

HITACHI SUNWAY TRAINING MANAGEMENT SYSTEM

LOOI SEE YEE

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HITACHI SUNWAY TRAINING MANAGEMENT SYSTEM

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A thesis submitted in partial fulfilment of the
requirements for the award of the degree of
Bachelor of Computer Science (Software Engineering)

School of Computing, Faculty of Engineering
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For my family.

Never forget my friends and my seniors.

Also, for my best supervisor from School of Computing, Faculty of Engineering
PM Dr. Mohd Shahizan bin Othman.

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ABSTRACT

Hitachi Sunway Training Management System (HSSTMS) is a system to developed to replace the existing system of e-Learning and Development Systems (e-LEAD) currently being used by the company. The e-Learning system currently being used is a system under IBM Lotus Notes where they are also client and servers for the e-Learning system and make them the as a client-server software platform for the system. However, there are problems that companies need to face when use the existing system which are the limitation for user to access into the system that cause users difficult access. In addition, the system also does not have a user-friendly interface that makes it difficult and takes times for user to understand how to use the system and other problems is when the existing system does not have filter properly for data management that makes it difficult for users to search the data from the system. The problems that have arisen make the Hitachi Sunway company want to change the system to a new system. With the steps taken, this opportunity take to develop the Hitachi Sunway Training Management System (HSSTMS) to solve the current problems arising and this system will also provide management such as user management for handle all the users, training management for HR to schedules training then for user apply the training, approval management for manager to approve their subordinate training request, report management which can generate reports by monthly, and also there is a notification will send by e-mail to the user for approval request about training. This web-based system will be developed using PHP Languages as a programming language and MySQL as data management. Finally, this project is expected to developed to meet users' needs and to help to management and operation the training schedule.

ABSTRAK

Sistem Pengurusan Latihan Hitachi Sunway (HSSTMS) adalah satu sistem yang dibangunkan untuk menggantikan Sistem e-Pembelajaran dan Pembangunan Sistem (e-LEAD) yang sedia ada digunakan syarikat. Sistem yang sedia ada ini mempunyai beberapa masalah yang perlu dihadapi oleh pengguna ketika mereka sedang menggunakaninya. Antaranya ialah masalah dalam mengakses sistem, terdapat banyak batasan untuk mengakses sistem sehingga menyukarkan pengguna. Selain itu, antara muka untuk sistem ini juga tidak mesra pengguna dan ianya sukar untuk difahami sehingga pengguna, mengambil masa yang lama untuk memahami dan menggunakaninya. Masalah lain ialah apabila sistem yang ada tidak mempunyai penapisan untuk menguruskan data dengan betul dan menjadikannya sukar bagi pengguna untuk menapis data yang ada di dalam sistem. Dengan permasalahan yang timbul ini syarikat Hitachi Sunway mahu menukarkan sistem ini kepada sistem yang baru. Dengan langkah-langkah yang diambil, peluang ini digunakan untuk membangunkan Sistem HSSTMS untuk menyelesaikan permasalahan yang timbul dan sistem ini juga akan menyediakan sistem pengurusan seperti bahagian pengurusan pengguna untuk mengendalikan semua pengguna, bahagian pengurusan latihan untuk HR bagi menjadualkan latihan kepada pengguna yang menggunakan latihan ini. Bagi bahagian pengurusan kelulusan, pengurus yang akan memberi kelulusan kepada mereka yang berada dibawahnya. Bahagian pengurusan laporan pula boleh menghasilkan laporan setiap bulan, dan juga terdapat pemberitahuan akan dihantar melalui e-mel kepada pengguna yang membuat permintaan kelulusan mengenai latihan. Sistem berasaskan web ini akan dibangunkan menggunakan bahasa PHP sebagai bahasa pengaturcaraan dan MySQL sebagai pengurusan data. Akhirnya, projek ini akan dibangunkan untuk memenuhi keperluan pengguna dalam membantu HR untuk bahagian pengurusan dan bahagian operasi jadual latihan.

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LIST OF ABBREVIATION

HSSTMS	Hitachi Sunway Training Management System
e-LEAD	e-Learning & Development System
HOD	Head of Department
ERD	Entity Relational Diagram
GUI	Graphic User Interface
SDLC	System Development Life Cycle
SRS	Software Requirement Specification
UML	Unified Modelling Language

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Hitachi Sunway Training Management System (HSSTMS) is a system which designed to provide registration training and courses for employees to apply thought online. It is a web-based system to replace old system, e-Learning & Development System (e-LEAD) which need to login through IBM Lotus Notes to access. The existing system have the difficult for user to access, does not have a user-friendly interface and also does not provide filter data. Therefore, after replace to new system, all party involved can easily accessed the system at any time, and anywhere. HSSTMS also provide management such as user management for handle all the users, training management for HR to schedules training then for user apply the training, approval management for manager to approve their subordinate training request, report management which can generate reports by monthly, and also there is a notification will send by e-mail to the user for approval request about training. This system is developed to meet the requirement for Hitachi Sunway in the systematic of training management.

The purpose of this system is for HR to easy handle, management and keep track all the activity of training. Hitachi Sunway is a large company, they have around more than 100 employees. This system also helps to monitor the training cost spend by company

for each employee for company to further analysis if needed. As training is an investment to train the employee to increase company profit, this system is important to give the information training to all the employees so that they have the opportunity to attend the training. This system also expected will improve the quality processing on registration and approval because all user can easy access the system through web, the approval will become more efficiency.

1.2 Problem Background

e-Learning & Development System (e-LEAD) is a subprogram under IBM Lotus Notes. The program is for all employees who want to register training that offer from company and HR will manual send training information by email. This system require user to login IBM Lotus Notes by using company network, after that only can access e-LEAD.

As Hitachi Sunway employees have to apply for training or courses that they are interested, the training type might be internal, inhouse or external. One of the issues identified in the current system is due to IBM Lotus Note software security, during the open apply period, user was went client onside or outstation, this make some of the employees miss the chance to apply the training because the current system only can access using company network.

Furthermore, user have limit access to the system, if their device did not install IBM Lotus Note software, employees maybe cannot get the latest update for their applied training involved of approval, review and changes need to be made. All the process are done by different party and no notification or tracking are made on the progress of the application.

Moreover, as there are many parties this make data management not secure and not filtering. All employee can view each other's applied training which contain pending

approval, the cost training for every employee in details, and also able to view training list under draft. Another problem with the current system is due to a lot of data can view in the system, it makes the system load very slow, messy and not user friendly. This will be confusion for new user to use the system.

1.3 Problem Statement

- i. Limit access to the old system due to IBM Lotus Note software security, only enable to access using company network.
- ii. The device must install IBM Lotus Note software to access the old system.
- iii. HR need to manual send training information by email and keep track all the training participant manual way.
- iv. Existing system not user-friendly interface difficult for new user to learn and use.
- v. Existing system did not provide filter data function, and does not have data management control, all user can view all the data.

1.4 Goal of the Project

The main purpose of this project is to design and develop Sunway Training Management System (HSSTMS) that will help ease the process of employee applying for training and courses, make the approval and all process fast, flexibly and easy to increase the efficiency of management.

1.5 Objectives of The Project

This project defines some objectives to be achieved. The objectives are:

- i. To identify the user requirement of Hitachi Sunway Training Management System.
- ii. To design Hitachi Sunway Training Management System that provide a complete process on registration on training or courses.
- iii. To develop Hitachi Sunway Training Management System according to all functional requirement.
- iv. To test the functionality of Hitachi Sunway Training Management System as per user requirement.

1.6 Project Scope

The software product is Hitachi Sunway Training Management System. It will the scope of this project is set to ensure that the system is developed to meet the users' requirement. Below are the concept designed for the system:

- i. The system consists of four users which is administration or HR, head of department, employee, trainer.

- a. Administration or HR

Person in charge from the company handle all the user, can add, edit, delete user roles and monitor the system and responsible to operation the training schedule.

b. Head of department

High level management user which have the role to approve / reject the training and also can register the training.

c. Employee

Employee from the company can register the training, and view the status and mark the attendance.

d. Trainer

Can be internal person from company or external person only allow to view the list of participant and attendance list.

ii. HSSTMS is designed in web-based to easy user to access to the system.

iii. This system will be focus on user management for handle all the users, training management for HR to schedules training then for user apply the training, approval management for manager to approve their subordinate training request, report management which can generate reports by monthly, and also there is a notification will send by e-mail to the user for approval request about the training.

iv. This system will also focus on data management which can filter data access and search engine for user.

1.7 Importance of the Project

Involvement With the development of this system successfully, it will become a new system which will replace limit access currently used for e-LEAD system. This system will have automation email notification, data management control, search engine and generation report. All party involved can easily accessed the system at anywhere, and anytime. All the process and approval will be tracked in the system. The system will notify the head of department and employee on training register and approval process by auto email notification. They have status pending 1st approval by head of department, then pending 2nd approval by Administration or HR until get all the approval then system will approve the applied training for that employee. Monthly report can generate from report management with training cost by Administration or HR.

Five of the importance of key develop this system are:

- i. HSSTMS is built to easy and speed up the process of registration and approval training through web.
- ii. Design a user-friendly interface for user more systematic and ensure the accuracy, reliability and reliability of training information.
- iii. Implement auto email notification which notify include register training, pending approval and approved to user up to date information
- iv. Save time and more secure after implement data management control and search engine.
- v. Enable to generate list of participants by training and monthly training report from report management.

1.8 Organization of The Report

This report consists of four chapters. Chapter one is introduction, chapter two is User Requirement Specification (URS), chapter three is Software Requirement Specification (SRS), and chapter four is Software Design Specification (SDD).

In Chapter 2, it will discuss about current system process, swim lane model, related documents, issues in current process and suggestion for improvement in current process. It will also discuss the new system process, swim lane model and any business rules involved.

Chapter 3 will discuss the methodology that will explain how the system works. After that, Chapter 4 will discuss about the system architectural design as it is the main part of the chapter. Next, it will describe the database design which include the illustrated relations between table, their operation and attributes

1.9 Conclusion

In conclusion, this chapter explains the in-depth about the introduction of the major factors in the system's development. In addition, problems related to the limited access and data management problem have been identified based on the studies undertaken. Finally, hoped that this system will meet the standards and requirements set by user from Hitachi Sunway.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review is a searching and evaluation of the available literature in a given subject area. It helps in identifying what is already recognized in the area of the study. Any question related to the area that does not have any answer can also be identified. It is an important aspect to be carried out before the development start.

In this project, the literature review done will be on the study of the current system E-Learning and Development Systems (e-LEAD). To be more focus study the current system to identify the problem by interview HR from Hitachi Sunway to have a talk session. It will also study on the others existing system that has similar features to the e-LEAD. Literature review will also do an analysis on the existing system to help produce the best possible Sunway Training Management System (HSSTMS).

All the elements that want to be included will be selected by the developer from the result of the analysis. Through the study of the existing system, developer can gather information about the actual workflow and problem regarding the e-LEAD and find the solutions to improve the system so that can benefit the Hitachi Sunway for training management.

2.2 Inter-Organization Case Study

Hitachi Sunway Information Systems ("Hitachi Sunway") is a leading ICT Services Integrator in ASEAN specialising in implementing, supporting and providing consultancy for Enterprise Resource Planning (ERP) & Product Lifecycle Management (PLM) solutions, managing and supporting IT infrastructures, Cloud-enabling IT platforms, including the Cyber Security elements.

The portfolio is aimed at helping clients to embrace the acceleration in digitalization that are transforming businesses. Hitachi Sunway has a proven track record of serving more than 1,000 clients in the region across various business verticals from small to global enterprises as well as public sector and industries such as manufacturing, financial, construction, education and healthcare. Hitachi Sunway currently operate in 15 locations across 5 countries (Malaysia, Singapore, Indonesia, Thailand, Vietnam) and will be expanding our operations to Myanmar, Cambodia and Laos.

With largest amount of employee, Hitachi Sunway needed provide training to development the employees to be more productivity and quality. Thefore, this project Hitachi Sunway Training Management System (HSSTMS) is important to provide employees an opportunity for development their skill, esay for HR to management the training, keep tracking and analysis the report to the company.

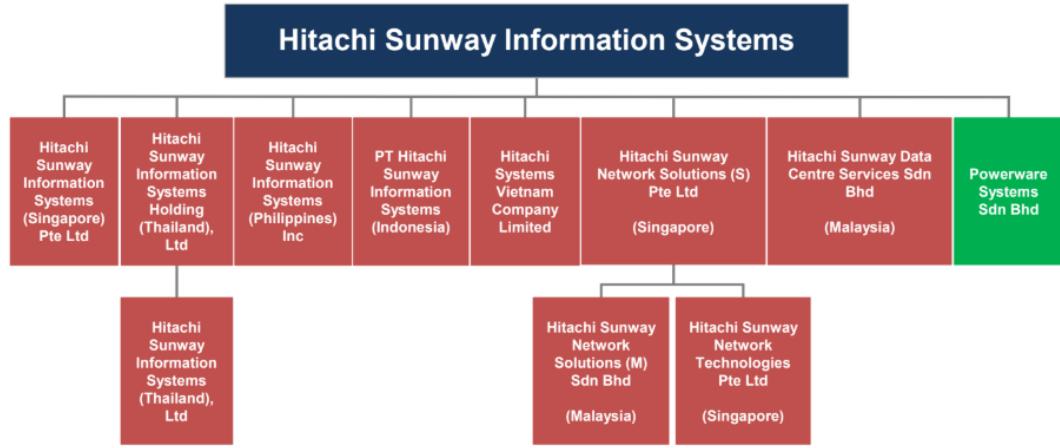


Figure 2.1 Hitachi Sunway organisation chart (Source: Hitachi Sunway, 2018)

2.3 Current System Analysis

e-Learning & Development System (e-LEAD) is a subprogram inside IBM Lotus Notes. This IBM Lotus Notes is a collaborative client-server software platform, the main function is for employees to receive and send the email. User is requiring to login IBM Lotus Notes before access e-LEAD. E-LEAD is a program to help organization the training and allow employees to apply through online. To handle all the training or courses, there are three type of training which are internal, inhouse and external. Internal training is entirely conducted by ownself, including the venue & the trainer, while inhouse training is invites third party as the trainer, but conducted in own premises and external training is conducted outside, along with external trainer.

In the submit form, employees need to list down at least three reason why need to attend the training and at least expectation for that training. After submit, the application will process for approval. There are four approval level need to go through after submit the applied training. First aporoval is superior, second head of department, third HR, fourrh Head of Company. These are the procedure need to go throught, after get all the apporaval, the system will update the training status to valid to attend to the training. After

done the training, trainee request to feedback training effectiveness form. Any trainee failed to feedback the form won't allow to register for next training. If the trainee want to cancel the applied, the process to withdrawal the training must to be done by 7 days before of actual training date started.

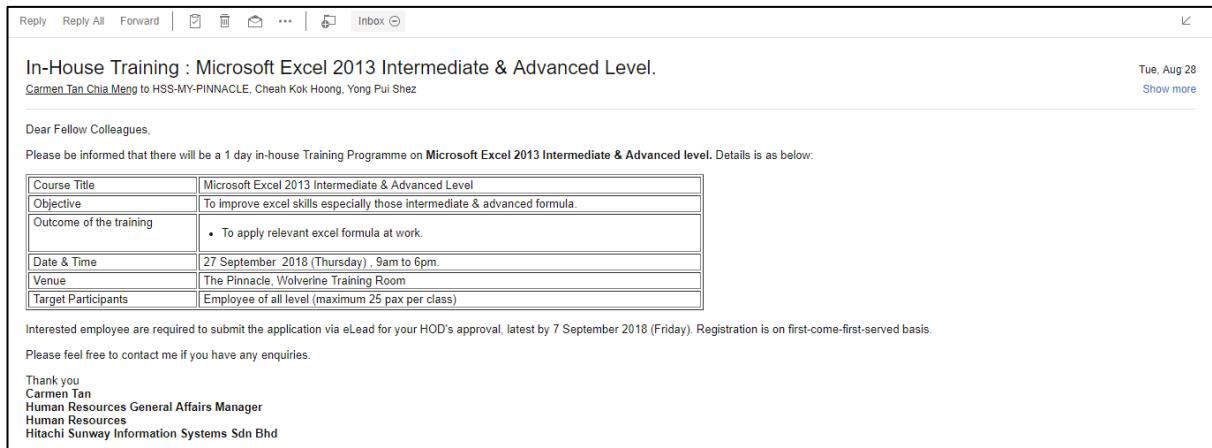


Figure 2.2 Screenshot of HR manual send an email notification to inform the training schedule (Source: Hitachi Sunway, 2018)

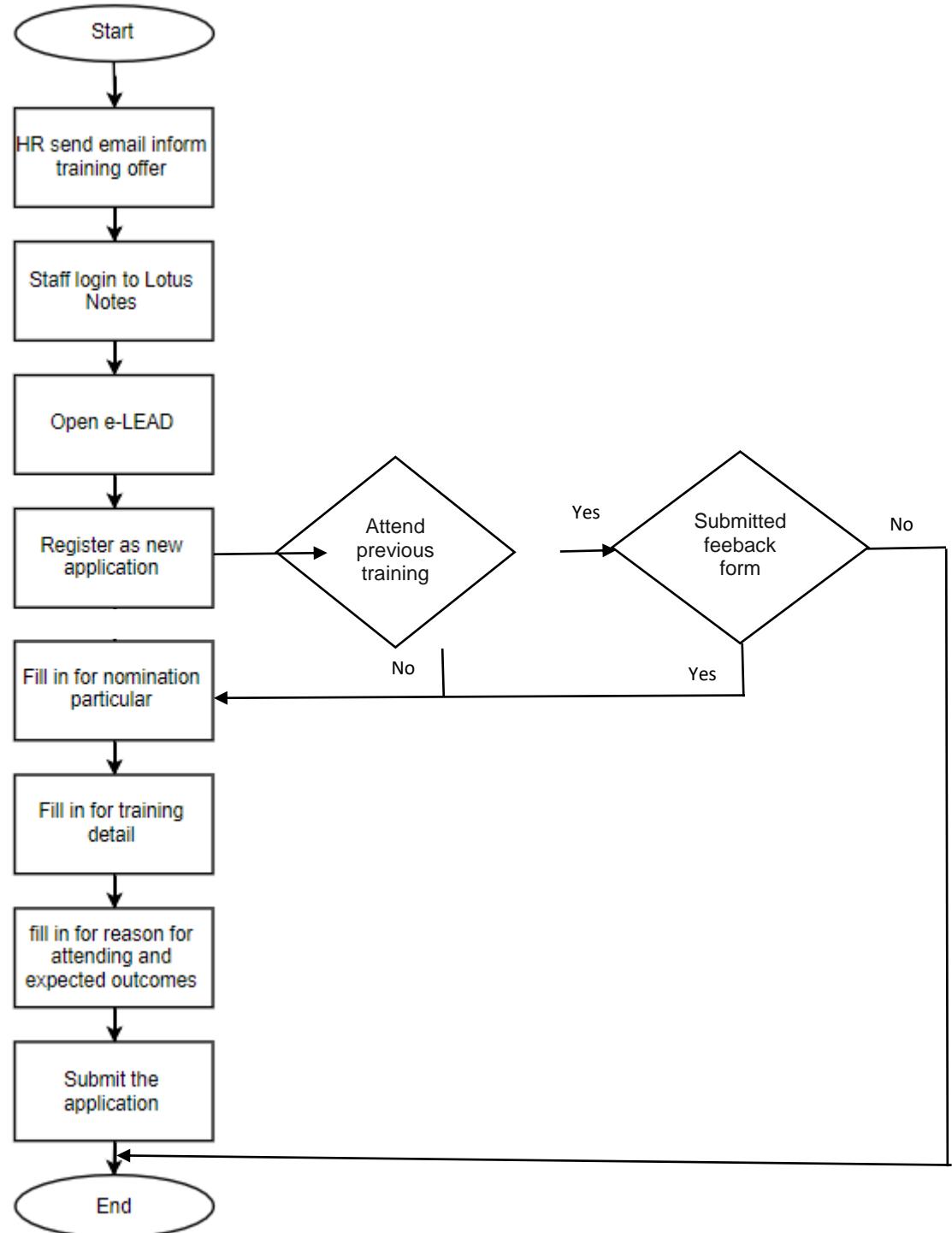


Figure 2.3 Flowchart process for submission application through e-Learning & Development System (e-LEAD)

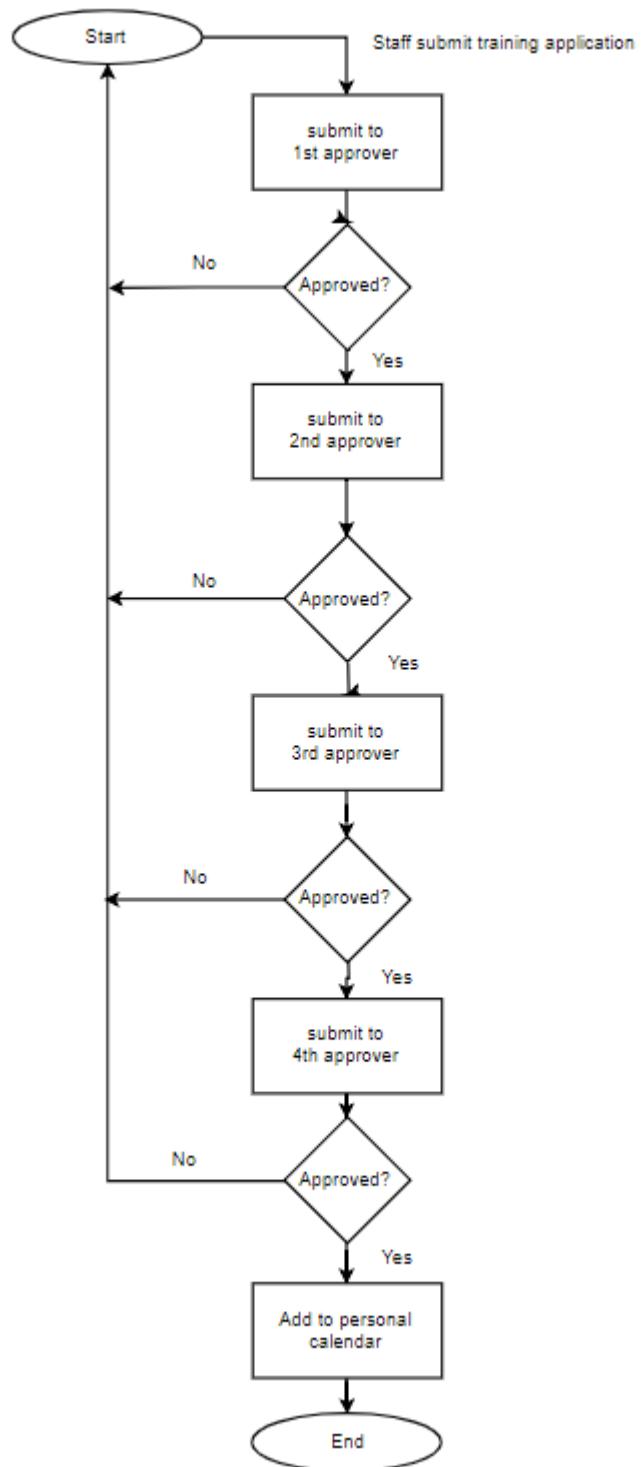


Figure 2.4 Flowchart the application must get all the approval level

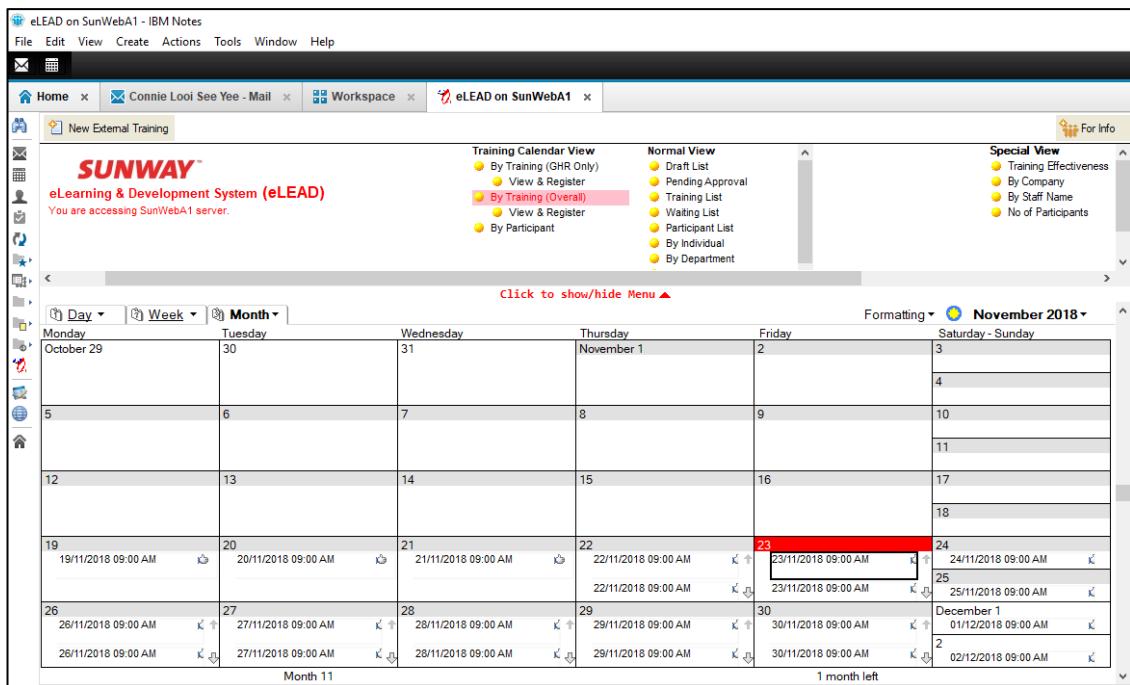


Figure 2.5 Screenshot of E-Learning and Development Systems (e-LEAD) home interface view (Source: e-LEAD, 2018)

The screenshot shows the "External Training Programme" form. At the top, it displays the Sunway logo and the title "External Training Programme v2.0". Below that, it shows the status as "CLOSED" and the reference number "Ref No : SunWebA1-Ext-2018-000001". The form is divided into sections: "Nomination", "Training Programme", "Justification", "Other Participants", "Approval", "Attachments", "Evaluation", and "HR Use Only". The "Nomination" section is active. It contains fields for "Name" (CHEW SERN SIANG), "Designation" (MANAGER - APPLICATIONS DEVELOPMENT), "Company" (HITACHI SUNWAY INFORMATION SYSTEMS SDN BHD), and "Department" (APP(M) - JDE). The "Nominee Particular (Staff attending the training)" section includes fields for "Name" (CONNIE LOOI SEE YEE), "Employee No." (068744), "Company" (HITACHI SUNWAY INFORMATION SYSTEMS SDN BHD), "Division" (APPLICATIONS), "Designation" (APPLICATIONS DEVELOPER), "Contact No." (03-5639 9911 Ext. 6332), and "Email" (conniesy@hitachi-sunway-is.com.my). A note at the bottom of this section says, "Please insert your mobile number so that you are contactable for urgent updates."

