to monitor every progress that students have made because supervisors need to keep in touch with students to know the latest developments of students. The supervisor will monitor each student's progress in terms of activities and the number of hours that students spend meeting with them. This is because ensuring that students conduct their research activities well can produce excellent results. Therefore, to solve this problem, a systematic monitoring system is needed in order to monitor the progress of postgraduate students in a more systematic and orderly manner.

1.4 Objective

To achieve the project aim, three objectives has been made:

i. To Identify problems faced by postgraduate research students in UiTM by using logbooks to record all research activities
ii. To design and develop the E-Logbook System for Postgraduate Research Students
iii. To evaluate the functionality and usability of the proposed system.

1.5 Scope

The scope of users for this system involves students, supervisors, PPS, and administrators. E-Logbook System for Postgraduate Students that will be developed for postgraduate research students at UiTM is expected to help monitor each student's progress in their research. Through this system, all data related to student data, meetings with supervisors, and progress will be stored in the system so that the process of evaluating student progress can be carried out properly. Processes in the system include recording meetings, notification of total meeting time with supervisors, updating progress or new findings in research and generating reports.

i. Student

In this system, students can record meetings with supervisors and update the latest progress in their research activities by attaching files as evidence. Further, if the number of meeting hours with the supervisor is insufficient, then they will receive a notification as a reminder to suffice the number of hours. In addition, they can also view their details and report their progress every month.

ii. Supervisor

Supervisors can view information about students under their supervision, including their names, id numbers, and courses. In addition, supervisors can keep an eye on their students' progress by viewing the files that students have entered into the system. Finally, the supervisor can assess and validate the students' findings once students attach their most recent research to the system.

ii. PPS

For PPS, they have access to the student list and information regarding the supervisor and students. In addition, they have access to recordings of meetings between postgraduate research students and their supervisors, as well as any items that students attached. After that, they will assess every student's progress based on the meetings' records and the attached documents.

iii. Administrator

The whole system is accessible to the administrator. The role of the administrator in this system is to oversee and ensure that the system operates in a regulated and seamless way at all times. If there is a technical issue on the system, such as the system being down, the administrator will resolve the issue. In addition, the admin has the ability to either add new users to the system or delete existing ones.

1.6 Project Significance

The proposed system will benefit students, supervisors, and the management of postgraduate studies at UiTM. Among the benefits include providing a more organized system to students. Moreover, students no longer have to worry about losing records stored in the logbook as students will keep everything in the database

securely. Also, by recording all research activities and progress into the eLogbook system, the students can see all the progress they have made more systematically.

In addition, this E-Logbook System for Postgraduate Research Students can provide facilities to supervisors and management of postgraduate studies by providing a system that can monitor all student research activities. Through this system, all monitoring of student progress will be easier and save time. Also, the supervisor and management of postgraduate studies can observe each student's research progress more clearly and systematically.

Therefore, this system will benefit postgraduate research students in completing their research. In addition, supervisors and management of postgraduate studies will also benefit from this system that will be developed where the work of monitoring students' research progress will be easier and more organized. This clearly shows that the E-Logbook System for Postgraduate Research Students can benefit many parties, including students, supervisors, and the management of postgraduate studies.

1.7 Conclusion

In conclusion, this chapter describes an overview of the project. It includes identifying current management processes and problems faced by postgraduate research students. In addition, the primary purpose of this project is to provide a system that can monitor the research activity of postgraduate students. The objective of this project is to ensure the requirement to meet user expectations. Finally, this E-Logbook System for Postgraduate Research Students will benefit many parties, including students, supervisors, and the management of postgraduate studies, where it is an efficient and organized system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will go through previous e-logbook system research that has been conducted. Reading, analyzing, evaluating, and writing are the components of this subject. Journals, books, papers, current systems, and online resources are all used as reference sources for the knowledge that will be gathered to build this system in the future. Additionally, the primary goal of this study is to evaluate the project's development approach.

All of the system development models that will be applied in system development are also described in this study. The comparison with similar current systems and the implications of a literature review on the suggested system will also be included. Additionally, the approach used throughout the development phase will be examined along with the appropriate qualities. The study on the e-logbook system and the design that will be used in its development is also included in this chapter.

2.2 Management Information System

A computer-based information system used for decision-making is known as a management information system (MIS) (Okeke, 2021). A management information system (MIS) is a technology that integrates information collection, processing, classification, storing, and distribution (Marathe, 2017). Information systems also

play a crucial role in contemporary life. In a broad sense, the term "information systems" refers to hardware, digital applications, storage, communication systems, internet utilities, and almost any other element of the technological infrastructure of a company, organization, government, school, or other groups that contribute to the concept of big data structure and management (Berdik, Otoum, Schmidt, Porter, & Jararweh, 2021).

Giving management a view of how his staff and department are functioning is the primary goal of MIS (Soni, 2020). |The management may instantly take the appropriate action if the data indicate any deviations from the specified objectives. It is possible to define a management information system as a system that employs defined procedures based on data from internal and external sources to help decision-makers plan, direct and carry out the tasks for which they were hired. The management information system is crucial to the operations of the business, particularly in the administrative department, where the suggestion is to make everyday tasks easier and support efficient information processing to prevent errors in the process.

An information system is made up of information and various sorts of components that aid in the processing and administration of information, according to a journal article titled "Information system and its types: Emphasizing territory, establishments and domain-specific" (Paul et al., 2020). These elements refer to the procedures and methods used for information-related tasks such as data gathering, processing, management, and distribution. According to (Hasan, 2018), the management information system (MIS) is broken down into four levels, starting at the top level with executive information systems, moving down to the middle level with management information systems and decision support systems, and finishing at the bottom level with transaction processing systems. Additionally, the management information system (MIS) is made up of three crucial parts: management,

information, and system. These parts will all be linked together to serve the entire firm.

To conclude, a management information system is crucial for a company to make decisions that will help it reach its goal. MIS is a crucial component of companies because it offers timely and reliable information that aids in decision-making (Marathe, 2017).

2.3 Electronic Logbook System

A logbook is a document used to systematically record all significant information, such as events, task progress, or activities. The acquisition of the necessary information, abilities, attitude and competencies is documented in a logbook (India., 2019). A logbook is a tool that may be used to keep track of progress or activities and ensure consistency in quality. Svendsen et al. (2019) claim that logbooks are frequently used for assessing and tracking student development. Individual trainees keep logbooks that describe each activity process they complete and their involvement throughout the procedure to be able to track their progress through the programme. The logbook's function is to keep track of training and experience to accomplish goals (Hee, Keshavarzi, & Rajagopal, 2020).

The Electronic Logbook System (E-logbook) is a digital logbook that has been upgraded with several advantages over the classic logbook, including the ability to be accessed from anywhere to make it simpler for users. The Electronic Logbook System (E-logbook) is a platform that enables users to enter all pertinent data, including dates, events, and actions, to be saved for evaluation or future use. Logbooks are a practical tool for giving feedback to students or workers, keeping track of their performance, and helping them plan their activities (Gondal, Iqbal, Ahmed, & Khan, 2017). When

there is proof that there is a problem, the electronic logbook system (E-logbook) enables monitoring progress, tracking, and identifying any possible weaknesses, so that the problem may be fixed (Chung, Lam, Chan, Wong, & Lee, 2018).