Figure 2.6 Screenshot of E-LEAD system interface to register the training (Source: e-LEAD, 2018)

The screenshot shows a form titled "External Training Programme - IBM Notes". At the top, there's a toolbar with various icons. Below it, a navigation bar shows the current workspace as "eLEAD on SunWebA1". The main content area contains a "Justification" section with a note: "Please list down at least 3 reasons for attending the program that were addressed in your KRAs or development plan. Eg : To improve my facilitation skills in conducting the employee orientation program." Below this is a list of five items:

1. To improve my excel skills when doing BI Publisher Report using an Excel Spreadsheets
2. To find the best way to do the BI Publisher Excel Report with advanced skill
3. Want to know more and learn about the intermediate and advanced formula in Excel
- 4.
- 5.

Below the justification is a section titled "PRE-TRAINING EXPECTATIONS (To be evaluated by nominator)". It includes a scale from 0 to 3 for competency levels: "0 = Zero Knowledge", "1 = Basic", "2 = Competent", and "3. Expert". A table titled "Expected Outcomes" lists five outcomes with corresponding competency scales:

Expected Outcomes	Level of Competency
1. Apply the skills in daily works	<input type="radio"/> 0 <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 3 <reset>
2. Can have more idea when doing BI Publisher Report in Excel Format	<input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <reset>
3. Can efficiency delivery the BI Publisher Report in Excel Format	<input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <reset>
4.	<input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <reset>
5.	<input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <reset>

Figure 2.7 Screenshot of interface fill in reason attending and expected outcomes
(Source: e-LEAD, 2018)

The screenshot shows the "External Training Programme v2.0" section of the e-LEAD system. At the top, it displays the Sunway logo and the title "External Training Programme v2.0". Below this, it says "MICROSOFT EXCEL 2013 INTERMEDIATE & ADVANCED LEVEL" and "Status - CLOSED". The reference number is "Ref No : SunWebA1-Ext-2018-00001".

A note indicates "* Compulsory field". Below this, there are several tabs: "A. Nomination", "B. Trg Prog", "C. Justification", "D. Other Participants", "E. Approval", "F. Attachments", "G. Eval..", "I. HR Use Only", and "E. APPROVAL SECTION & HISTORY LOG".

The "E. APPROVAL SECTION & HISTORY LOG" tab is active, showing two tables: "Approval Level" and "Withdraw Level".

Approval Level:

1. Imm Superior/Nominator	Approved Date	Status	Remark
CHEW SERN SIANG	29/08/2018	Approved	
2. HOD	Approved Date	Status	Remark
MUZAHID SHAH ABDUL RAHMAN	29/08/2018	Approved	OK
3. SHR	Approved Date	Status	Remark
CARMEN TAN CHIA MENG	30/08/2018	Verified	OK TRA272APP(M)-JDE30AUG18-BUDGETED FY18 BOND222APP(M)-JDE- NO BOND
4. PCM	Approved Date	Status	Remark
CHEAH KOK HOONG	03/09/2018	Approved	
<i>Finance PIC - FYI</i>			

Withdraw Level:

1. Requested By	Requested Date	Status	Remark
2. HOD	Approved Date	Status	Remark
MUZAHID SHAH ABDUL RAHMAN			

At the bottom, there is a "Comment Log" section.

Figure 2.8 Screenshot of employees need always check the status of approval (Source: e-LEAD, 2018)

2.4 Analysis Problem for Current System

A study on e-Learning & Development System (e-LEAD). The problems faced by management and employees are as follows:

- i. Limit access to the old system due to IBM Lotus Note software security, only enable to access using company network.
- ii. The device must install IBM Lotus Note software to access the old system.
- iii. HR need to manual send training information by email.
- iv. Existing system not user-friendly interface difficult for new user to learn and use.
- v. Existing system did not provide filter data function, and does not have data management control, all user can view all the data.

Yr	Dept	Name	Type	Training Subject	Cost	Training Hours	Created
2018					1,859,923.61	27,529.00	
				ACADEMIC ENHANCEMENT DIVISION	27,939.00	222.00	
				ANN ROSNIDA BINTI MD DENI	12,934.00	103.00	
				ANNYZA TUMAR	14,985.00	111.00	
	External	Conference	6th Teaching and Education Conference, Vienna		10,160.00	32.00	16/05/2018
	External	Outcome-Based Education (OBE) Applying OBE into Teaching, Evaluation and Assessment Incorporating COPPA 2nd edition			1,695.00	16.00	31/07/2018
	External	ISO 9001:2015 Advanced Internal Auditors Training			100.00	7.00	26/04/2018
	External	Outcome-Based Education: Applying OBE into Teaching, Evaluation and Assessment Towards Malaysian Qualification Agency (MQA) Accreditation			3,010.00	16.00	19/03/2018
	External	2018 Lancaster University Educational Development Programme Visit			0.00	40.00	02/02/2018
	HIAP POH TIN				40.00	8.00	
		Microsoft Excel 2016 (Advanced)			40.00	8.00	23/11/2018
		ACADEMIC STANDARDS AND QUALITY OFFICE			4,850.00	166.00	
		AZLIZA BINTI HASSAN			1,800.00	66.00	
	External	Siega 2018 Theme: Quality Assurance for Education 4.0: Strategies & Innovation in			400.00	10.00	27/08/2018

Figure 2.9 Screenshot of data management did not filter and everyone can review others

(Source: e-LEAD, 2018)

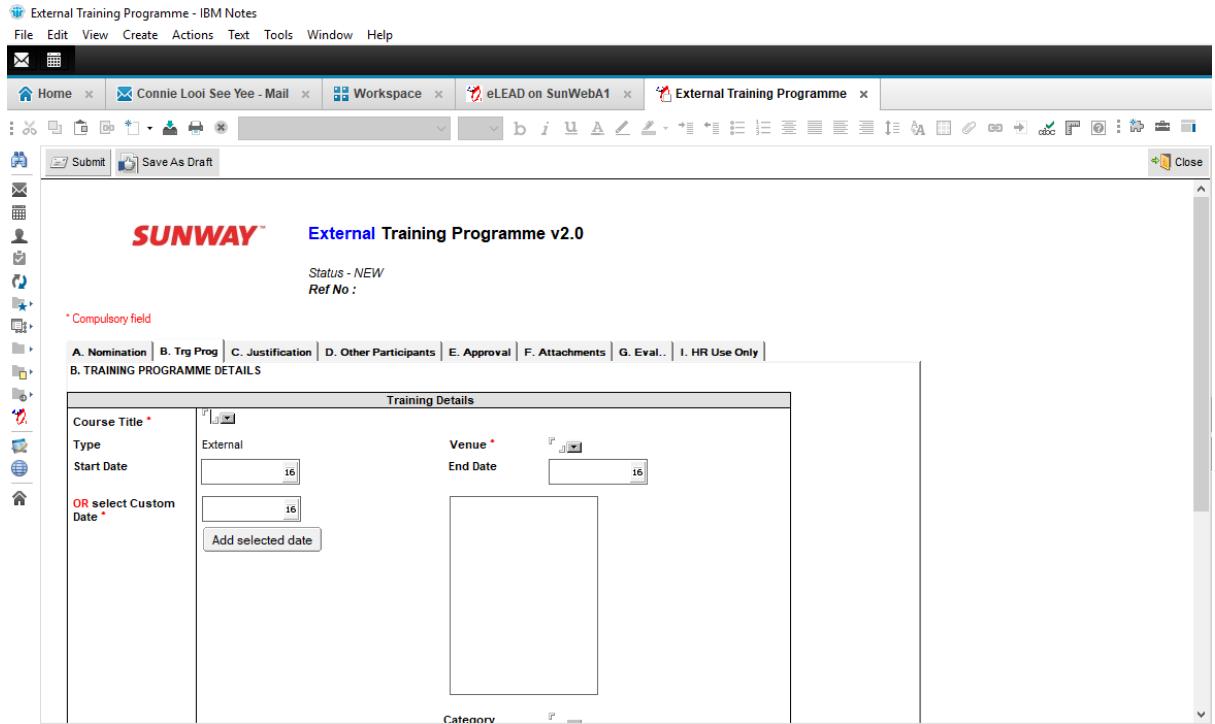


Figure 2.10 Screenshot of email notification already inform the date and place, it should not fill by staff (Source: e-LEAD, 2018)

2.5 Analysis others existing System

From a study on existing systems, it is apparent that user interface and data filter and management is the main problem. This will give the idea to development Hitachi Sunway Training Management System (HSSTMS) which can overcome all the weaknesses for user interface and data filter and management.

The purpose of conducting a comparative study on this system is to study the existing system to obtain the features in the system. These features may be applied to the development of the system that has been developed. Two types of comparable systems are the following subtopics.

2.5.1 Training Management Solutions by Training Orchestra

Training Management Solutions by Training Orchestra is focused on the training sessions organization and is built for training administrators. Its core is its back-office capabilities, and it is centered on company organization's processes. It also incorporate some end-user portals as well, the people who use a TMS on a day-to-day basis are key stakeholders such as training managers, HR professionals, corporate university directors.

System features:

- i. Use PHP language to develop the system
- ii. Use internet to access in the web based
- iii. Enable to display calendar view and its schedule
- iv. Provide search engine to search the training
- v. Display all the training schedule and different by colour for user to easy review

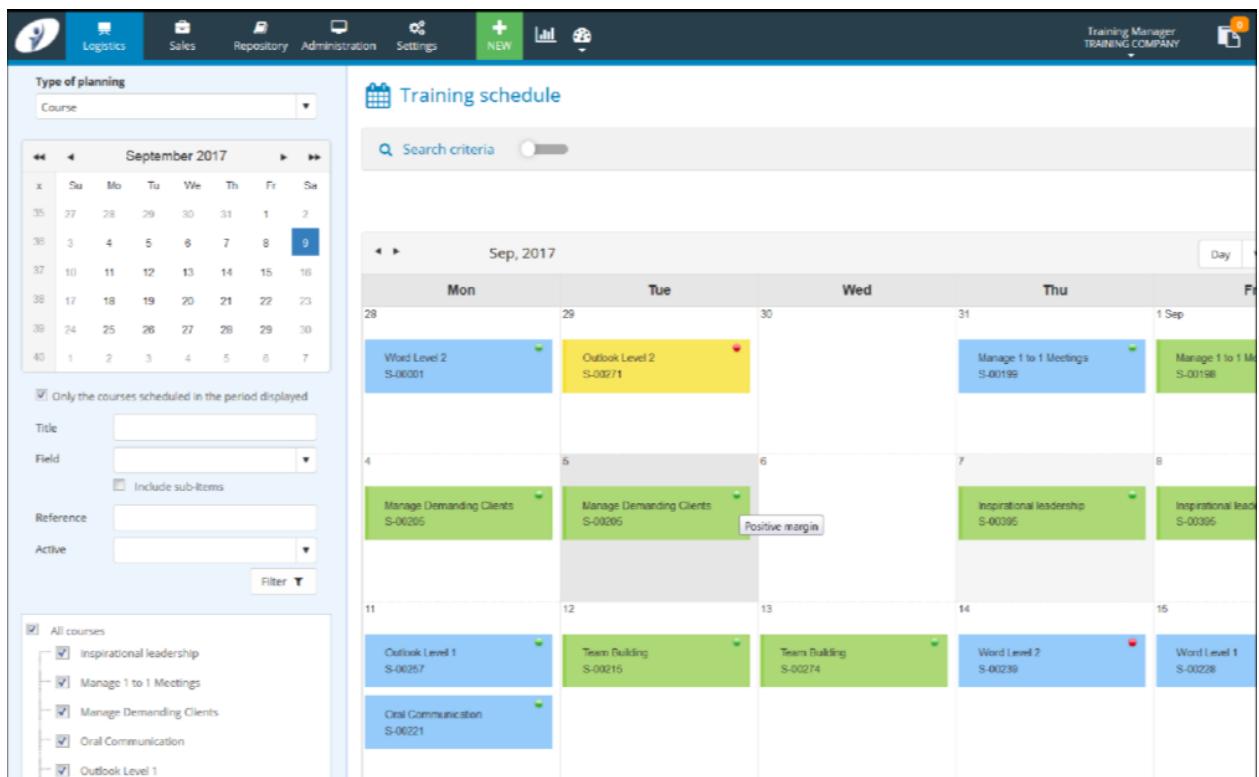


Figure 2.11 Screenshot of the interface of Training Management Solutions by Training Orchestra (Source: Training Orchestra, 2018)

2.5.2 NovigoTMS

NovigoTMS is a web based fully customizable Training Management Framework with inbuilt workflow engine that allows to setup a training management system suiting business needs. NovigoTMS allows users to schedule, track and report trainings, manage certifications and qualifications for individual employees, contractors or chosen workgroups. This will decrease the costs, time taken and resources deployed in maintaining your training program. NovigoTMS is built on SharePoint and can therefore leverage all the capabilities associated with SharePoint.

System features:

- i. Use PHP language to develop the system
- ii. Use internet to access in the web based
- iii. Not enable to show calendar view and its schedule
- iv. Don't have search engine to search the training
- v. Don't have a statistic for user to review the training schedule

Add New Course

Course Title *	<input type="text"/>
Category *	Internal
Course Type *	Commercial
Sub Type *	Assertiveness
Training Provider	(None)
Instructor	(None)
Charged To	(None)
Responsible Team	(None)
Currency Code	AED
Course Fee	0.00
Please enter the Course Fee calculated per Trainee	
Other Expenses	<input type="text"/> 0
Exchange Rate	<input type="text"/>
Course Status	Active
Course Note	<input type="text"/>
Training Location *	Dubai
City *	Dubai
Country *	United Arab Emirates
<input type="checkbox"/> Is ID Card Print Required <input type="checkbox"/> Is Certificate Print Required	

Save **Cancel**

Figure 2.12 Screenshot of the interface of NovigoTMS (Source: NovigoTMS, 2018)

2.6 Compare between Existing System

Comparison have been made between e-LEAD, Training Management Solutions and NovigoTMS. There are a few similarities and differences between the systems. Table 2.1 show the comparison between the systems.

Table 2.1: Comparison between proposed system and existing system

Features	e-LEAD	Training Management Solutions	NovigoTMS
Technology	Application	Web Based	Web Based
Login Modules (Different user different login ways)	X	X	X
User involved	i. Employees ii. HR iii. Employee iv. Admin IT	ii. HR iii. Employee iv. Admin IT	i. HR ii. Employee iii. Admin IT iv. Trainer
Update Personal Detail	X	✓	✓
Search For Training Available	X	✓	X
View Status Training	✓	✓	✓
Training canlander View	✓	✓	X
Generate report	X	✓	✓

2.7 Solution Proposal

After analysed the problem, suggestions on problem solving are to build seven modules. Module suggestions are as follows:

- i. Modules that allow users to log in to access the system.
- ii. Module that enable employees to apply for a training or courses.
- iii. The module allows employees to check the status of training or courses application.
- iv. The module for the approving officer approves the application submitted by the employees.
- v. Module for employees to view the list of applications for register or that have been applied (application history) in the system.
- vi. Module report to generating the report for Hitachi Sunway HR to tracking and analysis.
- vii. Module enable user to search the training schedule.

2.8 Literature Review on Technology Used

This part of the document covers the study of technology, tools and techniques used in the development of the Hitachi Sunway Training Management System (HSSTMS).

2.8.1 Hypertext Preprocessor (PHP)

The programming language that will be used to develop Hitachi Sunway Training and Development Management System will be PHP. PHP stands for Hypertext Preprocessor is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. PHP scripts are executed on server and it's free to download and use. Moreover, PHP can generate dynamic page content and encrypt data. PHP also can run on various platforms such as Windows, Linux and Mac OS.

Other advantage to choose PHP is because it is one of the easiest languages for building websites, which allows developers to quickly grasp on web development. PHP is very similar to C and Java therefore if a developer knows how to write code in C and Java, they can quickly learn PHP scripting language too. Furthermore, it is much faster than any other scripting language because it does not require a lot of system's resources. Even running with other software without getting slow and making other processes slow. A website made on PHP programming language is much easy to get hosted and more supportive. That is why it is one of the reasons that PHP is the best programming language for website development. PHP is the scripting language with the largest user base.

2.8.2 MySQL Database

MySQL is the most popular database system used with PHP. MySQL is a database system used on the web and runs on server. The data in a MySQL database are stored in tables. A table is a collection of related data, and it consists of columns and rows. Databases are useful for storing information categorically. MySQL can cost-effectively help to deliver high performance, scalable database applications.

2.9 Conclusion

Overall, this chapter has done a literature review of the current system and existing systems. From the study and comparison of the existing system, all the most important element and feature that need to be included in the proposed system has been figured out. The proposed system will follow all the results from the literature review.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In system development, methodology is an important aspect, to make sure the system will be developed according to the user requirement, and completed on schedule. According to the Oxford Advanced Learner's dictionary (8th edition), methodology is a method used in certain area of activity. Methodology is a framework in system development where the function is to structure, plan, and control the process of developing a system. There are several methodologies available to use to develop a system such as Waterfall Model, Iterative Model, Spiral Model, V-Model, Agile, Rapid Application Development (RAD), Rational Unified Process (RUP), Prototype, and Scrum Model.

Methodology is important to ensure the development of the system will be done in a systematic way. Choosing the right methodology to fit the system requirement is crucial because not all methodology can be used for a certain system. This chapter will explain the methodology chosen to develop HSSTMS and all the phases involved as well as the system requirement analysis.

3.2 Assessment of Methodology

The methodology is derived from the root word of the method which generally means a step-by-step action to implement a task or to achieve an objective. Methodology is a combination of paradigm, methods, procedures, rules, standards, techniques and tools as well as programming languages used to analyse and programming languages used to analyse and describe system design requirements. There are many different types of methodological models today. The most known methodologies will be waterfall models, spiral models and prototype model which is being widely used in software development.

3.2.1 Waterfall Model

The waterfall model is the first and traditional process model. It also called as Classic Life Cycle Model and oldest model for Software Engineering. Often considered the classic approach to the systems development life cycle, the waterfall model describes a development method that is linear and sequential. The project emphasized on planning, time schedule, target dates, budgets and implementation of an entire system at one time. The tight control is maintained over the life of the project through the use of extensive written documentation, as well as through formal reviews and approval/signoff by the user and information technology management occurring at the end of most phases before beginning the next phase.

The following illustration is a representation of the Water Model, listing the phases

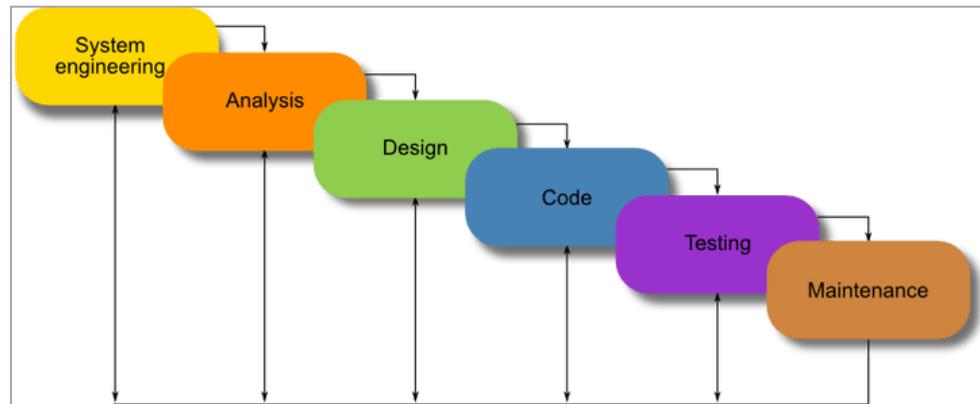


Figure 3.1 Waterfall Methodology (Source: Airbrake.io, 2018)

Below are the sequential phases in Waterfall model with the brief explanation:

Table 3.1: Phases in Waterfall Model

Phase	Explanation
Phase 1: Requirement Gathering and analysis	All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document.
Phase 2: System Design	The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture.
Phase3: Implementation	With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality, which is referred to as Unit Testing.

Phase 4: Integration and Testing	All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.
Phase 5: Deployment of system	Once the functional and non-functional testing is done; the product is deployed in the customer environment or released into the market.
Phase 6: Maintenance	There are some issues which come up in the client environment. To fix those issues, patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

All these phases are cascaded to each other in which progress is seen as flowing steadily downwards through the phases. The next phase is started only after the defined set of goals are achieved for previous phase and it is signed off, so the name "Waterfall Model". In this model, phases do not overlap.

3.2.2 **Spiral Model**

Spiral model is an evolutionary software process model which is a combination of an iterative nature of prototyping and systematic aspects of traditional waterfall model. This model was not the first model to discuss iterative development, but it was the first model to explain why the iteration matters. The spiral model mainly focus on the risk assessment and on minimizing project risk by breaking a project into smaller segments and providing the opportunity risks and weigh consideration of project continuation throughout the life cycle. Each life cycle involves a progression through the same

sequence of steps, for each portion of the product and each of its levels of elaboration, from an overall concept of operation document down to the coding of each individual program. Each trip around the spiral traverses four basic quadrants determine objectives, alternatives and constraints of the iteration, evaluate alternatives: identify and resolve risks, develop and verify deliverables from the iteration and plan the next iteration. Spiral model begins each cycle with an identification of stakeholders and their win conditions, and endeach cycle with review and commitment.

The following illustration is a representation of the Spiral Model, listing the activities in each phase.

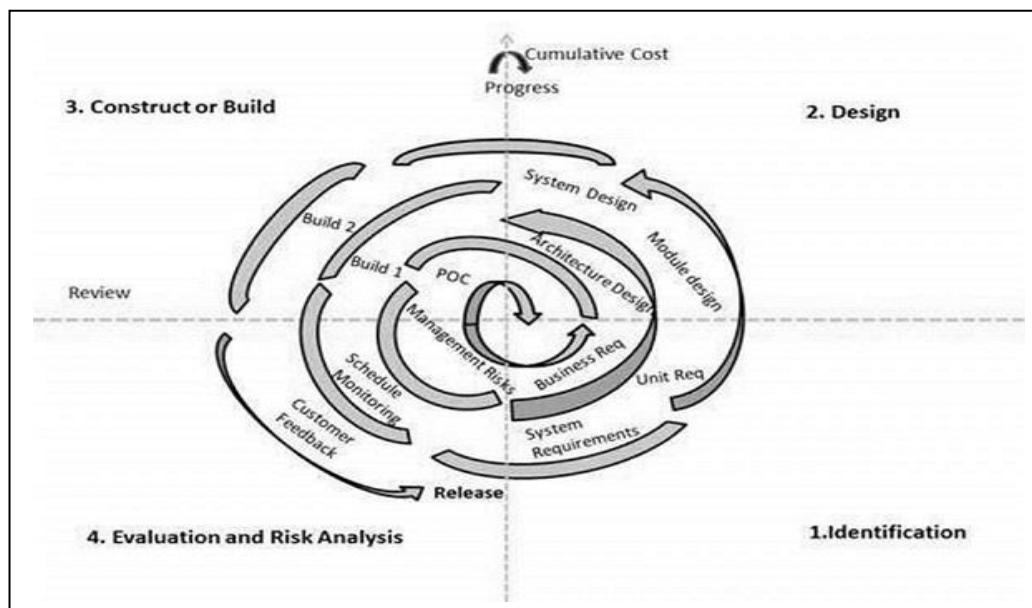


Figure 3.2 Spiral Model (Source: Airbrake.io, 2018)

The spiral model has four phases. A software project repeatedly passes through these phases in iterations called Spirals.

Table 3.2: Phases in Spiral Model

Phase	Explanation
Phase 1: Identification	<p>This phase starts with gathering the business requirements in the baseline spiral. In the subsequent spirals as the product matures, identification of system requirements, subsystem requirements and unit requirements are all done in this phase.</p> <p>This phase also includes understanding the system requirements by continuous communication between the customer and the system analyst. At the end of the spiral, the product is deployed in the identified market</p>
Phase 2: Design	The Design phase starts with the conceptual design in the baseline spiral and involves architectural design, logical design of modules, physical product design and the final design in the subsequent spirals.
Phase 3: Construct or Build	<p>The Construct phase refers to production of the actual software product at every spiral. In the baseline spiral, when the product is just thought of and the design is being developed a POC (Proof of Concept) is developed in this phase to get customer feedback.</p> <p>Then in the subsequent spirals with higher clarity on requirements and design details a working model of the software called build is produced with a version number. These builds are sent to the customer for feedback.</p>
Phase 4: Evaluation and Risk Analysis	Risk Analysis includes identifying, estimating and monitoring the technical feasibility and management risks, such as schedule slippage and cost overrun. After testing the build, at the end of first iteration, the customer evaluates the software and provides feedback.

3.2.3 Prototype Model

The prototype model requires that before carrying out the development of the actual software, a working prototype of the system should be built. A prototype is a toy implementation of the system. A prototype usually turns to be a very crude version of the actual system, possibly exhibiting limited functional capabilities, low reliability and inefficient performance as compared to the actual software. In many instances the client only has a general view of what is expected from the software product. In a such scenario where there is an absence of detailed information regarding the input to the system, the processing needs and the output requirements, the prototype model may be employed.

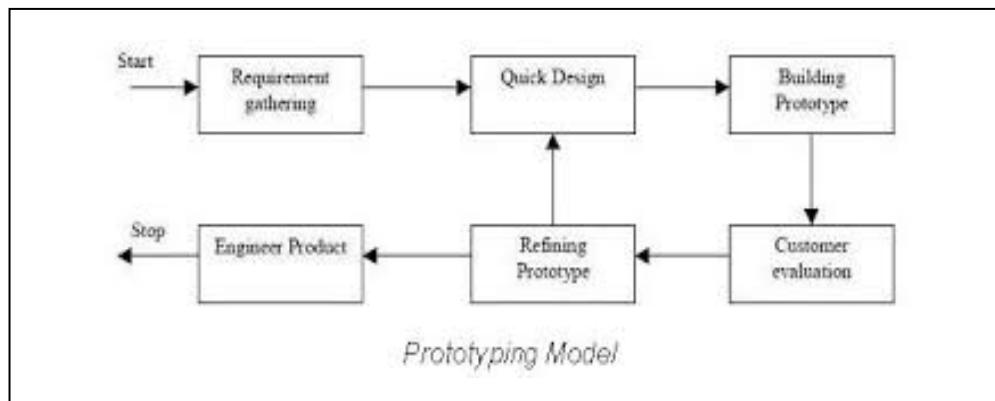


Figure 3.3 Prototype Model (Source: Airbrake.io, 2018)

Following is a stepwise approach explained to design a software prototype:

Table 3.3: Phases in Prototype Model

Phase	Explanation
Phase 1: Requirements Gathering and Analysis	The requirements of the system are defined in detail.

	The user is interviewed in order to know the requirements of the system.
Phase 2: Quick Design	When requirements are known, a preliminary design or quick design for the system is created. It is not detailed design; however, it includes the important aspects of the system, which gives an idea of the system to the user.
Phase 3: Build Prototype	Information gathering from quick design is modified to form a prototype. It represents a rough design of the required system.
Phase 4: Assessment or user evaluation	The proposed system is presented to the user for consideration as part of the development process.
Phase 5: Prototype Refinement	Once the user evaluated the prototype, it is refined according to the requirements. When the user is satisfied with the developed prototype, a final system is developed based on the final prototype.
Phase 6: Engineer Product	The final system is thoroughly evaluated and tested followed by routine maintenance on a continuing basis to prevent large-scales failures and to minimize downtime.

3.3 Studies on Selected Methodologies

Based on the comparative research that has been done earlier, prototype model has been selected to develop the system. A brief study should be carried out to justify the

suitability of applying this model in developing the system. Prototype model is divided into six phases which will be requirements gathering and analysis, quick design, build prototype, assessment or user evaluation, prototype refinement and engineer product. At one glance it resembles the phases found in the Waterfall Model. The main difference is an iterative process that takes place before the complete system acquired.

3.4 Justification of Methodology Usage

Prototype methodology is chosen because it is difficult to understand the user requirements in the system. There are four different user in HSSTMS and each and everyone of them have different requirements. To fulfill all those requirements, a testing will be done on the system before the actual implementation occur. User involvement in the system need to be high to get more complete feedback and suggestion. Based on those feedback and suggestion, HSSTMS can be developed more efficiently and eliminating any misunderstanding that can occur between user and the system. The final prototype will more likely to satisfy the user's requirement for feel, look and performance (Sabale, 2012).

Prototype methodology were made from six phases that is planning, analysis, design, development, implementation and testing, and operation and support phase.

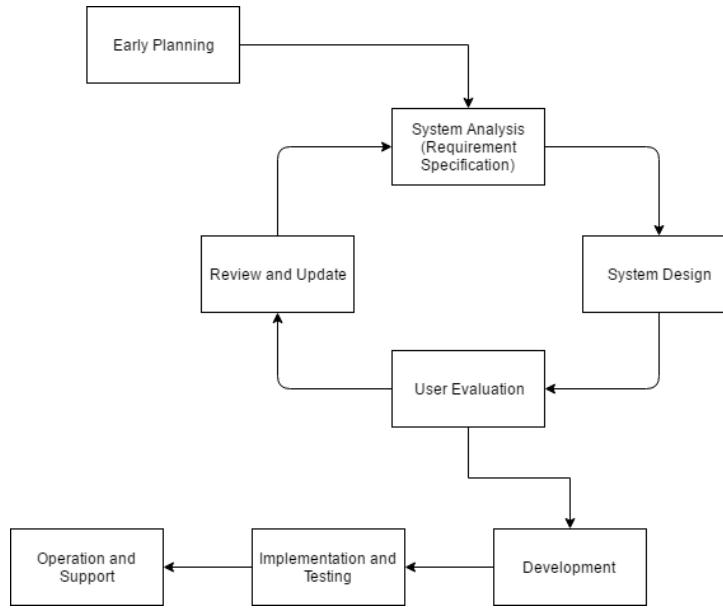


Figure 3.4 Phases in prototype methodology (Source: Airbrake.io, 2018)

3.4.1 Planning Phase

Planning phase is the first phase in prototype methodology. The main purpose of this phase is to identify the problem statement on current system analysis, goals of the project, scope, objective and the importance of developing the system. Every activity occur in the project must be planned using Gantt Chart to make sure all the planning will follow the time given and stay on track.

3.4.2 Analysis Phase

Analysis phase are conducted to analyze information gathered from various interviews and research on the user of the system. Based on the interview, HR are in need of the new system which is HSSTMS to replace the existing system. Suggestion requirements also being stated for the new system such as online monitoring, applying application online and generating report. Moreover, based on the research done on the

current system, HR have also required for the new system to be able to do all the functionalities of current system, online.

Analysis on system requirement are also done to identify the user's modules, technology used as well as hardware and software justification.

3.4.3 Designing Phase

In designing phase, developer has to create a design of the proposed system. Design included use case diagram, sequence diagram, class diagram, entity relation diagram and activity diagram. By referring to all these design a prototype can be made to test the user functional requirement on proposed system.

3.4.4 Development Phase

During development phase, a prototype are develop based on all the requirement identified from previous phases. The main purpose of this phase is to develop a prototype of the proposed system. In this phase, all the changes on the prototype need to be made whether it is for improvement or fulfilling user requirement. The development will go back to previous phase which is analysis and designing to complete the prototype.

3.4.5 Implementation and Testing Phase

Implementation phase involved repeating process of changes on the system prototype where if there are any feedback or suggestion of improvement, it will be

implemented on the prototype. When all the changes have been made and there are no possible modification, implementation will undergo for the actual system.

In this phase, the prototype model will be fully tested to identify any error before it can be used by the user. Testing including black box testing and white box testing. Black box testing is a software testing where the internal structure of the implementation is not known to the tester while white box testing is also a software testing but with the internal structure known to the tester.

3.4.6 Operational and Support Phase

This phase is the last phase in prototype methodology where it focused mainly on the user functional implemented. Training were to be given to the user including manual guide and technical support.

3.5 System Requirement Analysis

In HSSTMS, the system requirement are software and hardware. Hardware refer to the tools needed to develop the system where software function as a platform to do the coding and designing. Chosing the right hardware and software are important to fulfill user requirements.

3.5.1 Hardware Justification

For the development of HSSTMS, hardware justification are important to ensure it can operate at the optimum level according to the user environment. Table 3.1 is the hardawre minimum soecification that are used to develop HSSTMS.

Table 3.4: Hardware minimum specification

Hardware	Minimum Specification
Central Processing Unit	Intel® Core™ i3, 2.3GHz and above
Random Access Memory	4 GB and above
Hard Drice Capacity	500 GB and above
Operating system architecture	64-bit
Display	14" Display (Resolution: 1366x768)
Input device	Mouse and keyboard
Output device	Printer

3.5.2 Software Justification

Software used to develop HSSTMS are also important to ensure all development going smoothly. Table 3.2 show the software specification that will be use to develop HSSTMS.

Table 3.5: Software specification

Software	Specification
Windows 7,8,10	Operating System.
IE, Firefox, Chrome	Web browser to open system.
MySQL	Database Management System.
XAMPP	XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting

	mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts
Sublime Text	Sublime Text is a proprietary cross-platform source code editor with a Python application programming interface, supports many programming languages and maintained under free-software licenses.
Microsoft Office 2007	Web browser to open system
Microsoft Project 2007	Software used to develop Gantt Chart
Draw.io	Used to design ERD and class diagram.
Microsoft Visio Professional 2013	To design sequence diagram, swimlane diagram and use case diagram.

3.6 Project Planning

Development of HSSTMS are showed using Gantt hart. Gantt chart will explain every step in developing HSSTMS and what are theactivity need to be done in those step. Gantt chart can be refer at Appendix A and Appendix B.

3.7 Conclusion

Overall, this chapter explains the methodology chosen to fit the development of the system. Justification was made to explain the methodology chosen. Furthermore, this chapter clearly explains each phases involved in the methodology. Each phases are important to make sure the system will be develop according to user requirement. In addition, this chapter also describe the hardware and software justification that will be used to develop the system.

CHAPTER 4

SYSTEM ANALYSIS AND DESIGN

4.1 Introduction

This chapter will explain further about the requirement analysis of the system and it will be designed such as database design and interface design. All actors and their functionalities will be displayed and described in detail. All the requirement analysis will be separated by module. This chapter analyses both users and system requirements for Hitachi Sunway Training Management System (HSSTMS) and illustrates the result using UML behavioural diagrams, which uses case diagrams, sequence diagrams, and activity diagrams. A Software Requirement Specification (SRS) is then used to document all these requirements and UML behavioural diagrams. Besides that, this chapter also describes the design of overall system architecture, system database and its graphical user interface. All the diagrams related to implementation design of the system HSSTMS is documented in a Software Design Document (SDD)

4.2 Requirement Analysis

Requirement analysis describes the system functionalities that were developed by each of the entities in the system. The requirement analysis must be precise, as this

requirement needs to meet all the users' expectation. This section discuss about the functional and non-functional requirements of HSSTMS which HSSTMS which sketches out roughly of what will be run in this system. Below are the requirements analysis from the literature review on Chapter 2. These requirements will then be implemented in the system through diagrams.

4.2.1 Use Case Modelling

Use case modelling will be implemented in requirement analysis phase. Use case modelling is used to describe the relationship between user and system. Each user is represented as an actor and will interact with each defined function. Activities involved in requirement phase are use case modelling, sequence diagrams and activity diagrams for each use cases involved.

4.2.1.1 Actor Description

An actor can be represented as a human, machine or system that interact with the system directly or indirectly. There are four actor involved in IDIS system development. Table 4.1 shows the actor with its description.

Table 4.1: Actor Description

No.	Actor	Description
1.	Admin	Consists of appointed system administrator or HR that will manage HSSTMS system user and generate report for reporting.
2.	Head of department	Consists of appointed head of department for that department for approve subordinate training request and also can apply training.

3.	Employee	Consists of appointed all the employee but exclude head of department for apply training and view training status.
4.	Trainer	Consists of appointed trainer can be internal or external for view the list of participant for their training session.

4.2.1.2 Use Case Description

Figure 4.1 below shows the use case diagram of Hitachi Sunway Training Management System (HSSTMS). This use cases are used to show an overview of the system's functional requirements. The aim of this diagram is to provide a better understanding of the system behaviour.

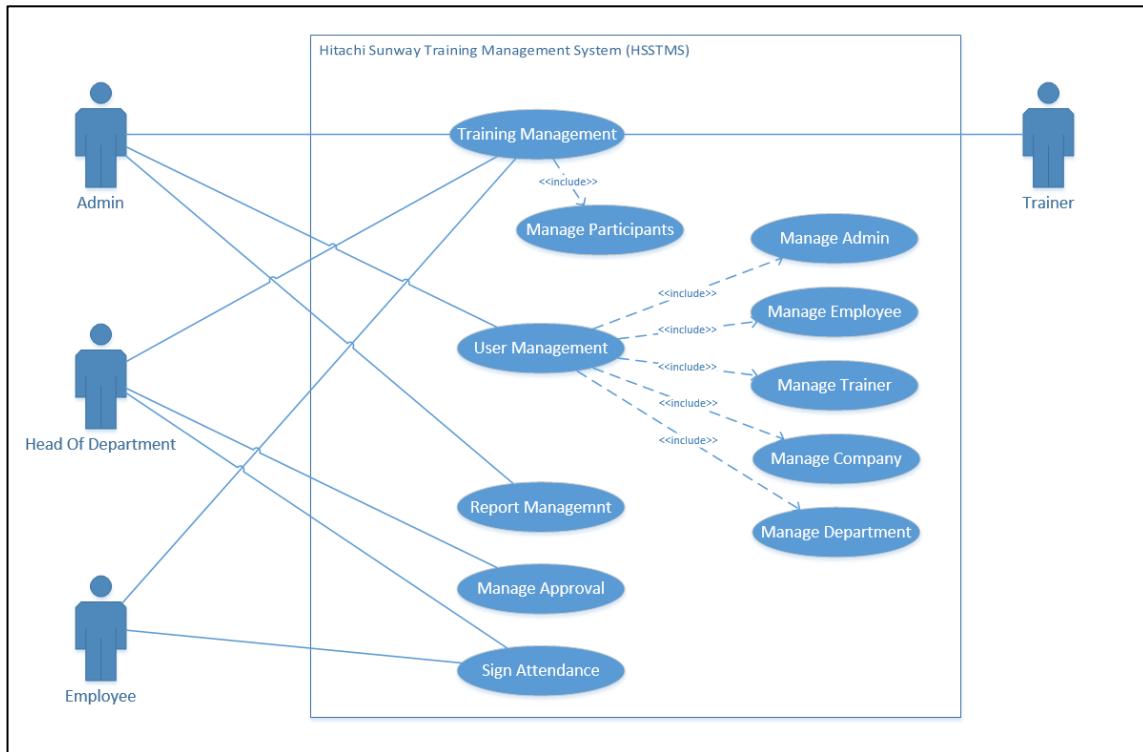


Figure 4.1: Hitachi Sunway Training Management System Use Case

Table 4.2: Use case description

Use Case	Actor	Description
Training Management	Admin, Head Of Department, Employee and Trainer	<p>Admin:</p> <ul style="list-style-type: none"> - Allow to add, delete or update the training - Allow to add, delete or approve the list of participants for each training. <p>Head Of Department and Employee:</p> <ul style="list-style-type: none"> - Allow to view and apply the training. <p>Trainer:</p> <ul style="list-style-type: none"> - Allow to view the list of participants for own training.
User Management	Admin	This use case will allow admin to add, delete or update for manage user admin, head of department, employee and trainer. It also allow admin to add, delete or update for manage company and department.
Report Management	Admin	This use case will allow Admin to generate the report in monthly or select other date range.
Manage Approval	Head Of Department	This use case will allow head of department to approve or reject their subordinate training request.
Sign attendance	Head Of Department and Employee	This use case will allow Head Of Department and Employee to sign their attendance for that day training.

4.3 Analysis Phase Workflow

Analysis phase workflow can be defined as a research and describing process of all requirements which have been collected during requirement phase workflow. In this phase, use case modelling has been used to analyse to get a clearer picture of the system design. These can be shown via activity diagram and sequence diagram.

4.3.1 Activity Diagram

Activity diagram is used to represent an interaction between activities and to show the process for each situation of the system that has been developed.

4.3.1.1 Login Activity Diagram

Figure 4.2 shows the activity diagram of login. System users need to log into the system with valid username and password. Once the username and password has been entered, user will be prompt a successful message and success login to the system. User will be prompt an error message if the username and password are invalid.

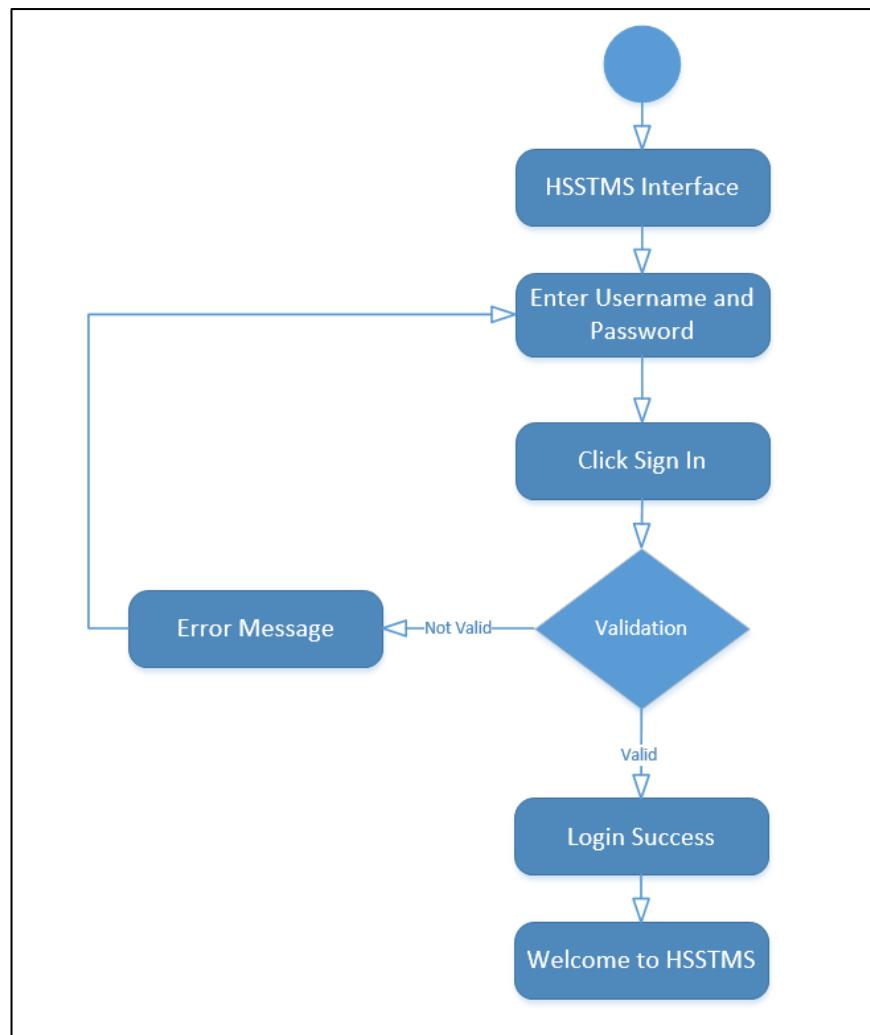


Figure 4.2: Login Activity Diagram

4.3.1.2 Training Management Activity Diagram for Admin

Figure 4.3 shows the activity diagram of training management for Admin. Admin allow to create new training. All training will assign a trainer. After created the training, Admin can update the training or delete the training from system. For each training, Admin can click inside to view the list of participants and add, remove or approve the participant.

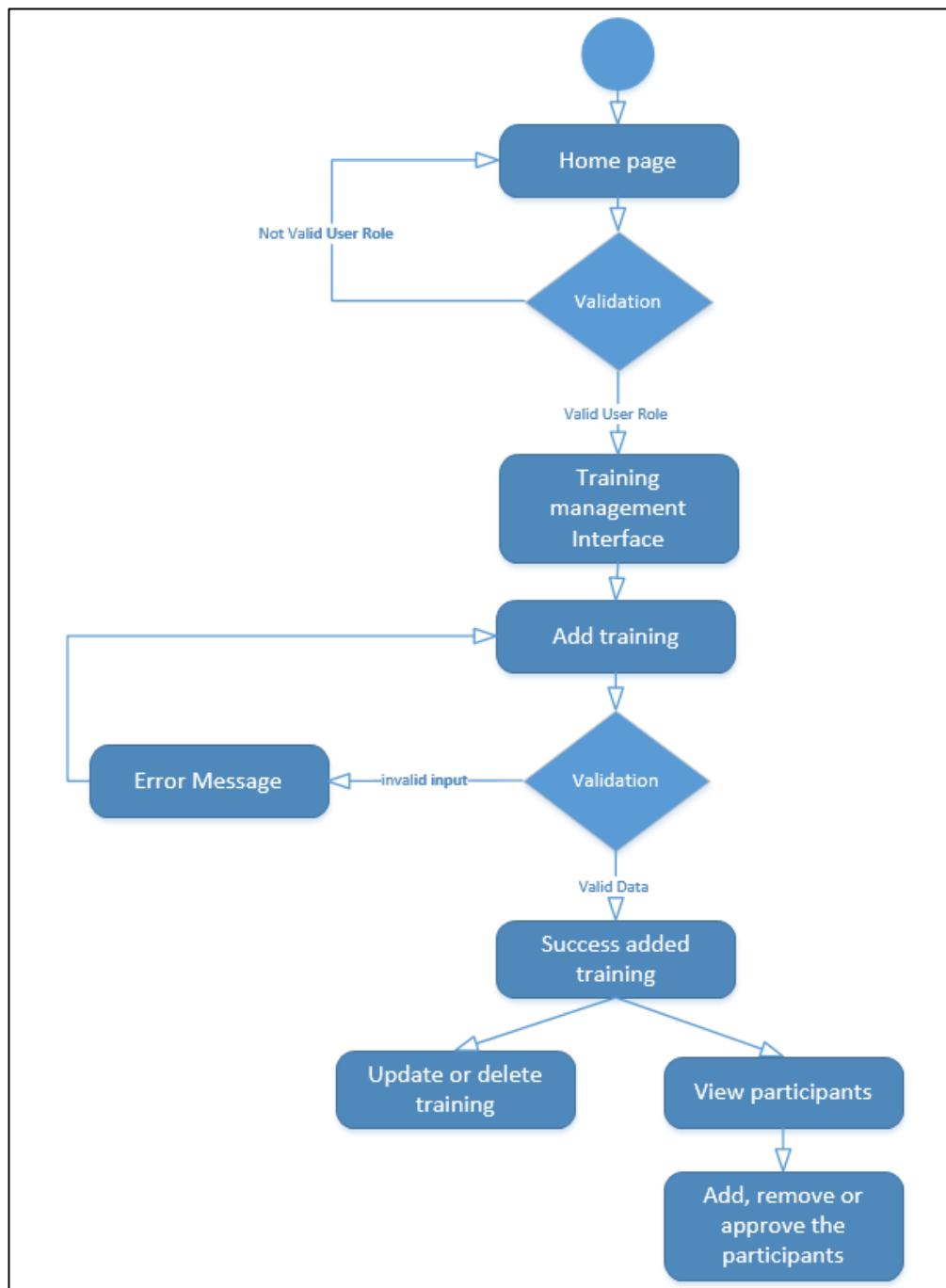


Figure 4.3: Training Management Activity Diagram for Admin

4.3.1.3 Training Management Activity Diagram for Head Of Department and Employee

Figure 4.4 shows the activity diagram of training management for Head of Department and Employee. These two users are allow to view the list of training and apply the training. They also can view the status training have been registered and the history complete training.