Improvement of small-scale tuna fisheries data quality through the application of an e-logbook system, according to (Raup, Patmiarsih, Juniar, and Setyadji, 2021) state that the manual logbook requires a lot of investment, particularly in human resources, because it must pay employee salaries; this is where e-logbook can be the solution. In addition to being inexpensive, the electronic logbook system (E-logbook) is an excellent approach to increasing data quality. The electronic logbook system (E-logbook), according to Ghelmani S et al. (2019), has greatly simplified all operations. The E-logbook is easier to access, retrieve, and engage with during the review process compared to the manual version.

2.4 Human-Computer Interaction (HCI) Theory

Human-computer interaction is the process of a human and a system interacting. Systems come in various forms, from physical machinery to software and computer systems. Multiple developing technologies are continuously improving how human-computer interaction is conducted as an extension of ubiquitous computing. Machine language commands were manually entered in the early phases of human-computer interaction. As a result, computer languages serve as the medium for conducting conversations (Shi, Zhang, Huang, Ma, & Tu, 2020).

2.4.1 Eight Golden Rules of Interface Design

Eight Golden Rules of Interface Design provides rules regarding a user interface design. Eight Golden Rules gave rules drawn heuristically from experience and applicable in practically all interactive systems once they had been appropriately improved, expanded, and understood. The usefulness of a system is greatly influenced by its user interface. To produce a good design, defining the Eight Golden Rules of Interface Design is very important so that the system can be produced well (Marston, Freeman, & Musselwhite, 2017).

Table 2.1 Eight Golden Rules of Interface Design

Rules	Description
Strive for consistency	Consistent sequences of actions are required in similar situations, and identical terminology should be used whenever possible.
Cater to universal usability	The needs of diverse users, including novices, experts, users of all age ranges, and users with disabilities, need to be recognized.
Offer informative feedback	For frequent and minor user actions, there should be modest system feedback, whereas for infrequent and major actions, the response should be more substantial.
Design dialog to yield closure	Sequences of actions should be organized into groups with a beginning, middle, and end, with informative feedback at the completion of a group of actions.
Prevent errors	The system should be designed such that users cannot make serious errors, and if a user makes an error, the interface should detect the error and offer simple, constructive, and specific instructions for recovery.
Permit easy reversal of actions	As much as possible, actions should be reversible.
Support internal locus of control	Experienced users need to feel they are in charge of the interface and that the interface responds to their actions.
Reduce short-term memory load	Interfaces in which users must remember information from one screen and then use that information on another screen should be avoided.

2.5 Web-based Application

A network-based extranet is a system that functions outside of a company's intranet. It is accessible to pertinent third parties via an Internet connection, which is often tunnelled through a VPN or another secure network connection/system. A company's intranet is frequently connected to an extranet, which is akin to a "DMZ," which offers various services, data, catalogues, EDI (Electronic Data Interchange), and login portals to outside parties while staying separate from the intranet.

Extranets were originally used to define a secure VPN-based intranet sharing arrangement between two or more businesses. Even today, extranets frequently signify some kind of sharing of an organization's intranet or its indicated data/resources with outside parties to aid in cooperation and exchange of essential intranet-only material with pertinent parties. Sharing such data makes it possible to provide necessary and crucial business services to third parties while yet keeping them separate from the company's intranet for security concerns. Data interchange, project cooperation, and communication with relevant parties are the main uses of extranets. Collaborative platforms have taken the role of email because while email is necessary for information dissemination, it is not appropriate for tasks or interactions that call for engagement. Contrarily, extranets serve as a more capable collaborative network-based system that gives outside parties access to crucial information that is often housed within the company's intranet.

Extranets were first used to define a secure VPN-based intranet sharing arrangement between two or more businesses. Even today, extranets frequently refer to sharing an organization's intranet or its implicit data resources with external parties to aid in cooperation and sharing essential intranet-only data with pertinent parties. By sharing this information, essential business services may be made available to third parties while, for security reasons, staying separate from the company's intranet. Data

interchange, project cooperation, and communication with relevant parties are the three main uses of extranets. Collaborative platforms have taken the role of email because while email is necessary for information dissemination, it is inappropriate for tasks or interactions that call for engagement. Contrarily, extranets serve as a more capable collaborative network-based system that gives outside parties access to crucial information that is often housed within the company's intranet.

Within this extranet of the network, which is divided from the company intranet by a firewall, there may be portals for suppliers, vendors, and even customers to access their pertinent data, such as worksheets, invoices, plans, and blueprints, as well as communications between relevant parties and web services requiring a login. The capacity to transfer enormous volumes of data with EDI, or Electronic Data Interchange, is one of the most important advantages of having a business extranet. Collaborative extranets allow businesses to share data with select partners in addition to exchanging critical information with all relevant parties, as opposed to depending on outdated email systems that are difficult to collaborate on for big datasets. Everyone may obtain essential knowledge through interactions across communications of large datasets, which can progress projects rather than cause them to stop.

Extranets enable a firm to share crucial intranet-based datasets without granting other parties access to the intranet when making decisions that need significant data sharing and relationships with other enterprises for joint growth efforts. Extranets enable critical services to be externally hosted and publicly accessible to the appropriate parties while safely and securely separating such services from the company intranet and its critical data. These services can be effectively streamlined and managed through extranets, which allow critical services to be externally hosted and publicly accessible to the appropriate parties (Wardynski, 2020).

2.5.1 Web Browser

A web browser application is used to view a local or global website. The web browser obtains the necessary information from a web server and displays the page on the user's device when a user requests a web page from a certain website. A web browser is a tool for accessing the Internet that enables users to search for information, send and receive emails, interact on social networks and instant messenger, and purchase online stores (Umar, Yudhana, & Faiz, 2018).

2.5.2 HTML

HyperText Markup Language, sometimes known as HTML, is the industry-standard markup language for texts intended to be viewed in a web browser. Tabarés (2021) claims that since the inception of the Web, Hypertext Markup Language (HTML) has been the recognized hypertext standard. By creating a language that can connect various websites, Tim Berners-Lee is credited as being the first to suggest the notion of transferring files across computers via hyperlinks.

2.5.3 CSS

Cascading Style Sheets is a language for creating style sheets that describe how a document is presented in a markup language like HTML. In order to improve comprehension or memorization, multimedia typically combine more than one sort of media, such as text (alphabetic or numeric), symbols, graphics, photographs, audio, video, and animations (Guan, Song, & Li, 2018).

2.5.4 JavaScript

JavaScript is a dynamic programming language that's used for web development, web applications, game development, and lots more. JavaScript is massively used on the client-side of web applications to achieve high responsiveness and user-friendliness (Gyimesi et al., 2019).

2.5.5 PHP

PHP is a server scripting language and a powerful tool for making dynamic and interactive Web pages. PHP is a general-purpose scripting language geared toward web development. PHP is an acronym for "PHP: Hypertext Preprocessor" and is a widely used, open-source scripting language.

2.5.6 MySQL

MySQL is an open-source relational database management system. According to (Ohyver, Moniaga, Sungkawa, Subagyo, and Chandra, 2019) state that MySql is a rational database server that supports the well-known SQL (Structured Query Language) database language. MySql is an open-source database which reliable and compatible with the major hosting provider.

2.6 System Development Models

Software Development Life Cycle is the application of standard business practices to building software applications. It was accomplished using various models, including

Agile and Waterfall. There are advantages and disadvantages in each SDLC model depending on different kinds of situations. Every development model includes activities like requirements gathering and analysis, system analysis, system design, coding, testing, and implementation. The main challenge is to select the best suitable model (Modi, Singh, & Chauhan, 2017).

2.6.1 Waterfall Model

In the waterfall model, we can only go on to the next step after finishing the previous one. A baseline is established after the completion of specific phases, freezing the development's results at that time. If there is a need to change these products, a formal change process is followed to make the change. A waterfall flows downhill when these stages are represented graphically. The waterfall paradigm should not be employed for large-scale projects, claim Modi et al. (2017).

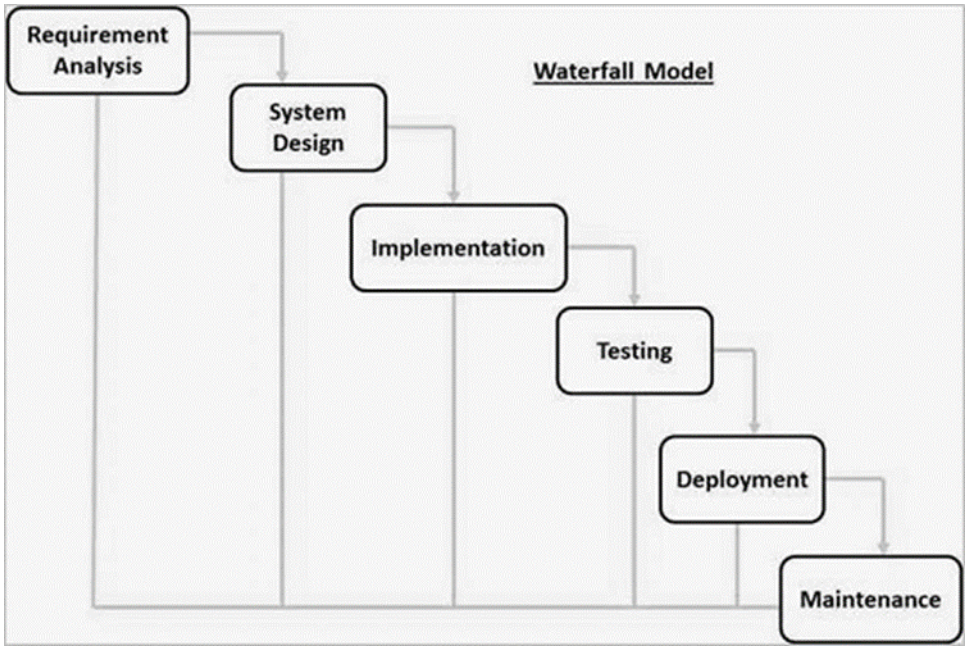

Figure 2.1 waterfall model

Requirements gathering and analysis, systems development, systems implementation and coding, testing, deployment, and maintenance are the six stages of the systems development lifecycle, according to Kramer (2018) in the journal "Best practices in systems development lifecycle: an analysis based on the waterfall model".

i. Requirements Gathering and Analysis

Requirements gathering and analysis make up the initial stage. Project planning is started by the project manager. In order to identify the project's methodology, deliverables, and expected outcomes, the organization's requirements both functional and non-functional are obtained, and analysis of those needs starts. To ascertain who would use the system and how business requirements are obtained. Users are currently contributing best practices, as well as their needs and desires.

ii. Systems Development

Systems development is the second step. The comprehensive requirements are transformed into a finished detailed systems design at this level. The main elements and their interaction are described in this design. It focuses on how to provide the system with the necessary functionality (must-haves and wish-list items). The first stage's criteria are used by the business architects to create a number of product designs. This stage's outcome is a description of how the application must be developed.

iii. Systems Implementation and Coding

Systems implementation and coding make up the third step. Convert the collection and analysis of requirements into system development, system implementation, and system coding. In order for the developers to apply the design and create the application, thorough and precise documentation and mapping are required. The Systems Development Lifecycle process's stage

might be the longest. The developers write the code in this step using information from the previous two phases and the approved design.

iv. Testing

Testing is the fourth step. Testing may start after the application has been created. To confirm that the code complies with the requirements, the application will be tested using the specs. To ensure that the application performs as intended, integration testing is required. Another great practice that has to be used is this one. Verification of the modifications to the application should be performed by the Business Architect or Analyst who provided the design specifications. It must be returned to the developer if expectations have not been reached so that any problems may be fixed.

v. Deployment

The deployment step is the sixth. After going through testing, the application is now prepared for deployment after being thoroughly validated and confirmed. A smart practice is to load the program on a test machine before deploying it. As a result, a backup plan is required in the event that the application or data translation fails. Other systems may suffer problems as a result of this. Be able to back out the program or have a backup. The final consumer must confirm that the product truly satisfies their demands and that the original specs were accurate. In other words, show that the product works as intended when used in the appropriate setting.

vi. System Operations and Maintenance

System operations and maintenance are the final phases. At this point, the application is complete, and the process improvement is complete. The end users will have questions, therefore be prepared to have technical and procedural specialists ready to address any further inquiries. Maintain an open issues log for any pending problems. This is the moment to fix any non-critical

flaws that may still exist. Make sure these problems aren't upgrades that the project owner must approve.

2.6.2 Agile Model

According to (Venkatesh & Rakhra, 2020), the Agile method is a very important approach for developing small to medium-scale systems where Agile can improve the quality of a product. Agile is an iterative approach to project management and software development that helps developers deliver value to their customers faster. Needs, plans and decisions are evaluated on an ongoing basis so that developers have a natural mechanism to respond to change quickly. Agility is not defined by a set of rituals or special development techniques. Conversely, Agile is a group of methodologies that demonstrate a commitment to a rigorous feedback cycle and continuous improvement. Agile selections are taken so that they can respond to changes in the market or feedback from customers quickly without compromising a year's worth of plans. Planning and delivery in small and frequent increments allow developers to gather feedback on each change and integrate it into future plans at a minimal cost. Each developer sets their own standards for quality, usability and perfection.

Agile methodologies are approaches to product development that are aligned with the values and principles described in the Agile Manifesto for software development. Agile methodologies aim to deliver the right product, with incremental and frequent delivery of small chunks of functionality, through small cross-functional self-organizing teams, enabling frequent customer feedback and course correction as needed.

In doing so, Agile aims to right the challenges faced by the traditional "waterfall" approaches of delivering large products in long periods of time, during which customer requirements frequently change, resulting in the wrong products being delivered.