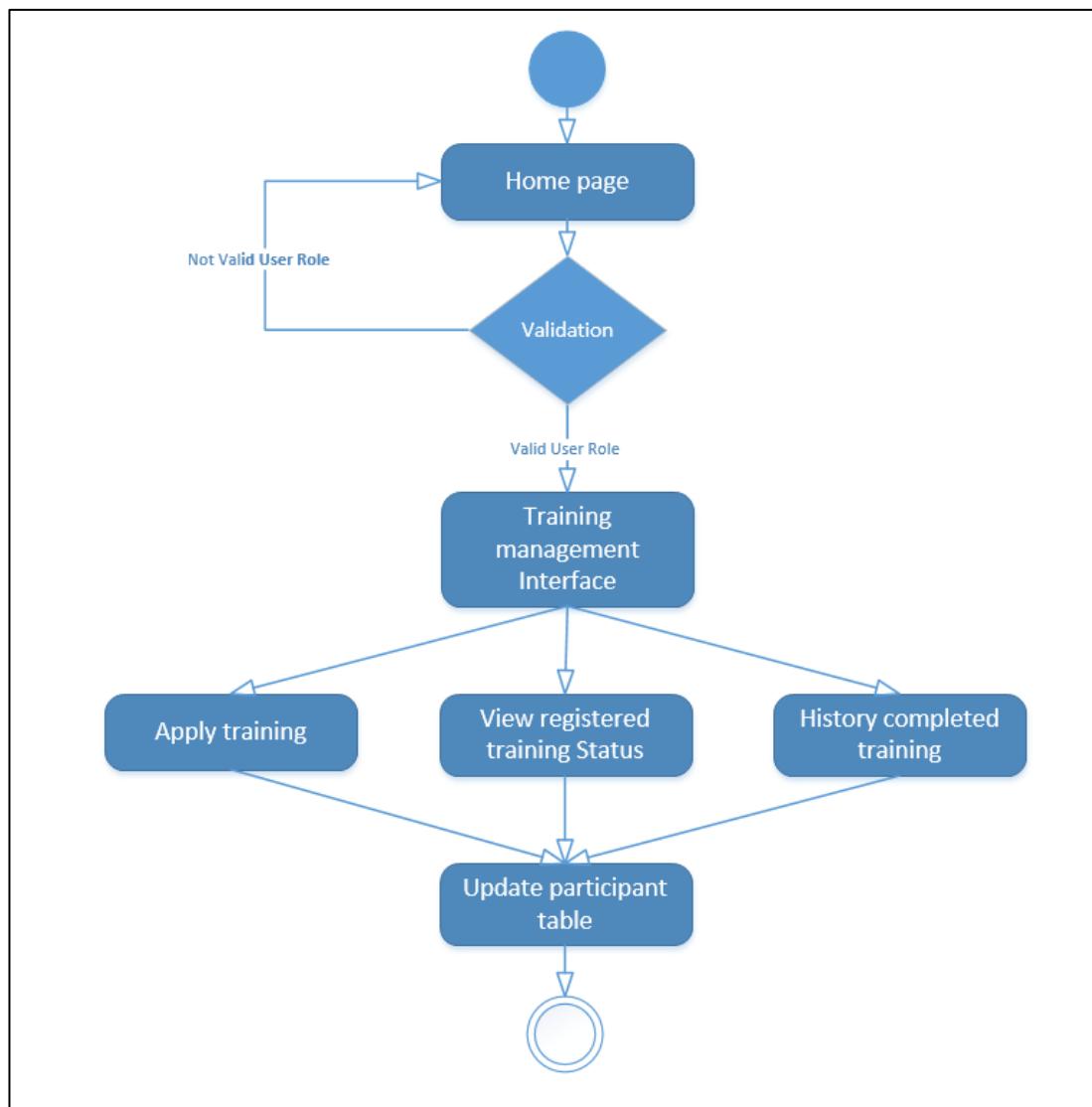


Figure 4.4: Training Management Activity Diagram for Head Of Department and Employee

4.3.1.4 Training Management Activity Diagram for Trainer

Figure 4.5 shows the activity diagram of training management for Trainer. This user allows to it training of list of participants. From the list of participants, trainer can random pick the name which the participant is attending the training

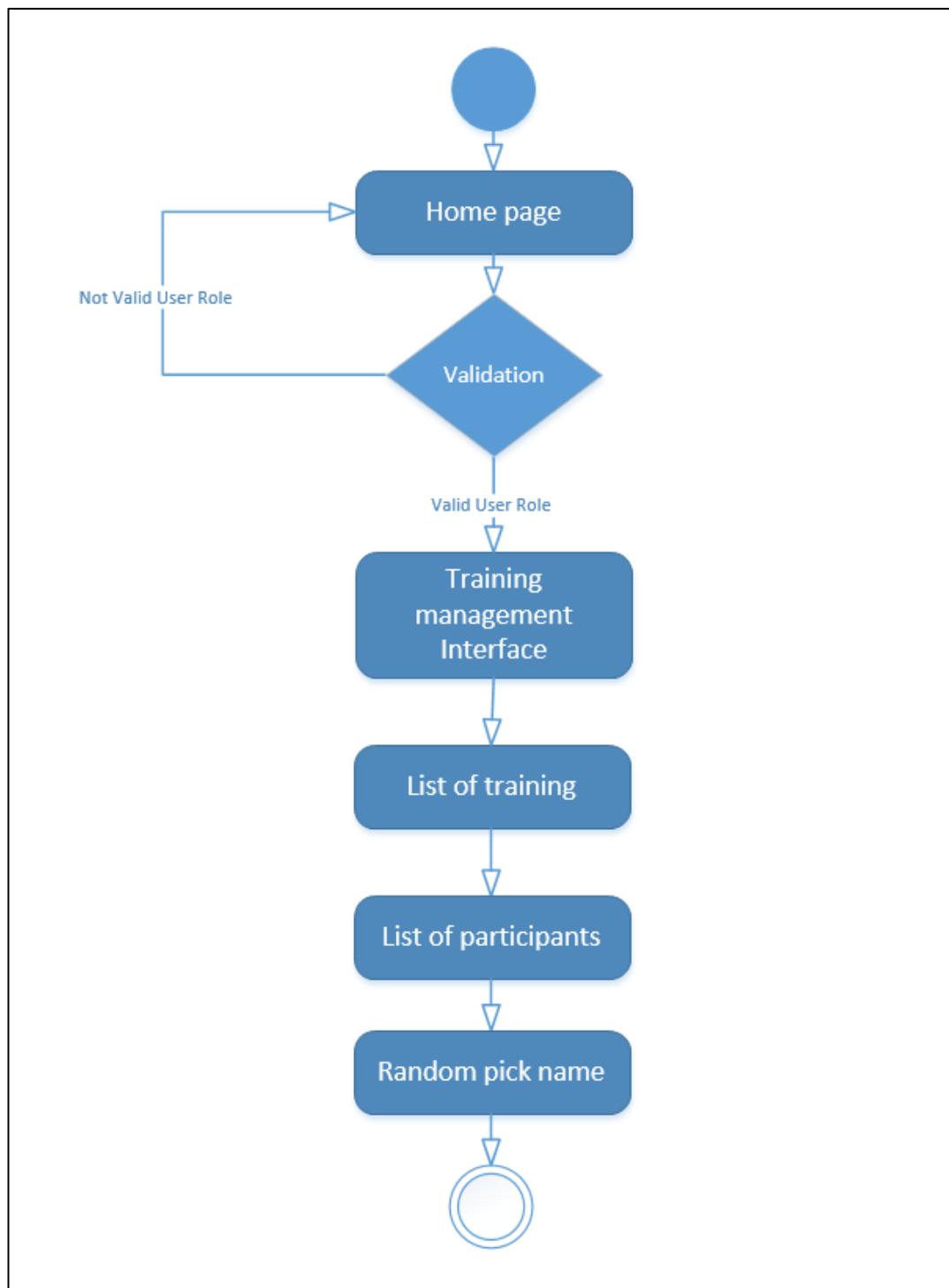


Figure 4.5: Training Management Activity Diagram for Trainer

4.3.1.5 User Management Activity Diagram

Figure 4.6 shows the activity diagram of user management. Admin allow to add, delete or update for manage user admin, head of department, employee and trainer. It also allows admin to add, delete or update for manage company and department.

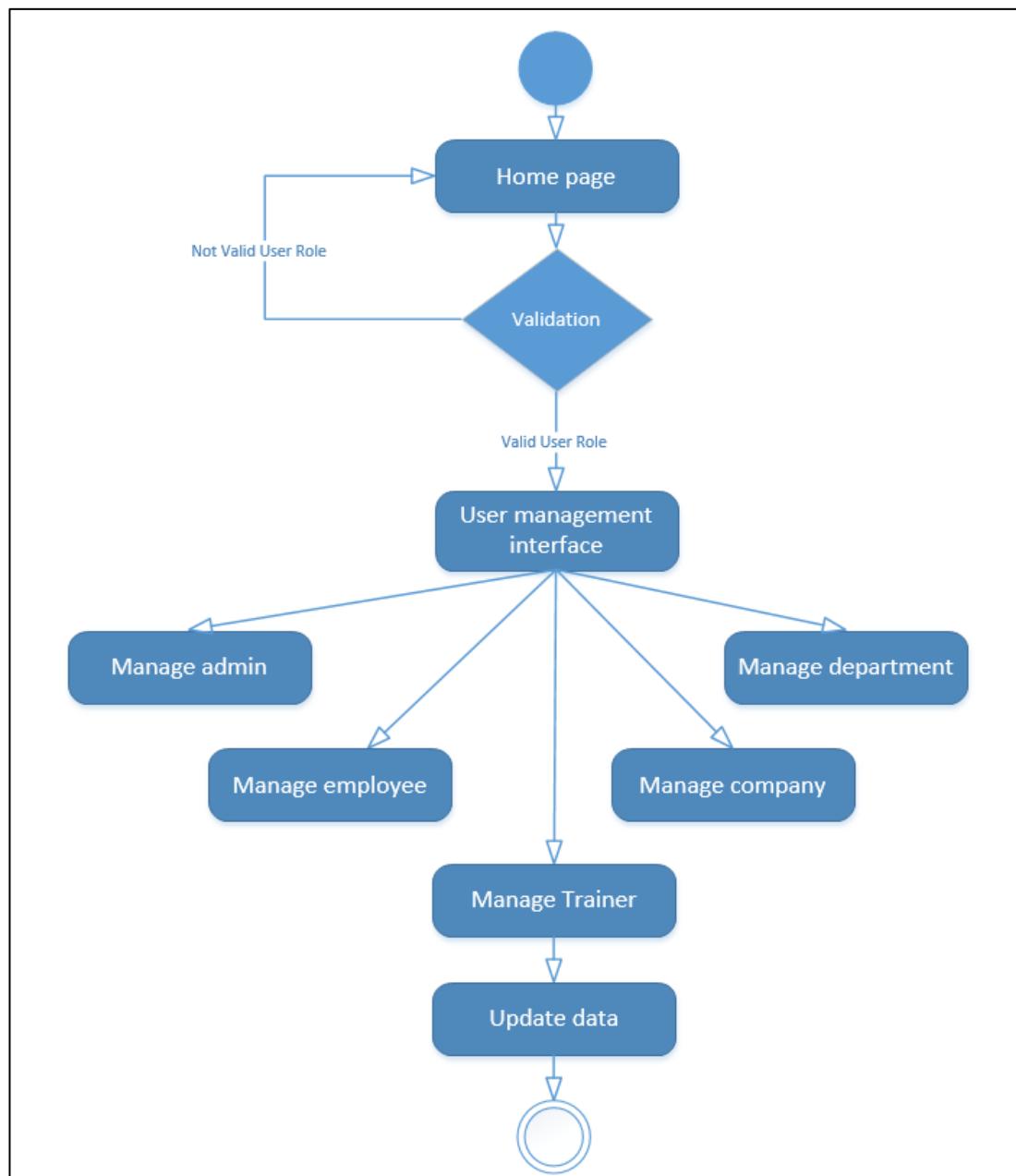


Figure 4.6: User Management Activity Diagram

4.3.1.6 Report Management Activity Diagram

Figure 4.7 shows the activity diagram of report management. Admin need to select the start training date and end training date to generate the report. The report will in excel format admin can use browser to download the report.

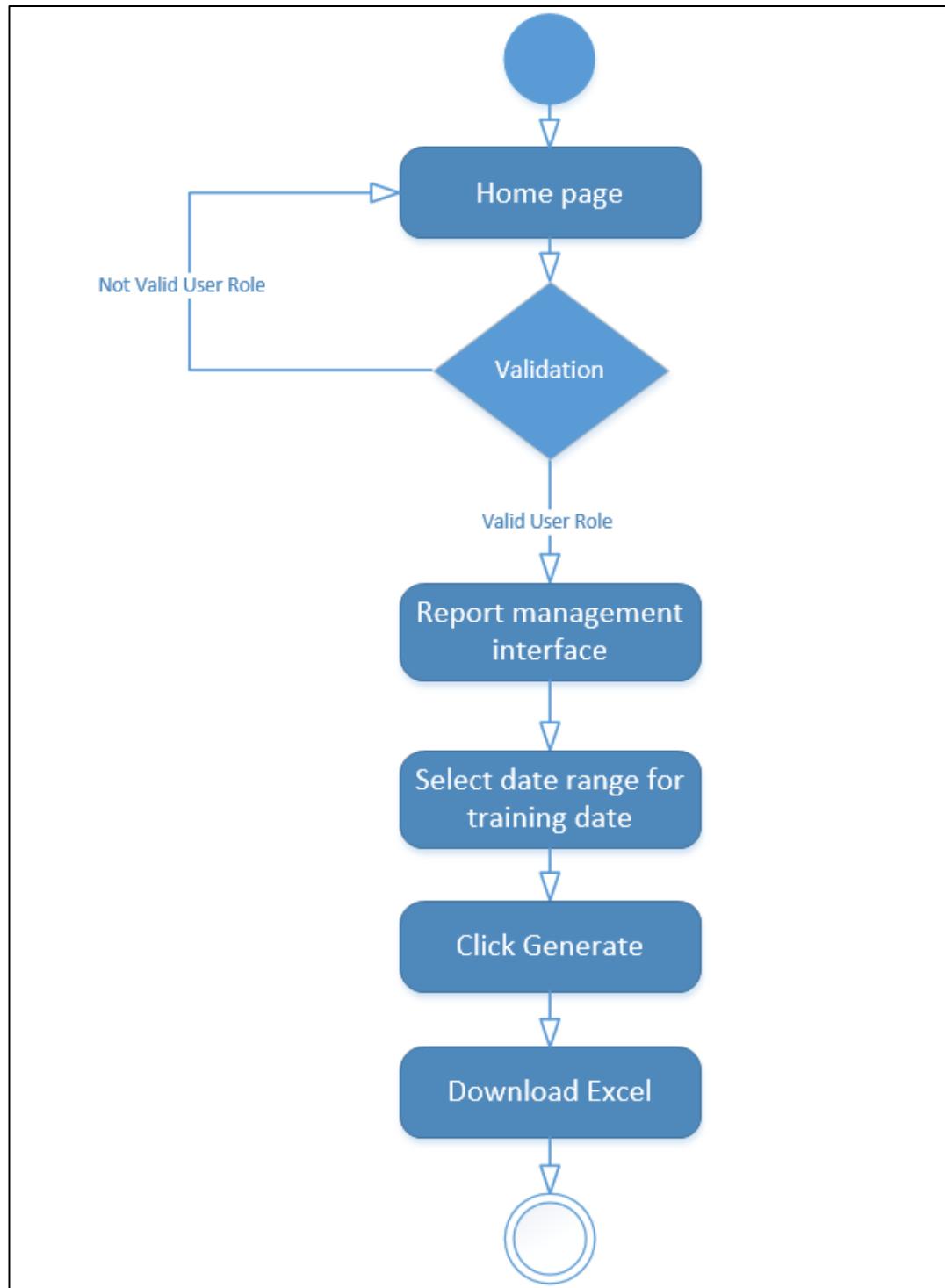


Figure 4.7: Manage User Activity Diagram

4.3.1.7 Manage Approval Activity Diagram

Figure 4.8 shows the activity diagram of manage approval. This function only enables for head of department to approve or reject their subordinate training request. Each the subordinate training request is processed either approve or reject, it will remove from the list of approval.

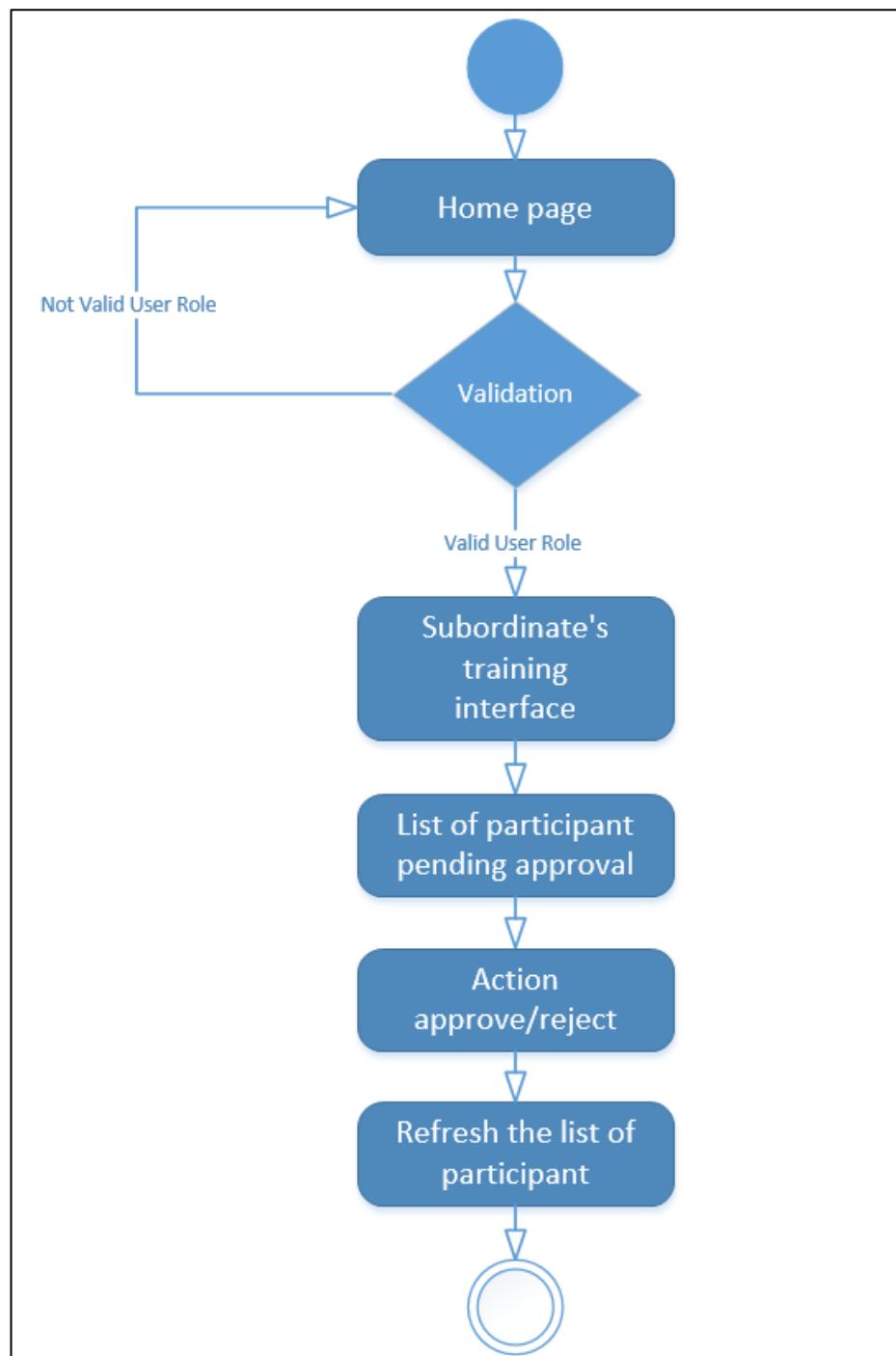


Figure 4.8: Manage Approval Activity Diagram

4.3.1.8 Sign Attendance Activity Diagram

Figure 4.9 shows the activity diagram of sign attendance. Head Of Department and Employee to sign their attendance when they attend the training on the same day. This sign attendance only available sign once per day.

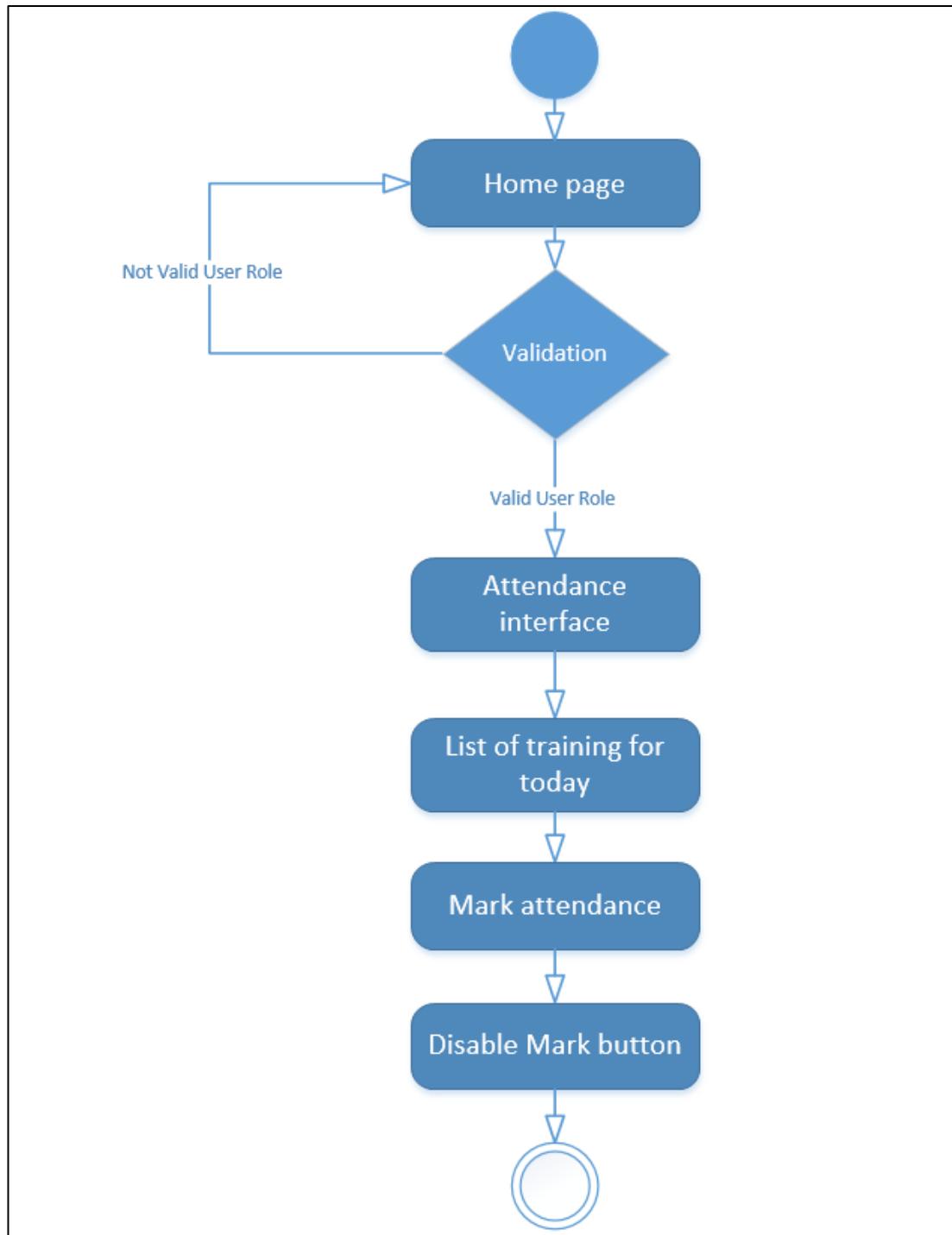


Figure 4.9: Sign Attendance Activity Diagram

4.3.2 Sequence Diagram

Sequence diagram is used to demonstrate how the behaviour of the objects from the use case diagrams is arranged in a time sequence. Figure 4.10 to Figure 4.17 illustrates the sequence diagram happened during for Hitachi Sunway Training Management System development.