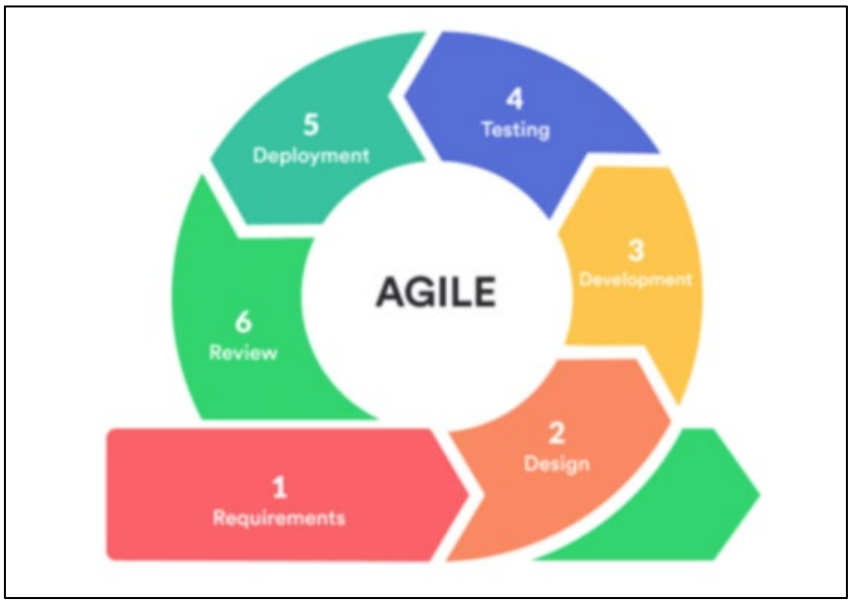

Figure 2.2 Agile model

2.6.3 Comparison between Waterfall and Agile

Agile and Waterfall are two well-known project management methodologies. Both of them are popular in software development, but each is best suited for different types of projects. The main difference is that Waterfall is a linear system of working that requires the team to complete each project phase before moving on to the next one, while Agile encourages the team to work simultaneously on different phases of the project.

Agile and Waterfall models are two different methods for the software development process. Though they are different in their approach, both methods are useful at times, depending on the requirement and the type of the project.

Table 2.2 Comparison between Waterfall and Agile

Agile	Waterfall
Agile is open to adaptation, encourages experimentation and welcomes changes of direction, even in later phases of the project. Because of this, the budget tends to be more flexible.	The budget for projects using the Waterfall methodology is generally fixed. Because the project is determined from start to finish, there is less room to change the budget mid-project.
The development process is iterative, and projects are implemented in a short period of time.	The development process is phased, and the phase is much bigger than the iteration.
An error can be fixed in the middle of the project.	Only at the end the whole product is tested. If the requirement error is found or any changes have to be made, the project has to start from the beginning.

2.7 Similar Existing System

In this section, researchers will analyze, diagnose, and discuss existing systems similar to the E-logbook system for postgraduate research students. Similar existing systems are intended to help researchers to complete the proposed system. Some of the existing similar systems include RIMS and UAEU-iWIL, which have similar features to the system to be developed.

2.7.1 Research Integrated Management System (RIMS)

Research Integrated Management System is a system for monitoring the activities of postgraduate research students used by Universiti Pendidikan Sultan

Idris (UPSI). RIMS is used by two important users, namely students who will record each research activity while the supervisor will monitor through this system. Figure 2.3 shows the homepage for the Research Integrated Management System (RIMS), where the user must log into the system before using it. This system requires students to enter the details of their research activities then the supervisor will verify the details. RIMS is a real-time system where every information that students enter, the supervisor will see at that time as well. In addition, in this system, students can also generate their research activity reports.

Figure 2.3 RIMS homepage

2.7.2 United Arab Emirates University Internship and Work Integrated Learning System (UAEU-iWIL)

UAEU-iWIL is an online system that simplifies the training process for students. Students can register for their internships and fill out their weekly reports. The academic advisor will monitor student progress through an online system and evaluate weekly progress reports. In addition, it also facilitates the preparation of faculty visits and coordination of visits, as well as industry registration and job posting. Figure 2.4 shows the UAEU-iWIL homepage.

Figure 2.4 UAEU-iWIL homepage

2.8 Implication

After doing the literature review to acquire the data that can potentially be useful for the project, this part addresses the implications of the review. The literature study has a number of consequences, nevertheless, that have an impact on how the project is developed. Journals, books, papers, websites, and other online materials provide the foundation of the research study.

The eight golden laws of interface design have been chosen as theories supporting the proposed system. Five of the eight golden rules will be used in the proposed system, and they can help with system design and development. In addition, research efforts are guided by system development models. The E-logbook system has been designed using an Agile model, and it fulfils the intended goal of enabling postgraduate

students to follow the flow of the process from needs analysis to the maintenance phase.

For a similar existing system, several qualities or characteristics are used for similar existing research. Important features of the existing system will be used in the proposed system. Among them are the functions of recording, reporting, and monitoring. Through these functions will make the eLogbook system for postgraduate research students as a good system.

2.9 Conclusion

To conclude, a literature review is an assessment of information that has been published based on earlier investigations by academics in the field of study. For a better understanding of the motivations for and strategies for developing the proposed system, research on E-logbooks has been conducted. Additionally, this project will make use of the eight golden laws of interface design theory. This project will use the agile methodology to ensure that it can be finished on time. Finally, the features obtained from the relevant existing system analysis will be used to construct the proposed system.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the method or technique that is relevant to adapt in the development of the E-Logbook System for Postgraduate Research Students (ESPRES). By implementing research methodology, the researcher knows how to be conducted, the main ideas and method used, and why the research was conducted. The Adapted Agile model is selected as the guidelines for developing Postgraduate E-Logbook System. The phases of the development process also were illustrated in this chapter.

3.2 Project Development Methodology

The Project Development Methodology describes a collection of approaches, strategies, guidelines, procedures, and activities used in a project. The methodology works as a guideline for the developer to develop the proposed system. It is also used to enhance, monitor as well as standardize the development process by specifying the activities to be carried out and the method to be used.

The project development methodology in developing the system will apply the Agile Model adopted by (Farooq, Kalim, Qureshi, Rasheed, & Abid, 2022). Through this methodology, continuous improvement at each stage will be implemented, and it will always be repeated until the project is completed. There are six phases in the

development of the proposed system, which includes planning, analysis, design, development, testing, and documentation. Figure 3.1 shows the process flow of the Agile model.

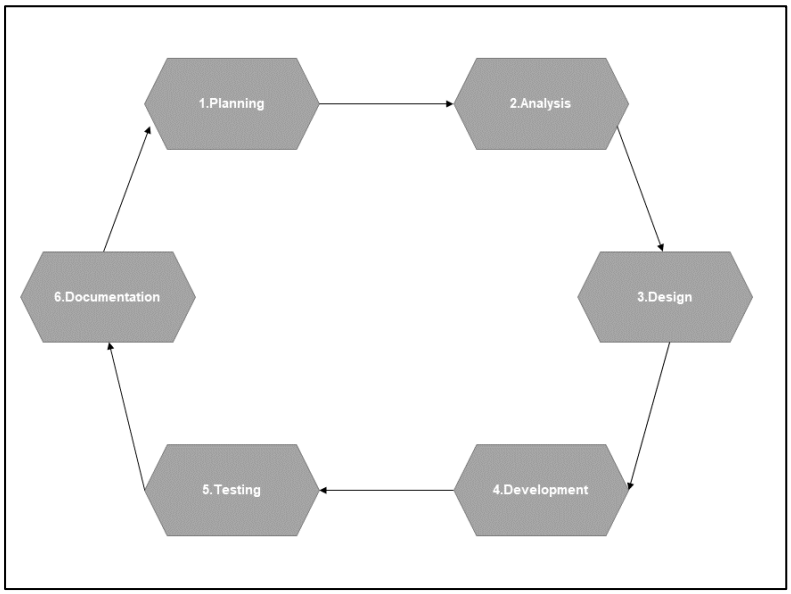

Figure 3.1 Adapted Agile model from (Farooq, Kalim, Qureshi, Rasheed, & Abid, 2022)

The project framework of the ESPRES in Agile comprises six phases: planning, analysis, design, development, testing and evaluation, and documentation. One stage's outcome is the input for the next phase means that any development process can only be started once the previous stage has been completed. Activities in each stage need to be systematic and well planned before the research can be conducted. The project framework for this whole project contains planning, analysis, design, development, testing and evaluation and documentation phases. Table 3.1 shows how the model is related to the Agile framework.

Table 3.1 Project framework

No	Phase	Activities	Outcome
1	Planning	• Identify the flow of the current business process. • Conduct an interview with the postgraduate research students. • Identify the problem based on the current business process.	• The flow of the current business process. • The business problem statement. • Chapter 1
2	Analysis	• Define user requirements. • Define system requirements.	• User requirement. • System requirement. • Chapter 2
3	Design	• Design Context Diagram • Design Data Flow Diagram	• Context Diagram • Data Flow Diagram • Entity Relationship Diagram • Site Map • Chapter 3
4	Development	• Develop an e-logbook postgraduate system.	• Complete system
5	Testing and Evaluation	• Test system functionality (Developer)	• Functionality result • Chapter 4
6	Documentation	• Compiling and refining a complete research report	• Final research report

3.3 Planning

The first step in the planning process is to discuss names for the system. The discussion then shifts to problem-solving, choosing an objective, and defining the project scope, importance, and framework, which clarifies the Agile model process, after settling on the project's title and theoretical approach. To have a better understanding, existing systems are examined, inspected, and their restrictions and limits are gathered. The information is gathered, and the project's name is decided after speaking with the project manager.

3.3.1 Gantt Chart

The flow of the activities is scheduled in the Gantt chart to make sure this project is to be able to complete within the period. This project takes about 12 months beginning in April 2022 and expected to end in February 2023. The figure below depicts the project planning activities for this project, and it is simple to handle planning and scheduling with the Gantt chart. The visual form of these charts also makes it easier to define mutually agreed-upon goals and work together to attain them. There are six phases, planning, analysis, design, development, testing, and documentation, that need to be highlighted and followed as a guideline to complete the project.

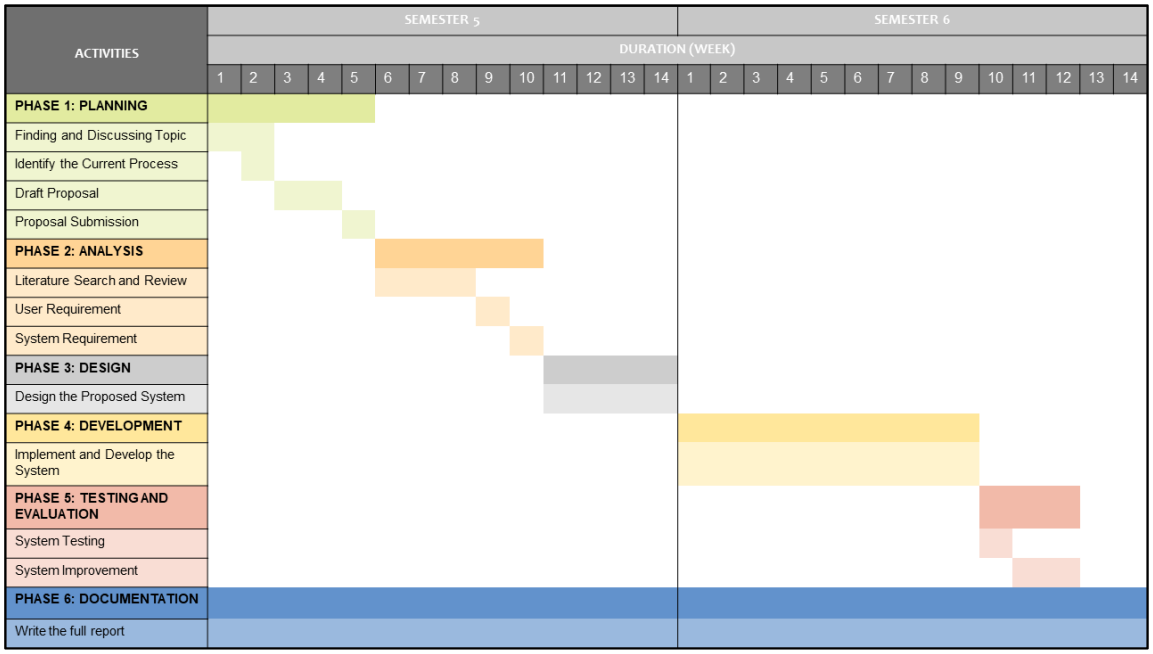

Figure 3.2 Gantt Chart

3.4 Analysis

The analysis phase involves identifying the functional and non-functional requirements and user requirements. These requirements are usually defined during the interview session, observation from the similar existing system and online journals or materials from articles. Table 3.2 until 3.5 shows the functional and non-functional requirements and user requirements for student supervisor and postgraduate studies (PPS).

Table 3.2 Functional and Non-Functional Requirements

Functional Requirement	Non-functional Requirement
1. Students and supervisors can access the system 2. The system allows the student to view the personal detail 3. The system will send a notification to students if the total of meeting hours is insufficient 4. The system will allow adding a new user 5. The system will enable the supervisor to verify the student's progress 6. The system will calculate the total of meeting hours 7. The system will allow the student to update the latest progress 8. The system will allow the supervisor to view student information 9. The system will generate the report	1. Security requirement (users can log in to system by using ID) 2. Reliability requirement (the system is available 24 hours a day) 3. Usability requirement (good internet connection is required to access the system)

Table 3.3 User Requirement for Student

No	User Requirement
1	The system allows the student to login to the system by using an ID and password
2	The system enables the student to view and manage personal data such as password, name, address, and telephone numbers
3	The system allows the student to insert the information meeting into the system
4	The system will calculate the total of meeting hour
5	The system allows student to attach file for research progress
6	The system will send a notification to students if the total of meeting hours is insufficient
7	The system allows student to generate the report

Table 3.4 User Requirement for Supervisor

No	User Requirement
1	The system allows the supervisor to login to the system by using an ID and password
2	The system will allow the supervisor to view student information.
3	The system will enable supervisor to verify the student progress
4	The system allows to view the student report

Table 3.5 User Requirement for PPS

No	User Requirement
1	The system allows the PPS to login to the system by using an ID and password
2	The system will allow the PPS to view student information.
3	The system will enable PPS to view student progress
4	The system allows to view the student report

3.5 Design for Database and User Interface

After gathering all the requirements for the proposed system, move on to the design step. Several diagrams, including the context diagram, data flow diagram (DFD), entity relationship diagram (ERD), site map, and user interface design, are included in this phase. The design phase's goals are to give a clear picture of how the proposed system will function at the end of a project.

3.5.1 Context Diagram (CD)

Context diagrams are the highest level for data flow diagrams. The context diagram presents the scope and boundaries of the system. This is the first diagram that needs to be drawn in the process of preparing a data flow diagram for the system. There are four entities involved in the E-Logbook System for Postgraduate Research Students. The first is a student who is a postgraduate research student, who will use this system for the purpose of recording their meetings with the

supervisor. Next, the supervisor will use this system to monitor the progress of their students. The third is postgraduate studies (PPS), where they will use this system to assess and monitor the progress of postgraduate research students. Lastly, the admin will manage the users and the system.