4.3.2.1 Login Sequence Diagram

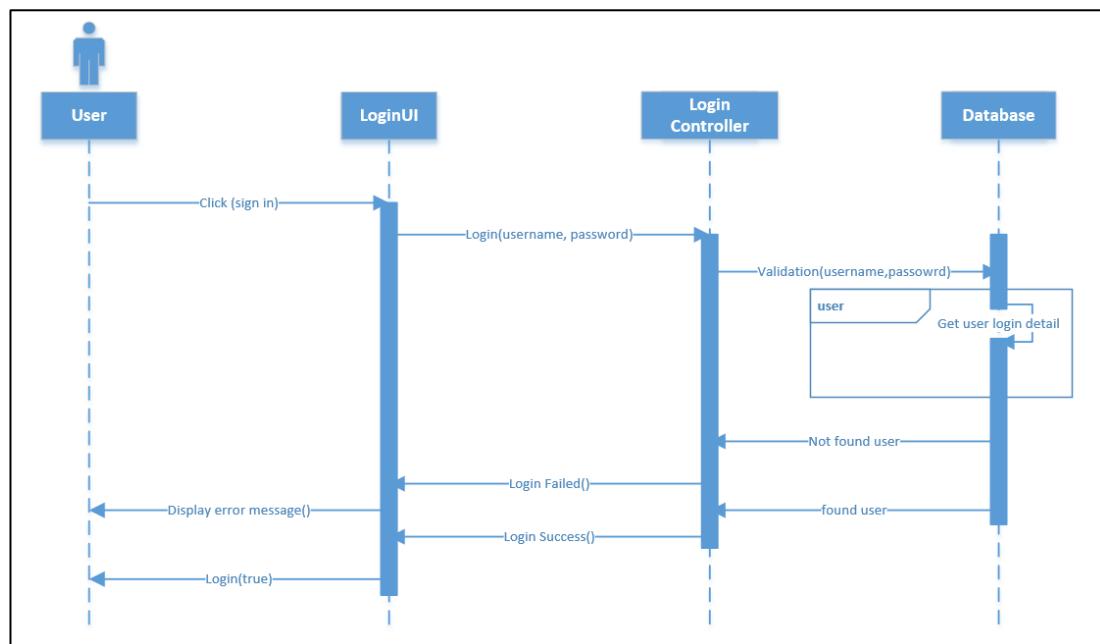


Figure 4.10: Login Sequence Diagram

4.3.2.2 Training Management Sequence Diagram (Add Training)

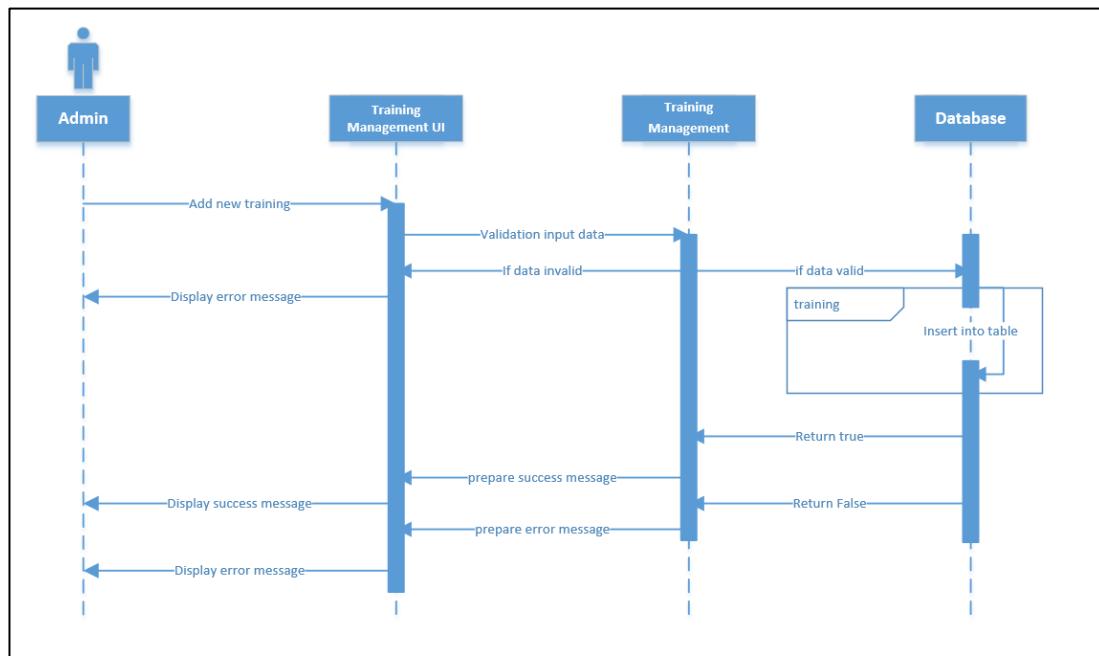


Figure 4.11: Training Management Sequence Diagram (Add Training)

4.3.2.3 Training Management Sequence Diagram (Apply Training)

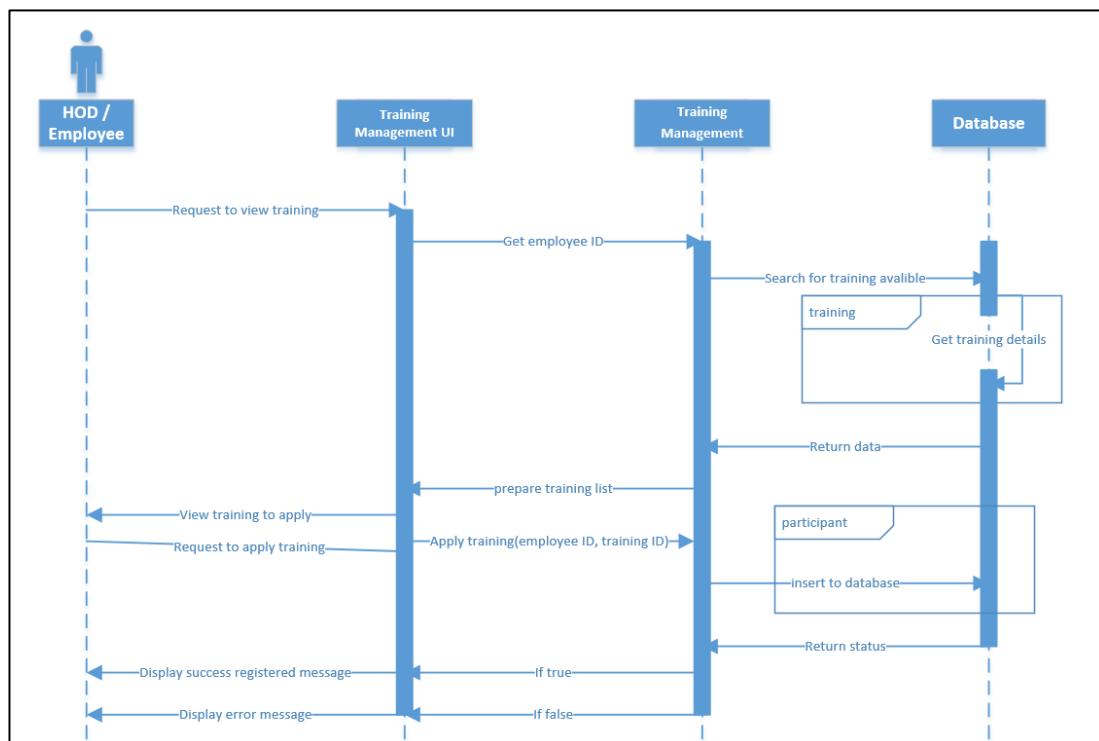


Figure 4.12: Training Management Sequence Diagram (Apply Training)

4.3.2.4 Training Management Sequence Diagram (View Training)

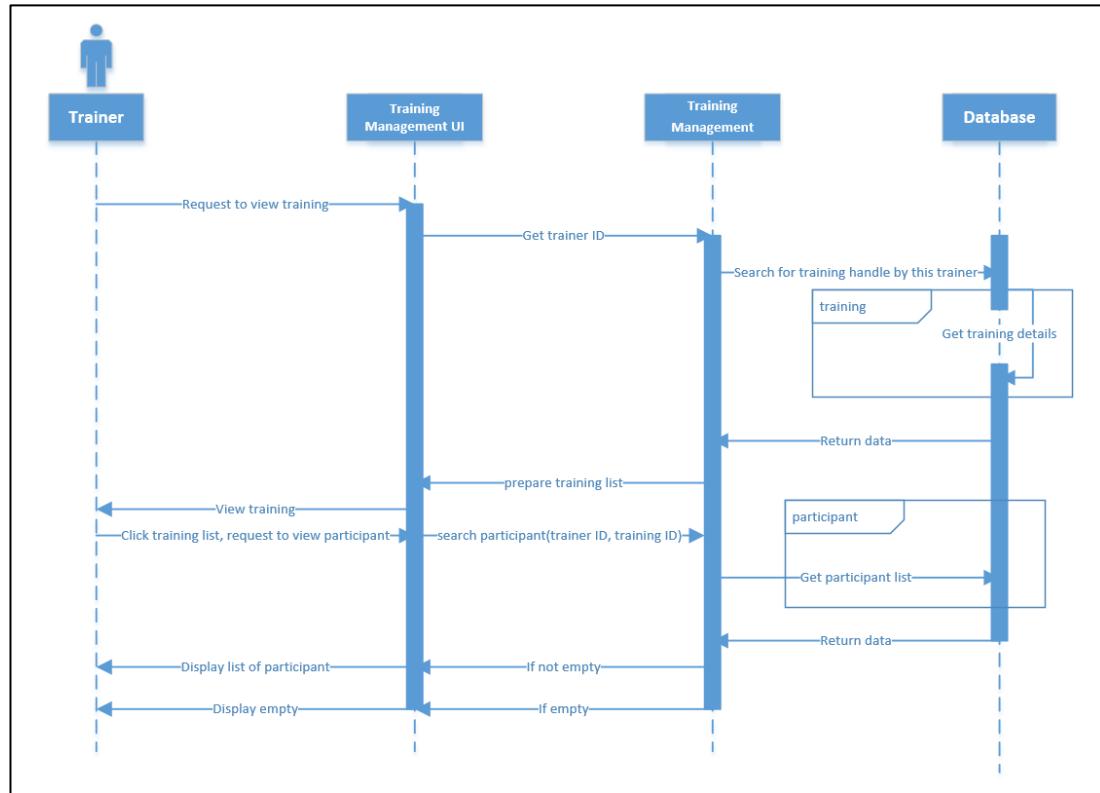


Figure 4.13: Training Management Sequence Diagram (View Training)

4.3.2.5 User Management Sequence Diagram

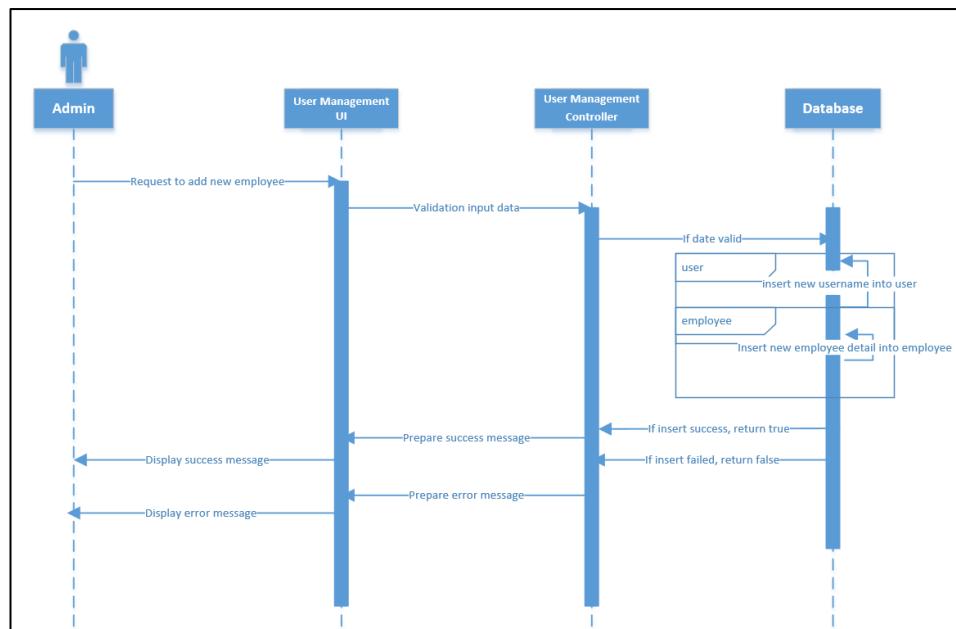


Figure 4.14: User Management Sequence Diagram

4.3.2.6 Report Management Sequence Diagram

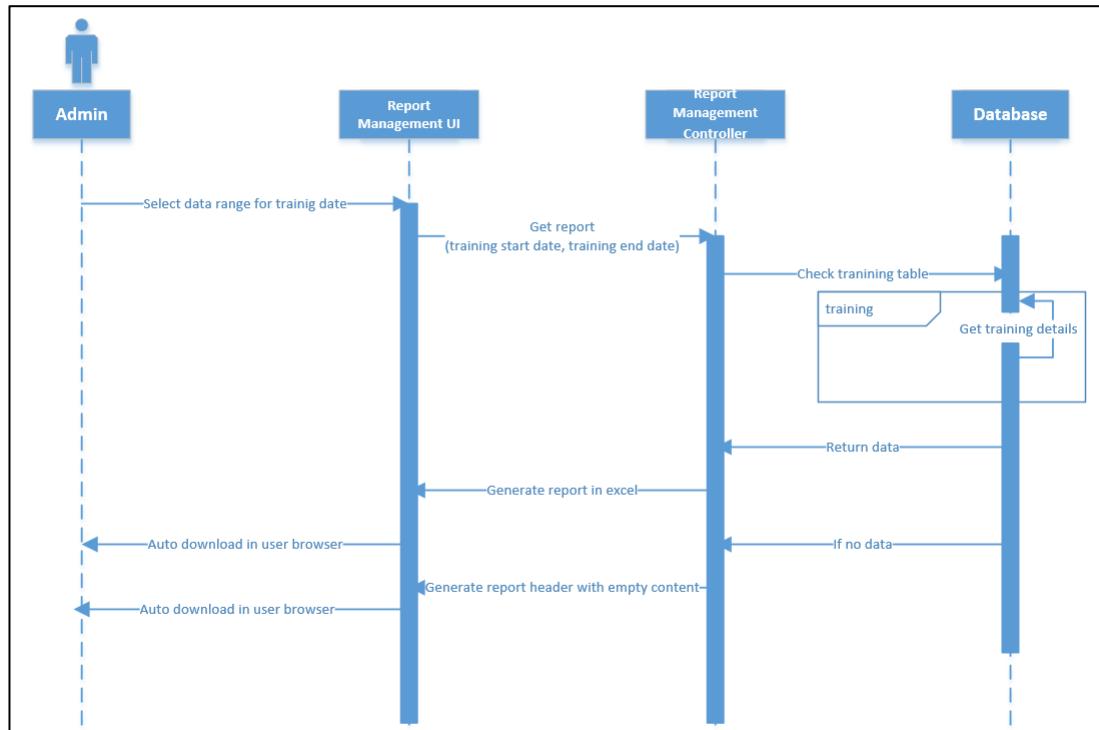


Figure 4.15: Report Management Sequence Diagram

4.3.2.7 Manage Approval Sequence Diagram

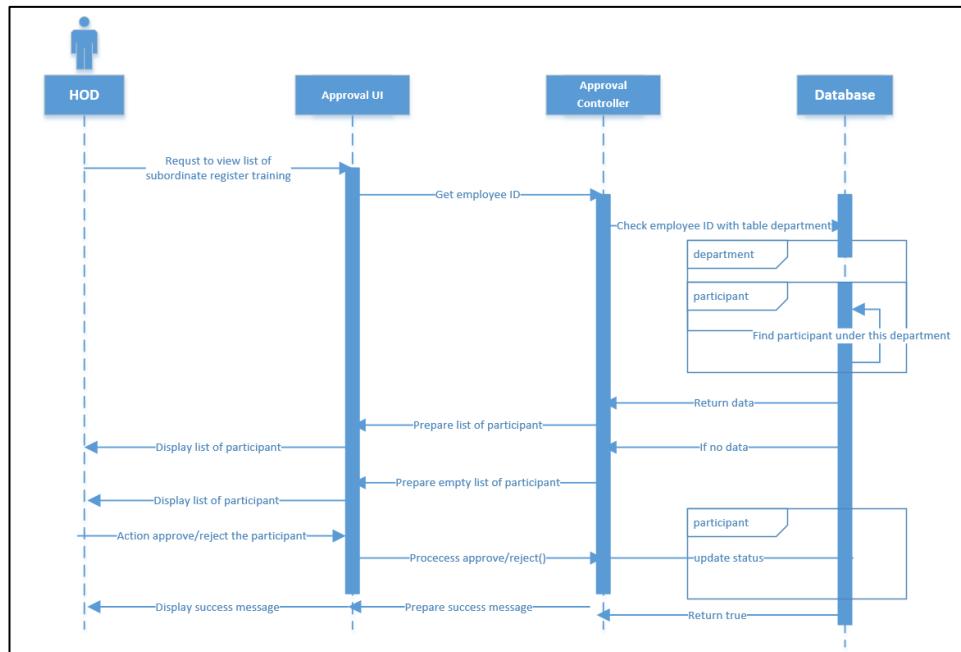


Figure 4.16: Manage Approval Sequence Diagram

4.3.2.8 Sign Attendance Sequence Diagram

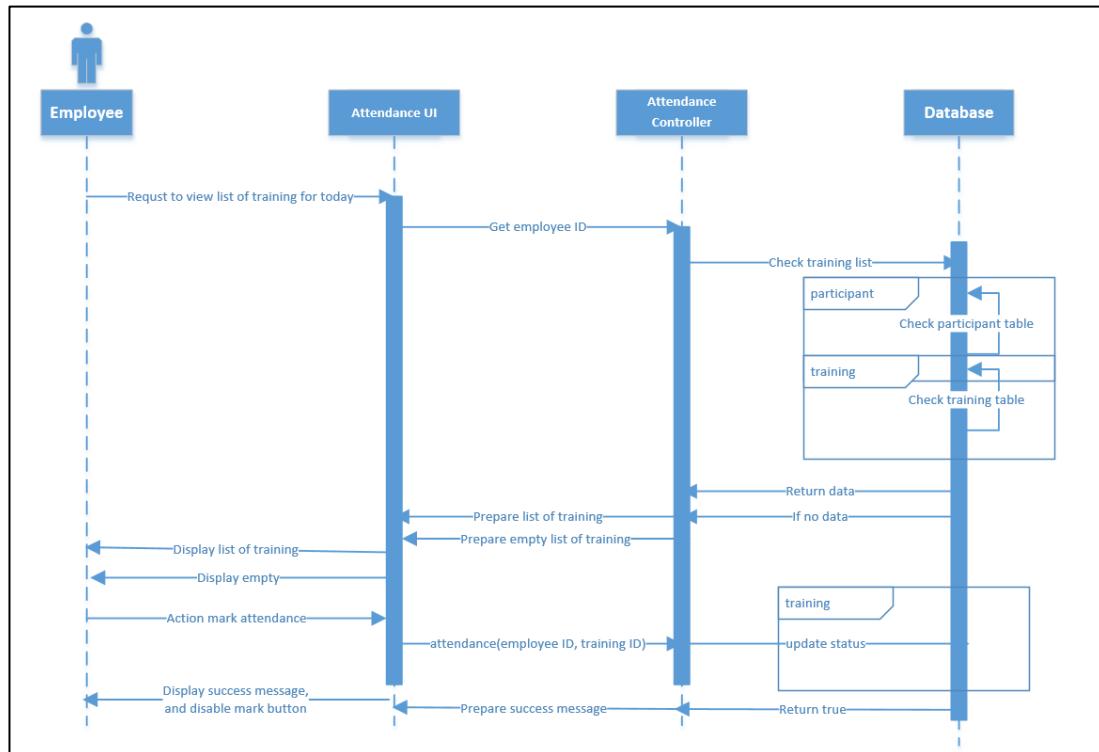


Figure 4.17: Sign Attendance Sequence Diagram

4.4 System Design Workflow

System design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

4.4.1 Architectural Design

Architectural Design is the process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system in Hitachi Sunway Training Management System (HSSTMS), there will be six modules which are:

(i) Login Module

This module describes how a user would logon into the HSSTMS with valid username and password.

(ii) View Profile Module

This module display user profile details and allow user to change their password from here.

(iii) Training Management Module, consist different function for 4 users:

a. Admin:

- Allow to add, delete or update the training schedule
- Allow to add, delete or approve the list of participants for each training.

b. Head Of Department and Employee:

- Allow to view training status, history completed training and apply the training.

c. Trainer:

- Allow to view the list of participants for own training.

(iv) User Management Module

This module describes how admin handle all the user which is admin, employee and trainer. This management also allow admin to handle for company and department.

(v) Report Management Module

This module is for generate the report in excel based on the selection start and end training date.

(vi) Manage Approval Module

This module for head of department to approve or reject their subordinate training request.

(vii) Sign Attendance Approval Module

This module is to take participant attendance for ongoing training, and for trainer to easily pick up random participant name who attended the training.

4.5 User Interface Design

This section contains the user interface design of Hitachi Sunway Training Management System (HSSTMS) which documents the user interface to yield a clearer view of the application. User interface design is very important as it is interacting directly with the user. An easy-to-use interface is required for HSSTMS since its target users are in Hitachi Sunway who only receive basic knowledge on using web applications. It helps to minimize the learning process on using this web application. The user interface design should be understandable, consistent and prevent users from making mistakes. Interface design of a website is important to ease the user experience. Interaction must be simple and easy to understand. The main purpose of interface design is to make the website be as easy as it could be handled without sacrificing any functionalities of the system. Below shows the interface of choose program to apply in HSSTMS.

4.5.1 Login Interface

Figure 4.18 shows the first page that will be launched when the user first browses the application. This page allows users to access the login page of the application.

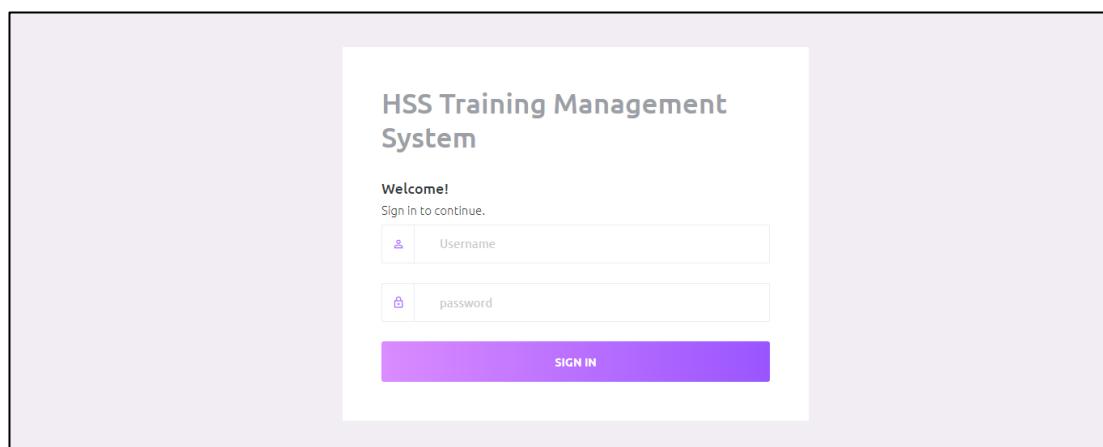


Figure 4.18: Interface for login page

4.5.2 Dashboard Admin

Figure 4.19 is an interface of dashboard for admin. This interface will be display after user success login to the system. The Dashboard Menu were located at the left of the page. There are three type statistics display in dashboard which is count pending approval, training registered, new open training, pie chart of user role and bar chart for training by month.

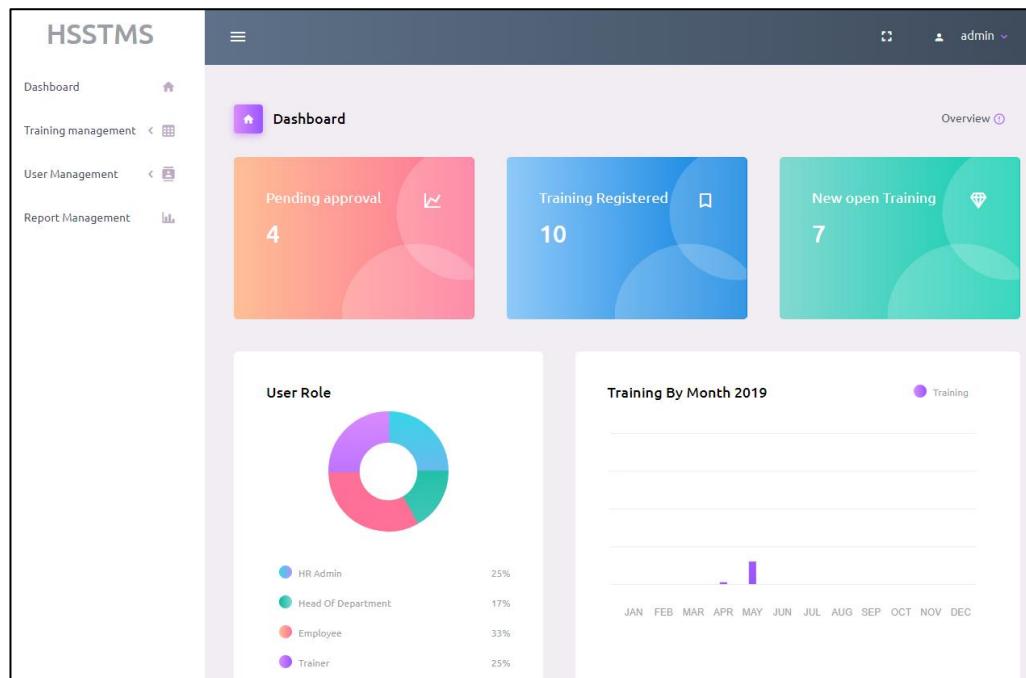


Figure 4.19: Interface for admin page

4.5.3 Dashboard Employee

Figure 4.20 is an interface of dashboard for employee. This interface will be display after user success login to the system. The Dashboard Menu were located at the left of the page. There are three type statistics display in dashboard which is count pending approval, training registered and new open training.

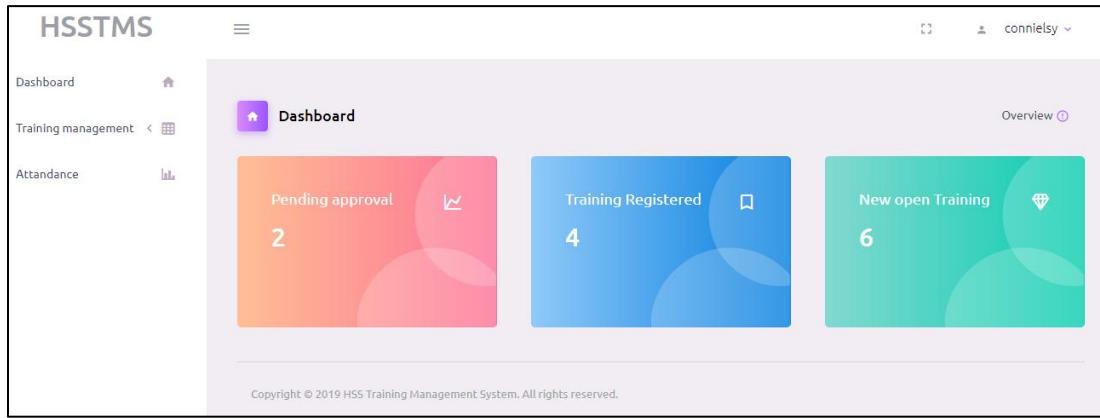


Figure 4.20: Interface for employee page

4.5.4 Dashboard Head Of Department

Figure 4.21 is an interface of dashboard for head of department. This interface will be display after user success login to the system. The Dashboard Menu were located at the left of the page. There are three type statistics display in dashboard which is count pending approval, training registered and new open training.

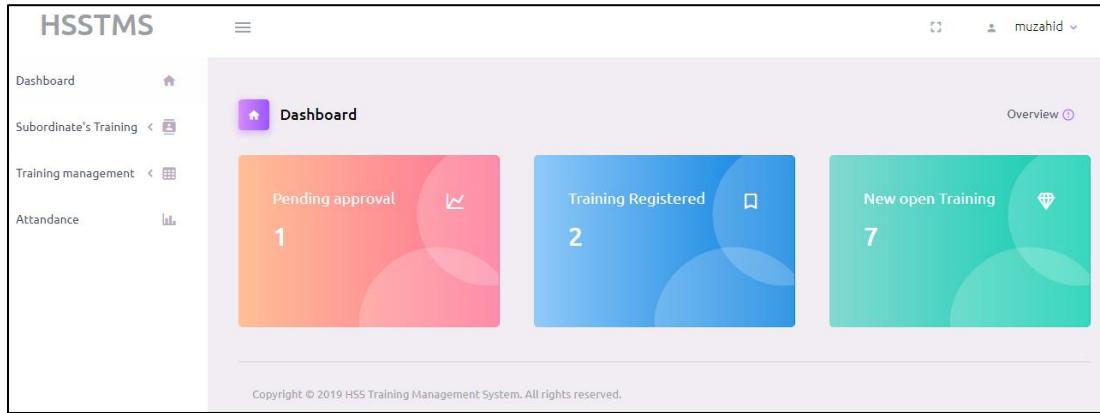


Figure 4.21: Interface for head of department page

4.5.5 Dashboard Trainer

Figure 4.22 is an interface of dashboard for trainer. This interface will be display after user success login to the system. The Dashboard Menu were located at the left of the page. Dashboard for trainer do not display statistics.

The screenshot shows the HSSTMS dashboard for a trainer. The left sidebar has a 'Training management' section with a 'Scheduled' item. The main content area is titled 'Dashboard / Training Management - Scheduled'. It displays a table with one entry:

No #	Training Title	Training Type	Training Start	Training End	Quota	Status	Actions
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	4 / 4	Full	@View @Reset

Showing 1 to 1 of 1 entries.

Figure 4.22: Interface for trainer page

4.5.6 Training Management (Admin View)

Figure 4.23 is an interface of training management. This interface is for admin user role, which admin can add, delete or update the training. Admin also can click on the training title to view list of the participant for each training. The training management also will show each status of training in the table view.

The screenshot shows the HSSTMS training management interface for an admin user. The left sidebar has sections for 'Training management' (with 'Open', 'Closed', and 'Complete' items), 'User Management', and 'Report Management'. The main content area is titled 'Dashboard / Training Management - Open Register'. It shows a table of training registrations:

Add New Training							
No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	2 / 2	Full	@View @Delete
2	English For Business Communication Skills	Communication Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 30	Open	@View @Delete
3	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View @Delete
4	Microsoft Visio - Level 2	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View @Delete
5	Microsoft Visio - Level 3	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View @Delete

Showing 1 to 5 of 7 entries.

Figure 4.23: Interface for training management (Admin View)

4.5.7 User Management

Figure 4.24 is an interface of user management. This interface is for admin user role, which admin can add, delete or update for admin, employee, trainer, company and department. The user management also will show each status of user status in the table view.

No #	Username	Employee ID	Role	Last Login	Last Update	Status	Actions
1	conniesy	HSS0001	Employee	2019-05-05 06:04:10	2019-05-05 06:04:10	ACTIVE	<button>View</button> <button>Delete</button>
2	nabila	HSS0002	Employee	2019-05-03 14:30:06	2019-05-04 12:20:44	ACTIVE	<button>View</button> <button>Delete</button>
3	hanis	HSS0003	Employee		2019-05-04 13:05:35	ACTIVE	<button>View</button> <button>Delete</button>
4	muzalid	HSS0004	Head Of Department	2019-05-05 06:05:16	2019-05-05 06:05:16	ACTIVE	<button>View</button> <button>Delete</button>
5	edwin	HSS0005	Employee		2019-05-04 13:05:56	INACTIVE	<button>View</button> <button>Delete</button>
6	cheah	HSS0006	Head Of Department	2019-05-03 14:27:22	2019-05-04 12:24:45	ACTIVE	<button>View</button> <button>Delete</button>

Showing 1 to 6 of 6 entries

Figure 4.24: Interface for user management

4.5.8 Report Management

Figure 4.25 is an interface of report management. This interface is for admin user role only, allow admin to generate the list of training in excel format based on the selection training start date and end.

No #	Training Title	Training Type	Training Start	Training End	Per Cost	Pax	Total
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	Rp1250	4	1000
2	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-16 09:00:00	2019-05-16 18:00:00	Rp1100	2	200
3	Oracle's JD Edwards EnterpriseOne	IT Skill	2019-05-03 00:00:00	2019-05-03 18:00:00	Rp1100	2	200
4	JD Edwards EnterpriseOne Tools Release 9.2	IT Skill	2019-05-10 09:00:00	2019-05-10 18:00:00	Rp1200	2	400
5	JD Edwards EnterpriseOne Financial Reports	Finance	2019-05-09 09:00:00	2019-05-09 18:00:00	Rp1100	1	100
6	HR Skills for HR Administrators	HR	2019-05-08 09:00:00	2019-05-08 18:00:00	Rp1100	1	100
7	English For Business Communication Skills	Communication Skill	2019-05-17 09:00:00	2019-05-17 18:00:00	Rp1100	0	0
8	Microsoft VISO (Basic To Advance Levels)	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rp10	0	0
9	Microsoft Visio - Level 2	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rp10	0	0
10	Microsoft Visio - Level 3	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rp10	0	0
11	Microsoft Visio - Level 4	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rp10	0	0
12	Microsoft Visio - Level 5	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rp10	0	0

Figure 4.25: Interface for report management

4.5.9 Training Management (Trainer View)

Figure 4.26 is an interface of training management for trainer . This interface is for trainer to view the list of own training session and check its each training participant list. It also provide function for trainer to select random pick participant name which is attend on the training on the time.

The screenshot shows a web-based application interface for HSSTMS. The top navigation bar includes 'Dashboard', 'Training management', and 'Attendance'. The current page is 'Dashboard / Training Management / View Participants - Microsoft Excel 2013 Intermediate & Advanced Level'. A blue button labeled 'Random Pick Name' is visible. The main content area displays a table with the following data:

No #	Participant Name	Employee ID	Last Update	Update by	Attendance	Remark
1	MUZAHID SHAH ABDUL RAHMAN	HSS0004	2019-05-04 13:00:34	muzahid	YES	
2	CONNIE LOOI SEE YEE	HSS0001	2019-05-04 13:00:18	trainerA	No	
3	NABILA	HSS0002	2019-05-04 13:00:18	trainerA	No	
4	EDWIN NG	HSS0005	2019-05-04 13:00:18	trainerA	No	

At the bottom, it says 'Showing 1 to 4 of 4 entries' and has 'Previous' and 'Next' buttons.

Figure 4.26: Interface for trainer view participant (Trainer view)

4.5.10 Subordinate's Training (Head Of Department View)

Figure 4.27 is an interface of Subordinate's Training for head of department. This interface is only available for head of department to approve or reject their subordinate training request. Each head of department have click the action either approve or reject, it will remove from the list.

The screenshot shows a web-based application interface for HSSTMS. The top navigation bar includes 'Dashboard', 'Subordinate's Training', 'Training management', and 'Attendance'. The current page is 'Dashboard / Subordinate's Training - Waiting Approval'. The main content area displays a table with the following data:

No #	Participant Name	Training Title	Training Start	Training End	Status	Actions
1	CONNIE LOOI SEE YEE	HR Skills for HR Administrators	2019-05-08 09:00:00	2019-05-08 18:00:00	Pending for Approve	✓ Approve ✗ Reject

At the bottom, it says 'Showing 1 to 1 of 1 entries' and has 'Previous' and 'Next' buttons.

Figure 4.27: Interface for Subordinate's Training

4.5.11 Training Management (Head Of Department and Employee View)

Figure 4.28 is an interface of Training management for head of department and employee. This interface is only available for head of department and employee, it only have function apply or view the training and status.

No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-18 09:00:00	2019-05-31 18:00:00	2 / 2	Full	<button>View</button>
2	JD Edwards EnterpriseOne Financial Reports	Finance	2019-05-18 09:00:00	2019-06-18 18:00:00	3 / 30	Open	<button>Apply</button> <button>View</button>
3	HR Skills for HR Administrators	HR	2019-05-18 00:00:00	2019-05-30 18:00:00	1 / 30	Open	<button>Apply</button> <button>View</button>
4	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-18 09:00:00	2019-05-30 18:00:00	0 / 25	Open	<button>Apply</button> <button>View</button>
5	Microsoft Visio - Level 2	Microsoft Skill	2019-05-18 09:00:00	2019-05-30 18:00:00	0 / 25	Open	<button>Apply</button> <button>View</button>
6	Microsoft Visio - Level 3	Microsoft Skill	2019-05-18 09:00:00	2019-05-29 18:00:00	0 / 25	Open	<button>Apply</button> <button>View</button>
7	Microsoft Visio - Level 4	Microsoft Skill	2019-05-18 09:00:00	2019-06-30 18:00:00	0 / 25	Open	<button>Apply</button> <button>View</button>

Showing 1 to 7 of 7 entries
NOTE : For cancellation training, please contact HR department for further inquiries.

Figure 4.28: Interface for Training Management (Head Of Department and Employee View)

4.5.12 Header Bar (All User)

Figure 4.29: Interface for header bar for all the user

Figure 4.29 is an interface of header bar for all the user. In the header bar, it have two menu view profile and theme. View profile is for user to view the account details and change their password. While for theme, is for user to change the colour of header bar skins and sidebar skins.

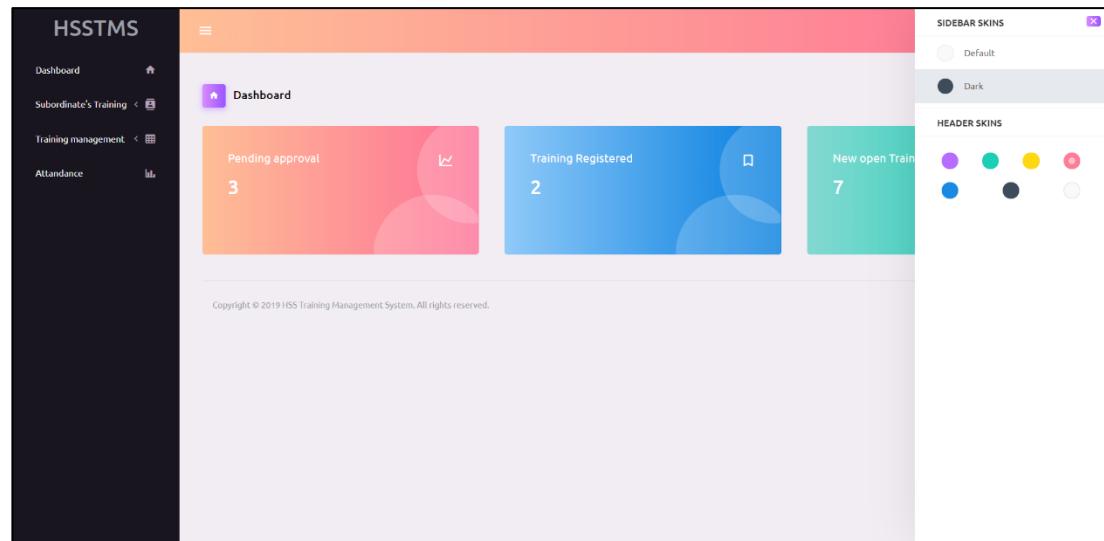


Figure 4.30: Interface for change header bar skins and sidebar skins

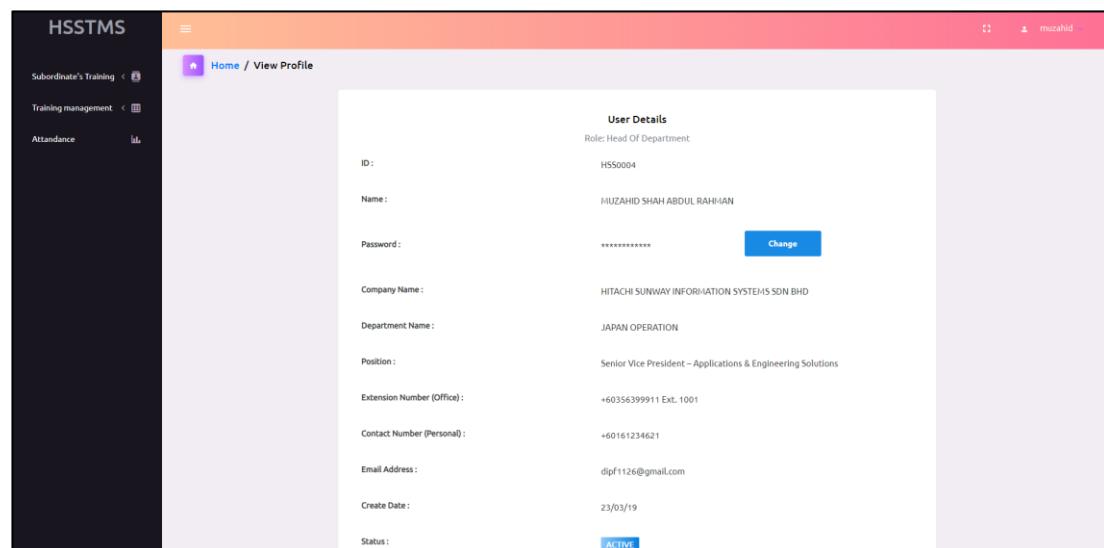


Figure 4.31: Interface for view profile without click change password

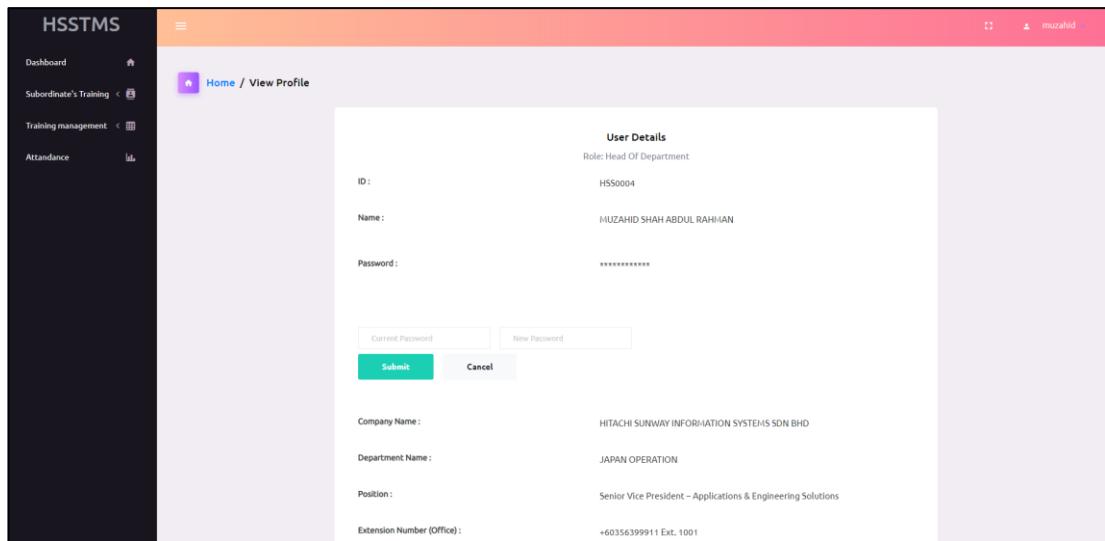


Figure 4.32: Interface for view profile after click change password

4.6 Database Design

Database design is the organisation of data according to a database model. The designer determines what data must be stored and how the data elements interrelate. With this information, they can begin to fit the data to the database model. Database design involves classifying data and identifying interrelationships.

Table 4.3 is *user* table which are created to save user information that related to login module which to give access to the system.

Table 4.3 : Table *user*

Field	Type	Null	PK/FK
user_id	int(11)	No	PK
username	varchar(20)	No	
password	varchar(256)	No	
role_id	int(11)	No	FK
employee_id	varchar(12)	No	FK
trainer_id	varchar(12)	No	FK
theme_navbar	varchar(20)	Yes	
theme_sidebar	varchar(20)	Yes	

create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	
last_login	timestamp	Yes	
active	varchar(20)	No	
remark	varchar(80)	Yes	

Table 4.4 is *role* table which are created for user information that to display user role description in the system.

Table 4.4 : Table *role*

Field	Type	Null	PK/FK
role_id	int(11)	No	PK
role_desc	varchar(256)	No	
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

Table 4.5 is *department* table which are created to save department information that related to user management in the system.

Table 4.5 : Table *department*

Field	Type	Null	PK/FK
department_id	int(11)	No	PK
department_code	varchar(30)	No	
department_name	varchar(80)	No	
head_of_department	varchar(80)	No	FK
company_id	int(11)	No	FK
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

Table 4.6 is *company* table which are created to save company information that related to user management in the system.

Table 4.6 : Table *company*

Field	Type	Null	PK/FK
company_id	int(11)	No	PK
company_code	varchar(30)	No	
company_name	varchar(80)	No	
company_contact	varchar(13)	No	
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

Table 4.7 is *employee* table which are created to save employee information that related to user management in the system.

Table 4.7 : Table *employee*

Field	Type	Null	PK/FK
id	int(11)	No	PK
employee_id	varchar(12)	No	PK
employee_name	varchar(80)	No	
position	int(11)	No	
department_id	int(11)	No	
personal_contact_number	varchar(13)	Yes	
office_extension_number	int(4)	Yes	
email	varchar(256)	Yes	
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

Table 4.8 is *trainer* table which are created to save trainer information that related to user management in the system.

Table 4.8 : Table *trainer*

Field	Type	Null	PK/FK
id	int(11)	No	PK
trainer_id	varchar(12)	No	PK
trainer_name	varchar(80)	No	
company_name	varchar(80)	No	
personal_contact_number	varchar(13)	No	
email	varchar(256)	Yes	
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

Table 4.9 is *training* table which are created to save training information that related to training management in the system.

Table 4.9 : Table *training*

Field	Type	Null	PK/FK
training_id	int(11)	No	PK
training_title	varchar(50)	No	
training_type	varchar(20)	No	
objective	varchar(300)	Yes	
outcome	varchar(300)	Yes	
training_start_timestamp	timestamp	No	
training_end_timestamp	timestamp	No	
venue	varchar(300)	No	
remark	varchar(300)	Yes	
start_register_timestamp	timestamp	No	
end_register_timestamp	timestamp	No	
cost_per_person	varchar(30)	Yes	
participant_quota	int(11)	No	

create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

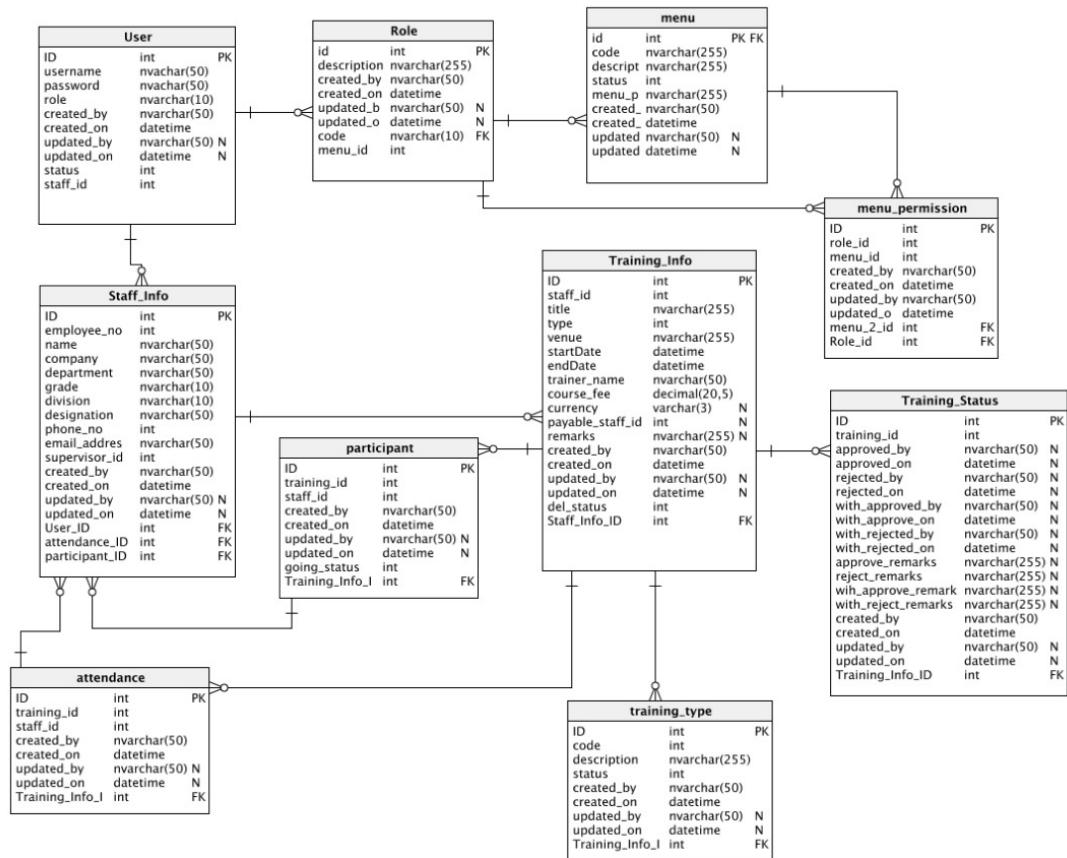
Table 4.10 is *participant* table which are created to save participant information that related to training management in the system.

Table 4.10 : Table *participant*

Field	Type	Null	PK/FK
participant_id	int(11)	No	PK
id	int (11)	No	FK
training_id	int (11)	No	FK
participant_status	varchar(30)	No	
attendance	varchar(100)	No	
remark	varchar(30)	Yes	
create_by	varchar(20)	No	
create_on	timestamp	No	
update_by	varchar(20)	No	
update_on	timestamp	No	

4.7 Entity Relationship Diagram (ERD)

An entity–relationship model describes interrelated things of interest in a specific domain of knowledge. A basic ER model is composed of entity types and specifies relationships that can exist between instances of those entity types.



Vertabelo

Figure 4.33: Entity Relational Diagram (ERD) of HSSTMS

4.8 Class Diagram

A class diagram is an illustration of the relationships and source code dependencies among classes in the Unified Modeling Language (UML). In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity.