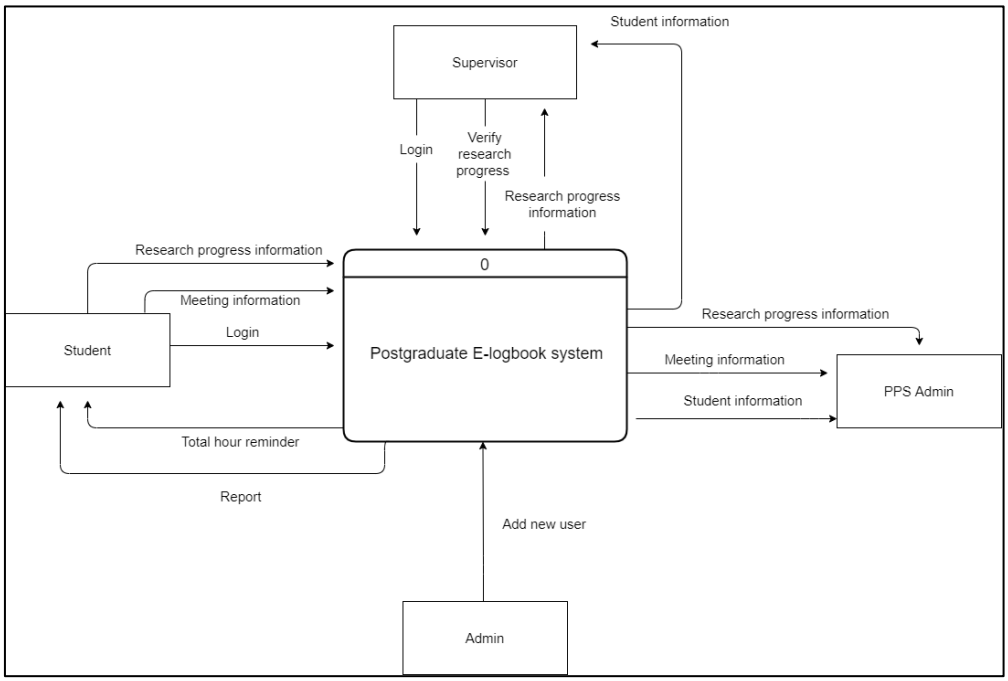

Figure 3.3 Context Diagram of E-Logbook System for Postgraduate Research Students.

3.5.2 Data Flow Diagram (DFD)

Data Flow Diagrams (DFDs) are useful as a sketch that explore how a system and its elements can be exploited. Its simplicity makes it possible for different people with different levels of expertise to contribute to system security analysis as it evolves. DFD is used to graphically illustrate data flow in a business information system. DFD describes the processes involved in a system to transfer data from input to file storage and generate a report.

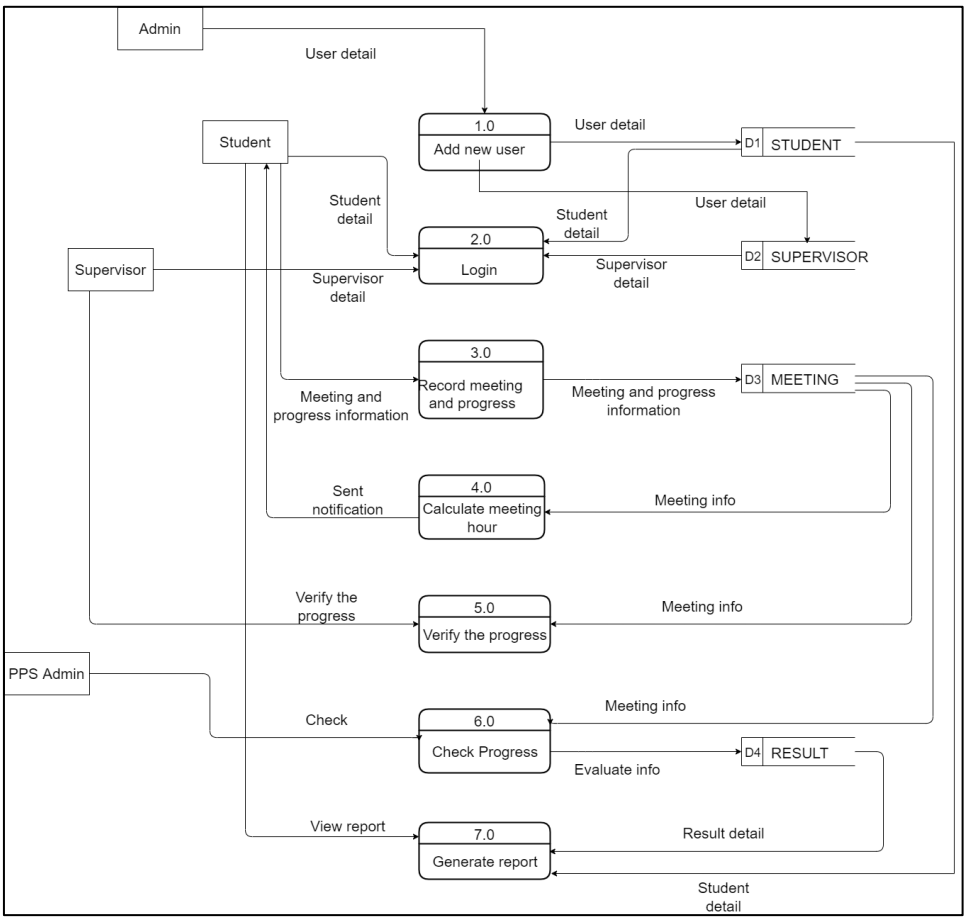

Figure 3.4 Data Flow Diagram of E-Logbook System for Postgraduate Research Students.

3.5.3 Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) describe how the entities are related to each other through the relationship type. The ERD for the E-Logbook System for Postgraduate Research Students has already been designed, as the Figure below. Based on the ERD diagram below, there are five tables that involve in the system, which are student, supervisor, meeting, result, and PPS. Figure 3.5 below shows the ERD for Postgraduate e-logbook system.