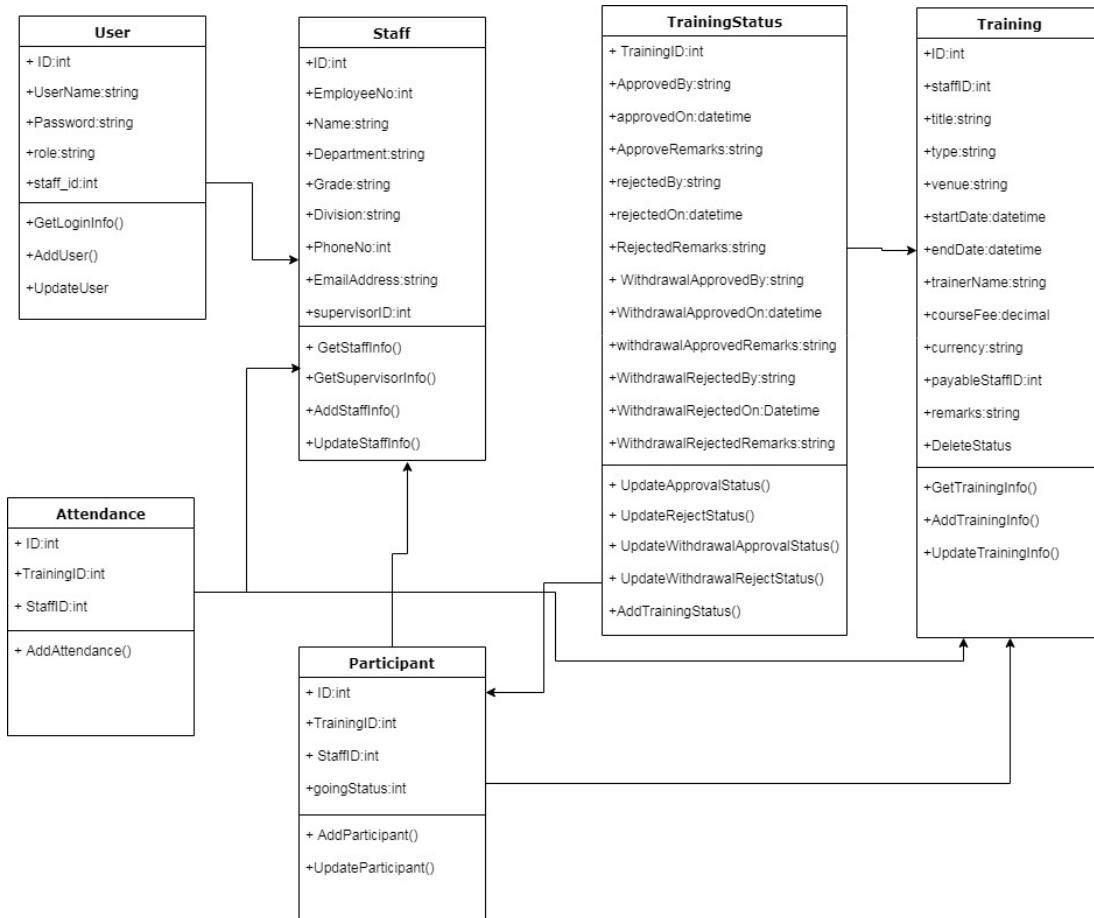


Figure 4.34: Class Diagram

4.9 Conclusion

In summary, this chapter fully explains the design of the Hitachi Sunway Training Management System (HSSTMS). Diagram include use case diagram, activity diagram, sequence diagram, activity diagram, entity relation diagram and class diagram. The figure is clearly explained based on the guidelines outlined. The modules contained in this system have also been described in detail to explain the actual design of the system.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Introduction

The project aim is to develop an online web based system Sunway Training Management System (HSSTMS) for Hitachi Sunway Information Systems Sdn Bhd. Hitachi Sunway Training Management System (HSTDMS) is a system which designed to provide registration training or courses for employees to apply thought online. It is a stand alone web-based system to replace old system e-LEAD which need to login through IBM Lotus Notes to access e-LEAD. The existing system have the difficult for user to access, does not have a user-friendly interface and also does not provide filter data. Therefore, after replace to new system, all party involved can easily accessed the system at anytime, and anywhere. HSTDMS will also provide management such as training participation, registration, HR management information, participation approval management, preparation of reports, schedules training, and also there is a notification will send by e-mail to the user for reminders about training. This system is develop to meet the requirement for Hitachi Sunway in the systematic of training management.

5.2 Development Environment and Tools

Hitachi Sunway Training Management System (HSSTMS) was developed in the Windows 10 as the operating system. The program code and system development is done in Notepad++ which is the development environment for producing web-based system. While the database was built and is operated via phpMyAdmin(MySQL). Testing and implementation of the system is done in the browser using localhost with the help of IIS web services.

5.3 Software and Hardware Installation

In the installation of software and hardware specifications and minimum requirements of a hardware and software should be taken into account. Specification of hardware and software for the development of this system is as described in Chapter 3. HSSTMS can be run through localhost via Google Chrome browser. By using localhost it will help to inspect any error that may be found in the system.

5.3.1 XAMPP Installation

Users should follow the steps below to install the XAMPP on Windows 8 and above:

- (i) Download XAMPP for Windows software from this website <https://www.apachefriends.org/index.html>.
- (ii) Click Download
- (iii) Click next and will get the installer file.
- (iv) Double click the installer file and follow by the recommended option until it successfully installed.

5.4 Main Module Programming Codes

This programming codes was written during construction phase. Each module in the system will be execute through codes writing based on system design. The result of programming writing should fulfil user requirement. The following sub topics explain more details of the system encoding for the main module of the system.

5.4.1 Add Training Management Module

Figure 5.1 shows that the codes that executed add new training schedule into training management. The codes will process each user click submit button, then the form will post all the data that have fill in by user to process insert into training table. If process insert into training table is success, there will be pop up message to notify user that the new training schedule is inserted successfully and return back to training management pages. This module is only allow admin user roles to add training.

Figure 5.1: Add Training Management Coding

```
<?php
//process form if submitted
if(isset($_POST['submit'])){

//Get all training details from the form
$title = $_POST['title'];
$type = $_POST['type'];
$trainer_id = $_POST['trainer_id'];
$objective = $_POST['objective'];
$outcome = $_POST['outcome'];
$venue = $_POST['venue'];
$quota = $_POST['quota'];
$cost = $_POST['cost'];
$register_start_date = $_POST['register_start_date'];
$register_start_time = $_POST['register_start_time'];
$register_end_date = $_POST['register_end_date'];
$register_end_time = $_POST['register_end_time'];
$training_start_date = $_POST['training_start_date'];
$training_start_time = $_POST['training_start_time'];
$training_end_date = $_POST['training_end_date'];
$training_end_time = $_POST['training_end_time'];
$remark = $_POST['remark'];

//Set register date and training date format
$start_register_timestamp = $register_start_date." ".$register_start_time;
$end_register_timestamp = $register_end_date." ".$register_end_time;
$training_start_timestamp = $training_start_date." ".$training_start_time;
$training_end_timestamp = $training_end_date." ".$training_end_time;

//Proceed to insert data into training table
if($training->insert_training($_SESSION['username'], $title, $type,
$trainer_id, $objective, $outcome, $venue, $quota, $cost,
$start_register_timestamp, $end_register_timestamp,
$training_start_timestamp, $training_end_timestamp, $remark )){?>
```

```

//If inserted success, pop up success message
<script type="text/javascript">
swal({
    title: 'Added!',
    text: 'Record added successfully.',
    icon: 'success',
    button: {
        text: "Continue",
        value: true,
        visible: true,
        className: "btn btn-info"
    }
}).then(function(isConfirm) {
    //After pop up, return back to admin-training-open.php
    window.location = "admin-training-open.php";
})
</script><?php
}
} //end if submit
?>

```

5.4.2 Apply Training Management Module

Figure 5.2 shows that the codes that executed for head of department or employee to apply training. When head of department or employee to apply training click apply button from training management, the system will post the request to this coding to process training registration. If the training is success to register into the system, system will prepare email notification to send to inform high management pending for approval .

Figure 5.2: Apply Training Management Coding

```

<?php
    // submit to apply training and training id is not empty
    if (!empty($_POST['training_id'])) {

        //Get training id and action by who
        $training_id = $_POST['training_id'];
        $createByUsername = $_SESSION['username'];
        $remark = "";

        //Based on user role to status
        if($_SESSION['role_id'] == 2){
            $status = "2ndApprove";
        }else{
            $status = "1stApprove";
        }

        //Get employee ID
        $id = $employee->get_employee_id($_SESSION['employee_id']);
    }
}

```

```

//Insert into participant table
if($participant->insert_participant($training_id, $createByUsername, $status,
$remark, $id)){
    //If insert success into participant table, proceed to prepare details to
    send email notification

    //Get boss Details
    $boss_id = $employee->get_head_of_department_id($id);
    $bossDetalis = $employee->get_employee_by_employee_id($boss_id);

    //Get employee Details
    $employeeDetalis = $employee->get_employee_by_id_only($id);

    //Get training details
    $trainingDetalis = $training->get_training_by_id($training_id);

    //send email (Set sender, email content, and etc )
    $to = $bossDetalis['email'];
    $subject = "Training - [ ".$trainingDetalis['training_title']." ] Is Now
Pending For Your Approval";
    $body = "<p>Dear ".$bossDetalis['employee_name'].",</p>
<p>".$employeeDetalis['employee_name']."' has submitted a training -
".$trainingDetalis['training_title']."' on ".date('d/m/Y')." for your
approval.</p>
<p>Please login HSSTMS portal: <a
href='http://sx140046csjs04.com/HSSTMS/'>http://sx140046csjs04.com/HSSTMS/</a>
to approve/reject this application.</p>
<p>Thank you.</p>
<p>Regards,</p>
<p>HSSTMS System Admin</p>";

    //Function to send email
    $mail = new Mail();
    $mail->setFrom(SITEEMAIL);
    $mail->addAddress($to);
    $mail->subject($subject);
    $mail->body($body);
    $mail->send();

    echo "success"; //return status
} else{
    echo "error"; //return status
}
//end if submit
?>

```

5.4.3 Approve Training Management Modul

Figure 5.3 shows that the codes that executed when head of department approve their subordinate training request. This module will process when head of department click approve for each of the participant. After that, the system will update the participant status and will checking based on the approval status, the email notification is different for 1st approval and 2nd approval status.

Figure 5.3: Approve Training Management Coding

```

<?php
    // submit to approve training and participant id is not empty
    if (!empty($_POST['participant_id'])) {

        //Get participant id and action by who
        $participant_id = $_POST['participant_id'];
        $status = $_POST['status'];
        $username = $_POST['username'];

        //Update status in participant table
        if($participant->update_participant_status_by_id($participant_id, $status,
        $username)) {

            //If update success into participant table, proceed to prepare details to
            //send email notification

            //Get participant details
            $trainingDetalis =
            $participant->get_participant_by_participant_id($participant_id);

            //Get boss Details
            $boss_id = $employee->get_head_of_department_id($trainingDetalis['id']);
            $bossDetalis = $employee->get_employee_by_employee_id($boss_id);

            //Get employee Details
            $employeeDetalis =
            $employee->get_employee_by_id_only($trainingDetalis['id']);

            //send email
            $to = $employeeDetalis['email'];

            //email notification is different for 1st approval and 2nd approval status
            if($status == "approve"){

                //send email (Set sender, email content, and etc )
                $subject = "Training - [ ".$trainingDetalis['training_title']." ] Has Been
                Fully Approved";
                $body = "<p>Dear ".$employeeDetalis['employee_name'].",</p>
                <p>The above training - ".$trainingDetalis['training_title']." has been fully
                approved and received by HR.</p>
                <p>You can login HSSTMS portal: <a
                href='http://sx140046csjs04.com/HSSTMS/'>http://sx140046csjs04.com/HSSTMS/</a>
                to review this application.</p>
                <p>Thank you.</p>
                <p>Regards,</p>
                <p>HSSTMS System Admin</p>";

            }else{

                //send email (Set sender, email content, and etc )
                $subject = "Training - [ ".$trainingDetalis['training_title']." ] Has Been
                Pass 1st level Approval";
                $body = "<p>Dear ".$employeeDetalis['employee_name'].",</p>
                <p>The above training - ".$trainingDetalis['training_title']." has
                been pass 1st level approval by ".$bossDetalis['employee_name']."</p>
                <p>You can login HSSTMS portal: <a
                href='http://sx140046csjs04.com/HSSTMS/'>http://sx140046csjs04.com/HSSTMS/</a>
                to review this application.</p>
                <p>Thank you.</p>
                <p>Regards,</p>
                <p>HSSTMS System Admin</p>";

            }

        }
    }
}

```

```

//Function to send email
$mail = new Mail();
$mail->setFrom(SITEEMAIL);
$mail->addAddress($to);
$mail->subject($subject);
$mail->body($body);
$mail->send();

echo "success";//return status

}else{

echo "error"; //return status

}

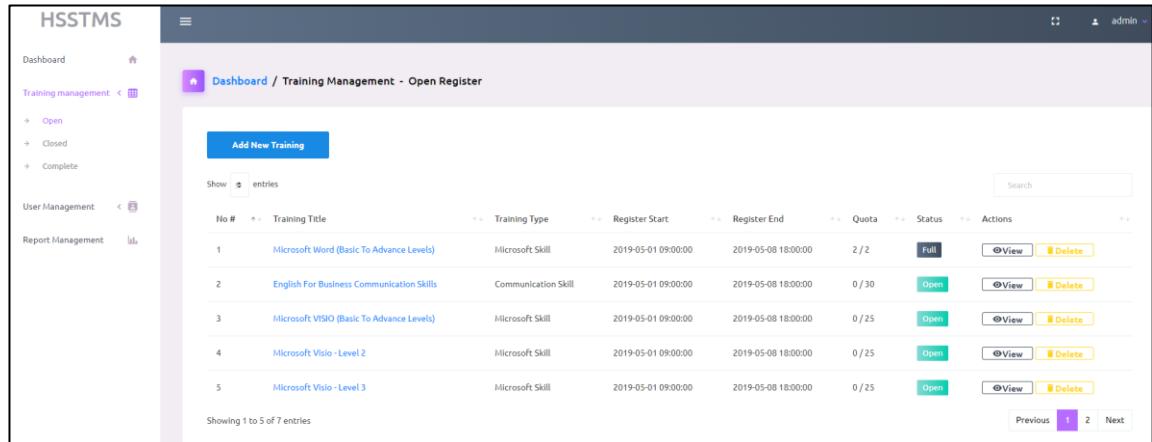
//end if submit
?>

```

5.5 Results and Achievements of the system

This interfaces will be display to the user if the programming codes were successfully executed. This interfaces will be showing a result and system achievements based on user action on the system.

Figure 5.4 and Figure 5.5 shows that the list of training will be displayed and the status. The system will popup message when admin want to delete the training.



The screenshot shows the HSSTMS application's Training Management module. The left sidebar has navigation links for Dashboard, Training management (with Open, Closed, Complete sub-options), User Management, and Report Management. The main content area is titled 'Dashboard / Training Management - Open Register'. It features a blue 'Add New Training' button. Below it is a table with columns: No #, Training Title, Training Type, Register Start, Register End, Quota, Status, and Actions. The table contains five entries:

No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	2 / 2	Full	@View Delete
2	English For Business Communication Skills	Communication Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 30	Open	@View Delete
3	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View Delete
4	Microsoft Visio - Level 2	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View Delete
5	Microsoft Visio - Level 3	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	@View Delete

At the bottom, it says 'Showing 1 to 5 of 7 entries' and has navigation buttons for Previous, Next, and page numbers 1, 2.

Figure 5.4: List of training

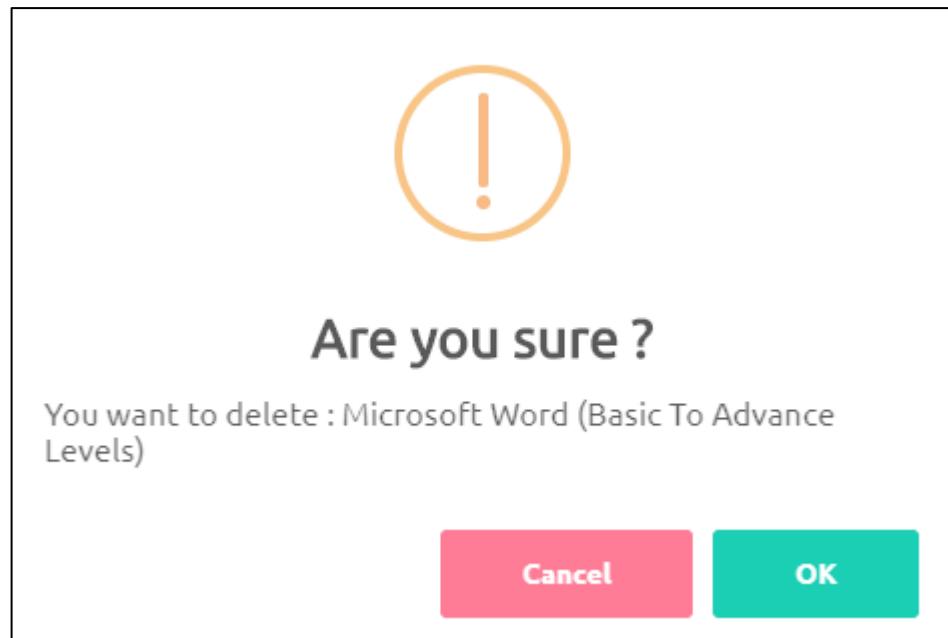


Figure 5.5: Delete confirm popup message

Figure 5.6 and 5.7 shows the interface of admin want to generate report. If HR direct click “Generate” button, it will show all the training and details, if user select by date range, the table will display based on the date range.

The screenshot shows the HSSTMS application's Report Management section. The sidebar on the left includes links for Dashboard, Training management, User Management, and Report Management. The main area has a header "Dashboard / Report Management" with fields for "Training Start Date" and "Training End Date" both set to "dd/mm/yyyy". Below these are two buttons: "Generate" and "Export to Excel". A table lists 13 training programs with columns for No #, Training Title, Training Type, Training Start, Training End, Per Cost, Pax, and Total.

No #	Training Title	Training Type	Training Start	Training End	Per Cost	Pax	Total
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-04 09:00:00	2019-05-04 00:00:00	Rm1250	4	1000
2	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-16 09:00:00	2019-05-16 18:00:00	Rm100	2	200
3	Oracle's JD Edwards EnterpriseOne	IT Skill	2019-05-03 00:00:00	2019-05-03 18:00:00	Rm100	2	200
4	JD Edwards EnterpriseOne Tools Release 9.2	IT Skill	2019-05-10 09:00:00	2019-05-10 18:00:00	Rm1200	2	400
5	JD Edwards EnterpriseOne Financial Reports	Finance	2019-05-09 09:00:00	2019-05-09 18:00:00	Rm100	1	100
6	HR Skills for HR Administrators	HR	2019-05-08 09:00:00	2019-05-08 18:00:00	Rm100	1	100
7	English For Business Communication Skills	Communication Skill	2019-05-17 09:00:00	2019-05-17 18:00:00	Rm100	0	0
8	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rm10	0	0
9	Microsoft Visio - Level 2	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rm10	0	0
10	Microsoft Visio - Level 3	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rm10	0	0
11	Microsoft Visio - Level 4	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rm10	0	0
12	Microsoft Visio - Level 5	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	Rm10	0	0
13	Microsoft Excel 2013 Advanced Level 1	Microsoft Skill	2019-04-25 09:00:00	2019-04-25 18:00:00	Rm1250	2	500

Figure 5.6: Generate report without select the date range

The screenshot shows the HSSTMS application interface. On the left is a sidebar with navigation links: Dashboard, Training management, User Management, and Report Management. The main area is titled 'Dashboard / Report Management'. It displays a table with one row of data. The table columns are: No #, Training Title, Training Type, Training Start, Training End, Per Cost, Pax, and Total. The data row is: 1, Microsoft Excel 2013 Advanced Level 1, Microsoft Skill, 2019-04-25 09:00:00, 2019-04-25 18:00:00, Rm250, 2, 500. Above the table are two buttons: 'Generate' and 'Export to Excel'. At the top of the main area, there are date inputs for 'Training Start Date' (01/04/2019) and 'Training End Date' (30/04/2019), and two buttons: 'Generate' and 'Export to Excel'.

Figure 5.7: Generate report selected April date range

5.6 Testing

After developed Hitachi Sunway Training Management System (HSSTMS) a system testing was conducted to examine and identify errors. The testing process is an important phase in system development to carry out repeatedly to identify lapses or errors that may have occur in running the application.

5.6.1 Black Box Testing

Black box testing is also performed at the interface module. This test does not touch on how to do an exercise program but it emphasizes that output must meet the requirements of users. These tests try to identify errors such as incorrect or missing functions, interface error, error in terms of structure or access to databases, presentation error and error at the start or finish.

5.6.2 White Box Testing

White box testing is a detailed examination of the program's internal logic flow and will test all programmable logic decision is right or vice versa. It usually involves testing on the part of the program loop to detect the error. User testing was performed to determine if users find the system easy to use while system testing was done to verify the absence of the error in the system. The results of the tests obtained on the

basis of the average user satisfaction with the system. A user testing has been conducted to test this system. Table 5.1 shows the result of the testing.

5.6.3 Testing Result

System testing will do both which is user testing and system is testing. User testing was performed to determine if users are able to find the system was easy to use while system testing was done to verify the absence of the error in the system. The results of the tests obtained on the basis of the average user satisfaction with the system. A user testing has been conducted to test this system. Table 5.1 shows the result of the testing.

For system testing, will be doing user and system testing. User testing was performed to determine if users find the system easy to use while system testing was done to verify the absence of the error in the system. The results of the tests obtained on the basis of the average user satisfaction with the system. A user testing has been conducted to test this system. Table 5.1 shows the result of the testing.

Table 5.1: Testing Result

User Acceptance Testing Results	
Question for user	Average Answers
1. Is this system easy to understand and use?	8/10
2. Is the main menu of the system help?	9/10
3. Is the system respond in timely manner?	9/10
4. Is the user data can be accessed easily?	8/10
5. Is this system interface makes it easy for users?	8.5/10
6. Is this system can be fully utilized?	8.5/10
7. Is the user can trust the security of the data stored?	7.5/10

Based on user testing that been conducted, found that consumers are satisfied with the system and believe that the system is easy to use and meet the user requirements.

Table 5.2 to Table 5.8 is the test that been conducted on some number of modules in Hitachi Sunway Training Management System (HSSTMS). The main objective of this testing is to determine the error that occurs during the user acceptance of the system.

Table 5.2: Admin create new training

Tester Name	:	Lee Yi Yi (Hitachi Sunway HR staff)
Date	:	26 April 2018
Module	:	Training Management – Add New Taining
Instruction	Predicted Result	Result
1. Login as admin 2. Choose Training Management 3. Click “Add New Training” button 4. Enter all required information 5. Click “Submit” 6. Sign Out	1. Able to view and update Training Management Module 2. Able to do enter all required information 3. System will give error when enter wrong input 4. Able to see the current new training inserted 5. Able to search the training	Success

Table 5.3: Employee apply training

Tester Name	:	Connie Looi (Hitachi Sunway IT staff)
Date	:	26 April 2018
Module	:	Training Management – Apply Training
Instruction	Predicted Result	Result
1. Login as employee 2. Choose Training Management 3. Click “Apply” 4. After popup message, click “Yes” button 5. Sign out	1. Able to view Training Management Module 2. Able to do apply the training 3. Able to see the status pending 1 st Approve after apply 4. Able to search the training	Success

Table 5.4: Head of department Training Management

Tester Name	:	Muzahid (Hitachi Sunway – Head of department for HSSM-APP)
Date	:	26 April 2018
Module	:	Training Management
Instruction	Predicted Result	Result
1. Login as head of department 2. Choose Training Management 3. Click menu “Subordinate's Training” 4. Click “Approve” button 5. After popup, click “Yes” 6. Sign Out	1. Able to view Training Management Module 2. Able to see the pending approval list 3. Able to approve the request 4. Able to search the pending list	Success

Table 5.5: Admin Add User (employee)

Tester Name	:	Lee Yi Yi (Hitachi Sunway HR staff)
Date	:	26 April 2019
Module	:	User Management – Add user
Instruction	Predicted Result	Result
1. Login as admin 2. Choose User Management 3. Click on employee 4. Click Add New Employee 5. Enter all required information 6. Sign out	1. Able to do enter all required information 2. Able to view list of user 3. Able to search all user	Success

Table 5.6: Admin Update User (employee)

Tester Name	:	Lee Yi Yi (Hitachi Sunway HR staff)	
Date	:	26 April 2019	
Module	:	User Management – Update user	
Instruction		Predicted Result	Result
1. Login as admin 2. Choose User Management 3. Click on employee 4. Click “View” button 5. Change the field which want to update 5. Sign out		1. Able to do update user 2. Able to view list of user 3. Able to search all user	Success

Table 5.7: Admin Delete User (Employee)

Tester Name	:	Lee Yi Yi (Hitachi Sunway HR staff)	
Date	:	26 April 2019	
Module	:	User management – Delete user	
Instruction		Predicted Result	Result
1. Login as admin 2. Choose User Management 3. Click “Delete” button 4. After popup message, click “Yes” 4. Sign out		1. Able to do delete user 2. Able to view list of user 3. Able to search all user	Success

Table 5.8: Trainer login to view participant list

Tester Name	:	Miss Tan	
Date	:	26 April 2019	
Module	:	Training management – View participant list	
Instruction		Predicted Result	Result
1. Login as trainer		1. Able to view participant 2. Able to view participant’s status	Success

2. Choose Training Management 3. Click training name 4. View all the participant 5. Click “Random pick” 6. View one of the name is display 4. Sign out	3. Able to search all participant 4. Able to random pick participant name	
---	--	--

5.7 Conclusion

The chapter is described the overall phase of the implementation of the Hitachi Sunway Training Management System (HSSTMS) in which the use of the software used has been described and implementation of the system has gone through several processes. The test phase is the phase of criticism to identify any errors that occur. Errors are identified and repaired to ensure that the final product of this system to function properly. Through testing, system developers can ensure that the system has been developed that successfully meet the needs of users and achieve objectives. In fact, the tests also, the construction of the system can improve the effectiveness of the system.

CHAPTER 6

DISCUSSION AND CONCLUSIONS

6.1 Introduction

This chapter discusses the project achievements, challenges encountered, limitations and suggestions for the future enhancement in this project, Hitachi Sunway Training Management System (HSSTMS).

6.2 Results and Achievements

The Hitachi Sunway Training Management System (HSSTMS) has successfully achieved all of its objectives that have been defined in Chapter 1. The achievements are:

- (i) This application allows an admin to create all the user role in user management through system.