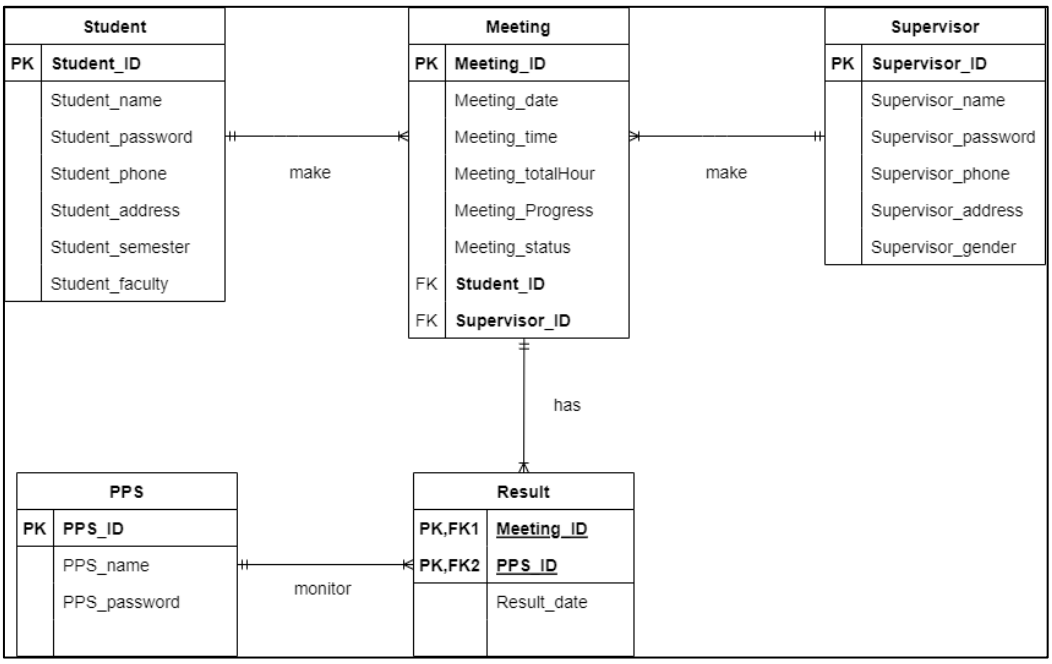

Figure 3.5 Entity Relationship Diagram of E-Logbook System for Postgraduate Research Students.

Furthermore, the information of each table is created to explain the attributes of the entities in ERD. The table information of each table gives a clear explanation of the information or data that can be stored in the database structure. Table 3.6 below shows the example information for entities and attributes. The table contains the attribute names, the description of the attribute, the data type that has been used to declare the attributes and the data sample in the database.

Table 3.6 Table of entities and attributes information for student

Field	Description	Data Type	Sample of Data
student_id	Student ID number	Integer (11)	2022189765
student_name	Student full name	Varchar (50)	Ahmad Faisal
student_password	Student password	Varchar (10)	Abc123
student_phone	Student phone number	Varchar (11)	0123456789
student_address	Student address	Varchar (50)	Kuala Terengganu
student_gender	Student gender	Varchar (10)	Male
student_faculty	Student faculty	Varchar (20)	FSKM

3.5.4 Site Map

The site map is a diagram that represents all the functions each of the users can perform in the proposed system. Each level in the hierarchy indicates the different tasks or functionalities of the project. Figure 3.6 below shows the Site Map for the user of E-Logbook System for Postgraduate Research Students, which is Student, Supervisor, PPS, and Administrator.

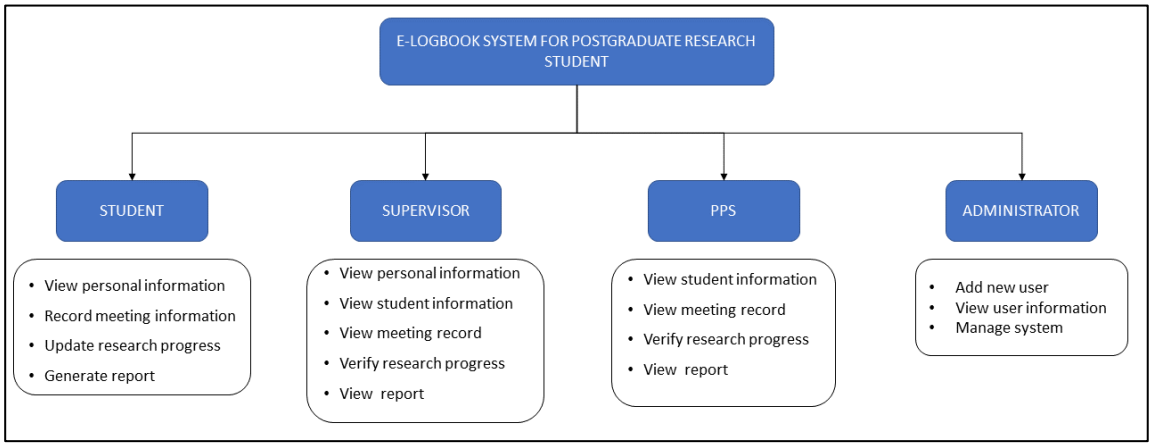

Figure 3.6 Entity Relationship Diagram of E-Logbook System for Postgraduate Research Students.

3.5.5 Interface design

The system interface is the relationship between users and information. The theme that was proposed initially consisted of a minimalist design in order to balance aesthetic design with functionality. The figure below shows an example of a user's interface after they log in to the system.

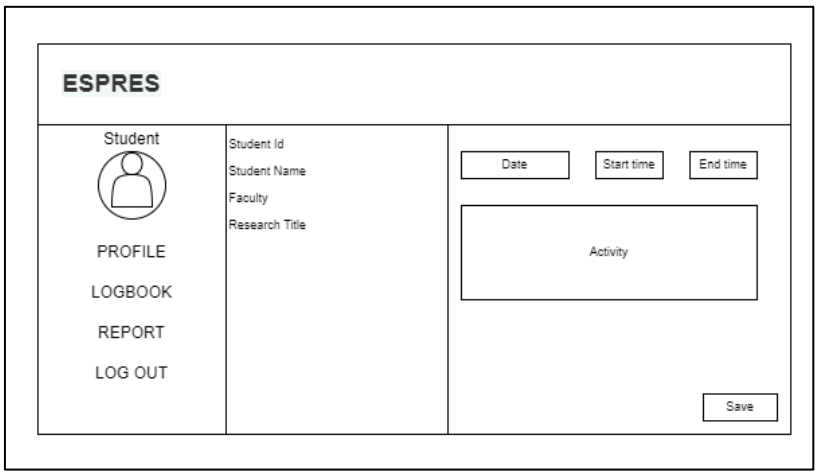

Figure 3.7 interface for student.

Figure 3.7 above shows a sample user interface for students. On the sidebar on the left, there is navigation that allows users to link to the desired page, such as profile, logbook, report and log out. In addition, at the top of the sidebar, there is also a picture, name and user ID number. In the middle of the page is a space for students to fill in meeting information, and then the information can be saved into the system by clicking on the save button.

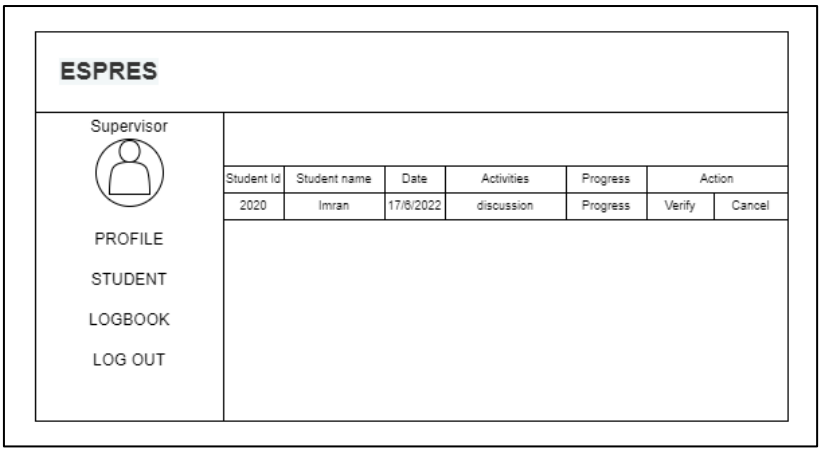

Figure 3.8 interface for supervisor.

Figure 3.8 shows an example of a user interface for a supervisor. On the left, there are four menus, namely profile, student, logbook, and logout. For the supervisor interface, there are two important functions, namely, students view, student details and a logbook where supervisors can monitor the progress of their students. If supervisors want to see student details, they can go to the student section, and all student details will come out. For supervisors to see the progress of students just need to go to the logbook, and the system will display the progress of their students and to verify them, just click the verify button on the action section.

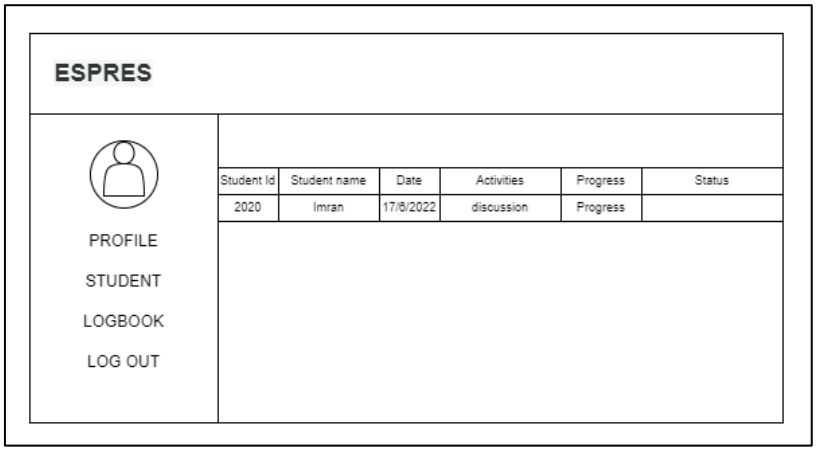

Figure 3.9 interface for PPS.

Figure 3.9 shows an example of a user interface for postgraduate studies (PPS). The PPS interface has a similar design to the supervisor but has different main functions. For PPS, they have a function to view student details. In addition, they also have the same function as the supervisor, which is to see the progress of students. Through this function, PPS can evaluate the performance of students by looking at all the progress that has been achieved throughout their research.

3.6 System Development

The development phase is the longest phase of the Agile model. In this phase, the code is produced, and it is the main focus of the developer to produce a well-functioning system. All the information is collected in the planning phase and used to develop the actual system according to the design phase. The hardware and software requirements for developing E-Logbook System for Postgraduate Research Students are essential at this stage.

Hardware specification has an important role in this project development. This is because the hardware or the devices were used during the development phase. Computer and Laptop hardware was used in the development process. Table 3.7 below shows the hardware specification needed to develop the Postgraduate e-logbook system.

Table 3.7 Hardware Specification for develop system

No.	Hardware	Specification
1	Laptop	Hp
2	Processor	Intel(R) Core(TM) i5-6200U CPU @ 2.30GHz 2.40 GHz
3	RAM	8GB
4	Operating System	Microsoft Windows 10

In the software requirements specification, the E-Logbook System for Postgraduate Research Students used Microsoft Word, Draw.io, PhpMyAdmin, and Visual Studio Code to develop this project. The coding language used to develop this project in PHP, HTML, CSS and JavaScript. Visual Studio Code is the software that is used as a platform to write the coding and the programming language of the proposed system. Table 3.8 shows the description of software specifications for Postgraduate e-logbook system.

Table 3.8 Software Specification for develop system

No.	Software	Description
1	PhpMyAdmin	To manage the database of the system
2	Visual Studio Code	To develop the code of the system
3	Draw.io	To design a figure for Postgraduate E-Logbook System
4	Microsoft Word	To make documentation for the project

3.7 Testing and Evaluation

This step is very important to ensure that the E-Logbook System for Postgraduate Research Students functions well in the future without any problems. The developer will initially test the system using the test plan for the student and supervisor to record the findings. Furthermore, user evaluation is also included in this phase which consists of an expert user and other user evaluations. The testing and evaluation phase focuses on the functionality and usability of the proposed system. This testing phase will use two methods Test Plan and a Questionnaire.

3.7.1 Test Plan

Testing has always been one of the most important activities in system development to ensure the quality, functionality and reliability of the software developed. According to (Bozic & Wotawa, 2019), the main objective of the tests performed is to ensure that the software meets the specifications. Specifications are made prior to software development based on software requirements. Among the things that will be

tested is the function of the system developed. For this developed system, the researcher will give the user to test in terms of the functions available in this system. The table below shows the test plan for the user.

Table 3.9 Test Plan for Student

No	System Requirement	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Log in to the system			
2	View student details			
3	View menu			
4	Fill meeting detail			
5	Get notification of the total meeting hour.			
6	Attach file			
7	View report			
8	Log out			

Table 3.10 Test Plan for Supervisor

No	System Requirement	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Log in to the system			
2	View supervisor details			
3	View menu			
4	View meeting detail			
5	View student progress			
6	View student report			
7	Verify the progress			
8	Log out			

Table 3.11 Test Plan for PPS

No	System Requirement	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Log in to the system			
2	View list of students			
3	View student detail			
4	View meeting detail			
5	View student progress			
6	View student report			
7	Log out			

3.7.2 Questionnaire

To test the usability of the E-Logbook System for Postgraduate Research Students, the System Usability Scale (SUS) will be used to evaluate it. According to (Lewis, 2018) System Usability Scale (SUS) is a survey of 10 statements that are widely used as subjective measures of system usability. The survey asked users to rate their level of agreement or disagreement with ten statements. The survey then provided the following ten standard statements with two response options agree and disagree. Table 3.12 shows the questionnaire for user evaluation.

Table 3.12 Questionnaire for user evaluation

No	Description	Answer (/)	
		Agree	Disagree
1	I think that I would like to use this system frequently.		
2	I found the system unnecessarily complex.		
3	I thought the system was easy to use.		
4	I think that I would need the support of a technical person to be able to use this system.		
5	I found the various functions in this system were well integrated.		
6	I thought there was too much inconsistency in this system.		
7	I would imagine that most people would learn to use this system very quickly.		
8	I found the system very cumbersome to use.		
9	I felt very confident using the system.		
10	I needed to learn a lot of things before I could get going with this system.		

3.8 System Documentation

The final phase of system development is documentation. This stage was a process where all the information in the system would be combined into one report after the project was completed. Besides, system documentation provides the flow of the project and references to the user about the eLogbook system for postgraduate research student. Therefore, the documentation needs to create for an explicit purpose

and can be understood by those who will read it in future use. The documentation is produced to ensure all the important information is not missing, and it is easy for the developer to track down an error that needs to be improved in the future.

3.9 Conclusion

To conclude, this chapter has explained the overall process of research methodology. The methodology selected to develop the E-Logbook System for Postgraduate Research Students (ESPRES) is the adapted Agile model. The development model consists of six stages: planning, research analysis, design, development, testing and evaluation, and documentation. Each phase has activities, tools or techniques, and outcomes for every action carried out. Thus, the design for the system is shown in the form of a diagram which is a Context Diagram, Data Flow Diagram, and Entity Relationship Diagram. Overall, to ensure successful and well-functioning system development, test plans and questionnaires need to be carried out to be implemented.

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