- (ii) This application allows the admin create new training in training management through system.
- (iii) This application allows the admin and manager to approve / reject registered training through system.
- (iv) The system enable to send out email notification to the user for approve / reject reminder.
- (v) This application allows an admin to generate report into excel file.

6.3 Project Challenges

There is sure to be challenges faced in any kind of project. A few challenges encountered during the development of HSSTMS are:

- (i) The possibility of scope for this topic might become wider and deeper for the Hitachi Sunway including all the country and department.
- (ii) Difficult handler due to different country have different time.
- (iii) The lack of knowledge and finding suitable terms to classify information technology asset.

6.4 Improvement / Enhancement

There is some implemented can be address the problems and weaknesses that still exist in this system. Improvements over time can make job management faster and easier. Among the suggestions for improvement of the system are:

- (i) Implement auto reset forget password email for user to reset their password.
- (ii) More email notification should be implement in order to keep track the system
- (iii) Plugin schedule job in order to monitor, auto update status and backup the system data.

6.6 Conclusion

All the objectives set for this project development have been achieved. During this project development several challenges were faced. However, appropriate steps and solution were taken. Good supervision and guidelines were also given by supervisor in order to complete the project within the time frame. Besides that, some limitations for the project were highlighted. Last but not least, some suggestion and recommendations for this project were identified as well for future enhancement

REFERENCES

Suhaimi Ibrahim, Wan Mohd Nasir Wan Kadir, Paridah Samsuri, et al (1999).

Kejuruteraan Perisian Malaysia: Penerbit UTM.

Retrieved on 9 March 2019

Sommerville, I. (2004). Software Engineering. Seventh Edition. United States of America : Pearson Addison Wesley.

Retrieved on 9 March 2019

Website SPA : <http://spa.anm.gov.my>

Retrieved on 9 March 2019

Spiral Model: <http://testingfreak.com/spiral-model->

Retrieved on 15 March 2019

Model Waterfall: https://www.tutorialspoint.com/sdlc/images/sdlc_waterfall_model

Retrieved on 30 March 2019

Prototype Model: <http://shopeemart.weebly.com/sdlc.html>

Retrieved on 2 April 2019

PHP Tutorial: <https://www.w3schools.com/php/>

Retrieved on 5 April 2019

PHP Site: <http://php.net/>

Retrieved on 24 April 2018

Wikipedia: http://en.wikipedia.org/wiki/Software_prototyping

Retrieved on 25 April 2018

Database: <https://www.apachefriends.org/index.html>

Retrieved on 28 April 2018

APPENDIX A

GANTT CHART FINAL YEAR PROJECT 1

TASK NAME	START DATE	END DATE	DURATION (WORK DAYS)	Sep-18				Oct-18								Nov-18							Dec-18					
				22	23	29	30	6	7	13	14	20	21	27	28	3	4	10	11	17	18	24	25	1	2	8	9	15
Project planning and verification																												
PSM Briefing	22/9/2018	22/9/2018	1																									
Supervisor Selection	23/9/2018	23/9/2018	1																									
Title Selection	29/9/2018	29/9/2018	1																									
Title Verification	30/9/2018	30/9/2018	1																									
Determination of Scope and Objectives	30/9/2018	30/9/2018	1																									
Analyze																												
Collecting organizational information	1/10/2018	1/10/2018	1																									
Identifying problems and needs	2/10/2018	7/10/2018	5																									
submit Chapter 1 for review	8/10/2018	8/10/2018	1																									
Correct for Chapter 1	9/10/2018	9/10/2018	1																									
Collect information and reference materials	10/10/2018	13/10/2018	3																									
Conduct literature studies	14/10/2018	14/10/2018	1																									
Submit Chapter 2 for review	15/10/2018	15/10/2018	1																									
Correct for Chapter 2	16/10/2018	16/10/2018	1																									
Determine the methodology	17/10/2018	21/10/2018	4																									
submit Chapter 3 for review	22/10/2018	22/10/2018	1																									
Correct for Chapter 3	23/10/2018	23/10/2018	1																									
Design																												
Architectural design	24/10/2018	28/10/2018	4																									
Database design	29/10/2018	2/11/2018	3																									
Interface design	3/11/2018	3/11/2018	1																									
Submit Chapter 4 for review	4/11/2018	4/11/2018	1																									
Correct for Chapter 4	5/11/2018	5/11/2018	1																									
Preparation and delivery of reports																												
Prepare and submit draft reports	6/11/2018	8/12/2018	20																									
Discussion and correction of draft reports	9/12/2018	9/12/2018	1																									
Final report submission	15/12/2018	15/12/2018	1																									

A-1: Gantt Chart Final Year Project 1

APPENDIX B

GANTT CHART FINAL YEAR PROJECT II

Task Name	Start Date	End Date	Duration (Work Days)	Jan-19		Feb-19						Mar-19						Apr-19					May-19								
				26	27	2	3	9	10	16	17	23	24	2	3	9	10	16	17	23	24	6	7	13	14	20	21	4	5	6	18
System Design			31																												
Information Gathering	2/2/2019	3/2/2019	1																												
System Design	3/2/2019	25/2/2019	22																												
Database Design	3/2/2019	9/2/2019	6																												
System Development			73																												
Application Development	2/3/2019	6/4/2019	33																												
Database Physical Design	4/3/2019	20/3/2019	17																												
Coding	8/3/2019	31/3/2019	24																												
System Implementation			9																												
Testing	5/4/2019	8/4/2019	4																												
Changing	2/4/2019	16/4/2019	5																												
Report and Presentation			22																												
Draf Report Writing	15/3/2019	24/3/2019	10																												
Presentation Preparation	15/4/2019	1/5/2019	17																												
Project Presentation	5/5/2019	5/5/2019	1																												
Report Correction	5/5/2019	15/5/2019	10																												
Report Submission	18/5/2019	18/5/2019	1																												

B-1: Gantt Chart Final Year Project II

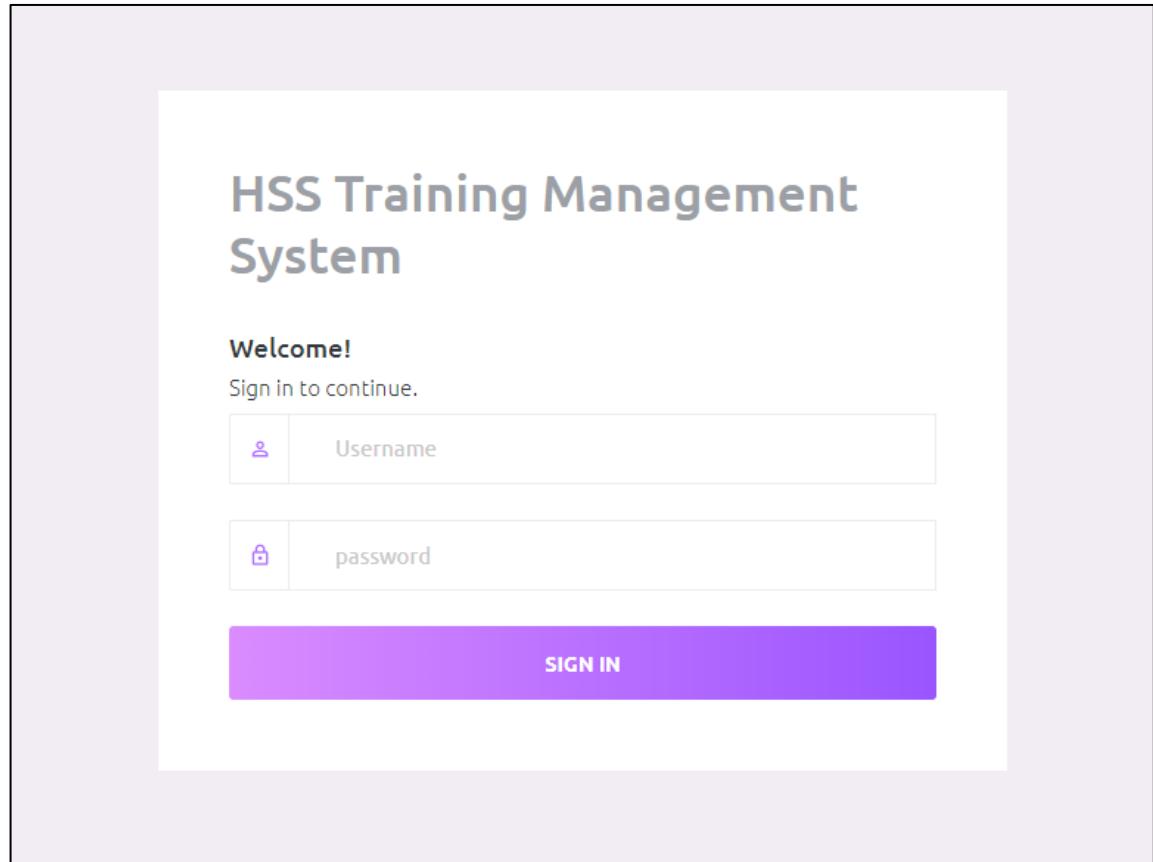
APPENDIX C

USER MANUAL

HITACHI SUNWAY TRAINING MANAGEMENT SYSTEM (HSSTMS)

USER MANUAL

1. Login

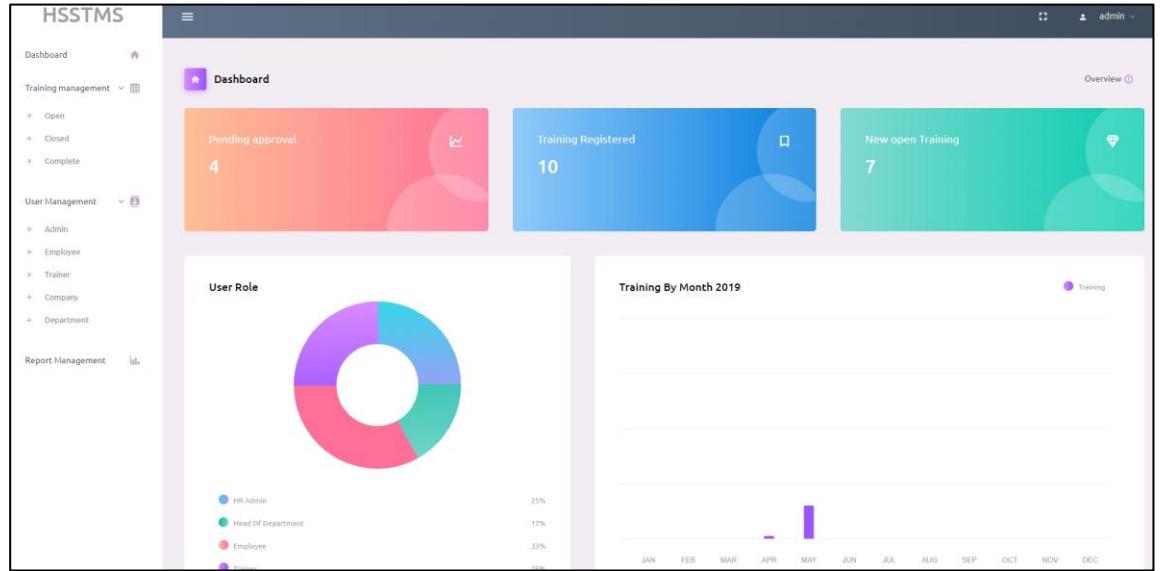


Users should be able to login into the system by using the correct username and password. Below are the steps to login into the system:

- (i) Users need to enter this address into the web browser:
<http://localhost/hsstms>
- (ii) Enter Username
- (iii) Enter Password
- (iv) Click Sign in

2. Admin

2.1. Admin Dashboard



- (i) This screen will show the analysis data in total amount, pie chart and bar chart.
- (ii) There are three main menu which are Training Management, User Location and Report Search.
- (iii) There will be 30 minutes time out and auto logout for all the user who did not do any action within 30 minutes.

2.2. Create Training

The image consists of two screenshots of a web-based training management system. The top screenshot shows the 'New Training' form with fields for Training Title, Training Type, Trainer ID, Objective, Outcome, Venue, Participant Quota, and Cost Per Person. A validation message 'Please enter training title' is displayed next to the Training Title field. The bottom screenshot shows fields for Register Start, Register End, Training Start, Training End, and a Remark field, along with a 'Submit' button.

- (i) Admin needs to fill in all the asset details in a new training form.
- (ii) An admin should be able to identify properly. An error message will be prompted if system detect admin did not enter correct data.
- (iii) After finish filled in the details, an admin need to click submit button to submit the data.

2.3. Training Management – Admin View

HSSTMS - Dashboard / Training Management - Open Register

No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	2 / 2	Full	<button>View</button> <button>Delete</button>
2	English For Business Communication Skills	Communication Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 30	Open	<button>View</button> <button>Delete</button>
3	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	<button>View</button> <button>Delete</button>
4	Microsoft Visio - Level 2	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	<button>View</button> <button>Delete</button>
5	Microsoft Visio - Level 3	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	<button>View</button> <button>Delete</button>

Showing 1 to 5 of 7 entries

HSSTMS - Dashboard / Training Management - Training scheduled

No #	Training Title	Training Type	Training Start	Training End	Quota	Status	Actions
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	4 / 4	End	<button>View</button>
2	Oracle's JD Edwards EnterpriseOne	IT Skill	2019-05-03 00:00:00	2019-05-03 18:00:00	2 / 2	End	<button>View</button>
3	Microsoft Excel 2013 Advanced Level 1	Microsoft Skill	2019-04-25 09:00:00	2019-04-25 18:00:00	2 / 2	End	<button>View</button>

Showing 1 to 3 of 3 entries

- (i) In training management, will have 3 type of display:
 - a. Open – List of training is open for register
 - b. Closed – List of training register date end and on going to start the training
 - c. Complete – List of training date is end

- (ii) Type of status:
 - a. Full – Hit the maximum quota
 - b. Open – The training still opening for register
 - c. End – training finished
 - d. Check – Notice for admin to check the training
 - e. Schedule – The training is scheduled

2.4. View participant

No #	Participant Name	Attendance	Remark	Last Update	Update by	Status	Actions
1	CONNIE LOOI SEE YEE	NO		2019-05-04 18:58:52	muzahid	Pending 2nd Approve	<input checked="" type="button"/> Approve <input type="button"/> Remove
2	EDWIN NG	NO		2019-05-04 12:49:30	edwin	Pending 1st Approve	<input checked="" type="button"/> Approve <input type="button"/> Remove

- (i) Admin can view all the participant from a training.
- (ii) Admin can direct approve the request from here
- (iii) Admin also can remove the participant for this training for cancellation flow.

2.5. Create User

New Admin
Please key in admin details

Username: Please enter username

Password:

Confirm Password:

Remark: Admin Name

Submit **Cancel**

Position:

Contact Number (Personal): 60161234567

Extension Number (Office): 3323

Email Address: Username@hitachi-sunwayis.com

Role:
Head Of Department
Employee

Remark:

Submit **Cancel**

- (i) Admin can create all the user role which is admin, head of department, employee and trainer
- (ii) For head of department and employee, admin can assign the role.
- (iii) All the insert form will display error message in order for admin to enter correct input.

2.6. Create Company and department

New Company

Please key in company details

Company Code: Please enter company code

Company Name:

Company Contact:

Submit **Cancel**

New Department

Please key in department details

Company Name: Please select company name Please select company name

Department Code:

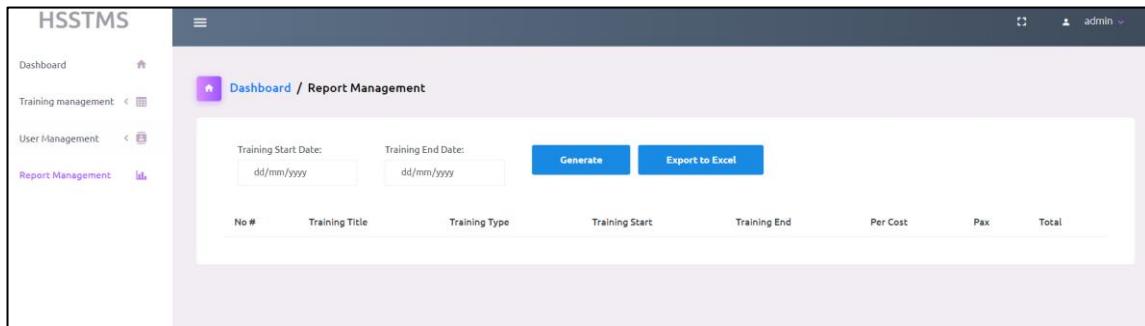
Department Name:

Head Of Department: Employee ID

Submit **Cancel**

- (i) Admin can create all new company and department
- (ii) For existing company and department, admin allow to update and delete
- (iii) All the insert form will display error message in order for admin to enter correct input.

2.7. Report Management



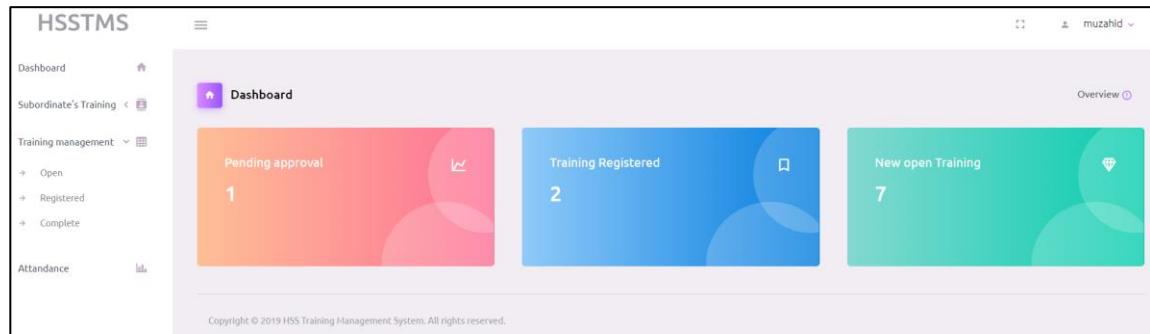
No #	Training Title	Training Type	Training Start	Training End	Per Cost	Pax	Total
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	RM250	4	1000
2	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-16 09:00:00	2019-05-16 18:00:00	RM100	2	200
3	Oracle's JD Edwards EnterpriseOne	IT Skill	2019-05-03 00:00:00	2019-05-03 18:00:00	RM100	2	200
4	JD Edwards EnterpriseOne Tools Release 9.2	IT Skill	2019-05-10 09:00:00	2019-05-10 18:00:00	RM200	2	400
5	JD Edwards EnterpriseOne Financial Reports	Finance	2019-05-09 09:00:00	2019-05-09 18:00:00	RM100	1	100
6	HR Skills for HR Administrators	HR	2019-05-08 09:00:00	2019-05-08 18:00:00	RM100	1	100
7	English For Business Communication Skills	Communication Skill	2019-05-17 09:00:00	2019-05-17 18:00:00	RM100	0	0
8	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	RM0	0	0
9	Microsoft Visio - Level 2	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	RM0	0	0
10	Microsoft Visio - Level 3	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	RM0	0	0
11	Microsoft Visio - Level 4	Microsoft Skill	2019-05-18 09:00:00	2019-05-18 18:00:00	RM0	0	0

A	B		C	D	E	F	G	H
1	No #	Training Title	Training Type	Training Start	Training End	Per Cost	Pax	Total
2	1	Microsoft Excel 2013 Advanced Level 1	Microsoft Skill	25/4/2019 9:00	25/4/2019 18:00	RM250	2	500
3								

- (i) Admin can generate the report into excel file by select data range
- (ii) If did not choose the data range, the system will auto choose all the list of training

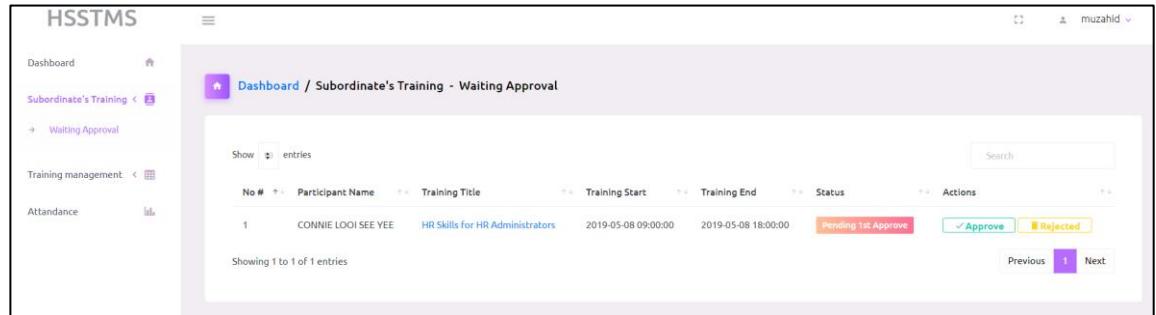
3. Head of department

3.1. Head of department Dashboard



- (i) This screen will show the analysis data in total amount for pending approval, training register and new open training.
- (ii) There are three main menu which are Subordinate's Training, Training Management and Attendance.
- (iii) There will be 30 minutes time out and auto logout for all the user who did not do any action within 30 minutes.

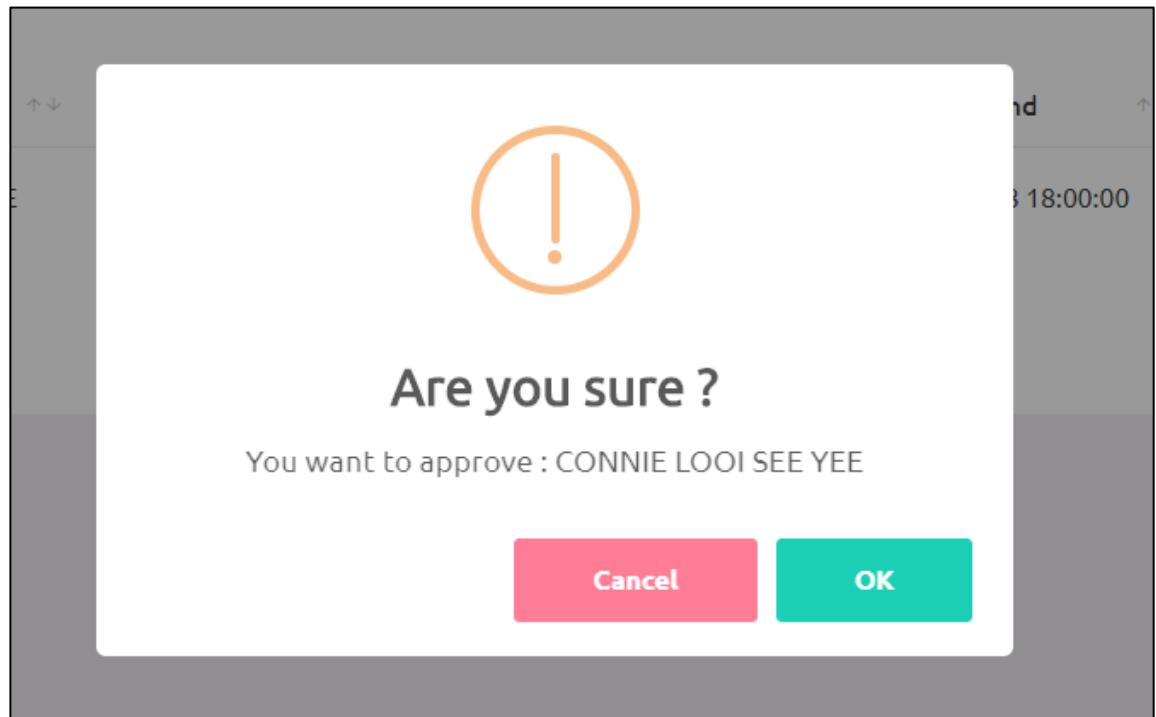
3.2. Approver



The screenshot shows the HSSTMS dashboard with a sidebar containing 'Dashboard', 'Subordinate's Training' (with a 'Waiting Approval' sub-item), 'Training management', and 'Attendance'. The main area is titled 'Dashboard / Subordinate's Training - Waiting Approval' and displays a single entry:

No #	Participant Name	Training Title	Training Start	Training End	Status	Actions
1	CONNIE LOOI SEE YEE	HR Skills for HR Administrators	2019-05-08 09:00:00	2019-05-08 18:00:00	Pending 1st Approval	<input checked="" type="button"/> Approve <input type="button"/> Rejected

Showing 1 to 1 of 1 entries.



A modal dialog box is displayed, featuring a large orange exclamation mark icon at the top. Below it, the text 'Are you sure?' is centered. Underneath, it says 'You want to approve : CONNIE LOOI SEE YEE'. At the bottom are two buttons: a pink 'Cancel' button on the left and a teal 'OK' button on the right.

- (i) Head of department can approve or reject this subordinate register training.
- (ii) A popup message to double confirm the action of head of department to approve or reject.

3.3. Training management – Head of department

No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	2 / 2	Full	<button>View</button>
2	English For Business Communication Skills	Communication Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 30	<button>Open</button>	<button>Apply</button> <button>View</button>
3	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	<button>Open</button>	<button>Apply</button> <button>View</button>
4	Microsoft Visio - Level 2	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	<button>Open</button>	<button>Apply</button> <button>View</button>
5	Microsoft Visio - Level 3	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	<button>Open</button>	<button>Apply</button> <button>View</button>
6	Microsoft Visio - Level 4	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	<button>Open</button>	<button>Apply</button> <button>View</button>
7	Microsoft Visio - Level 5	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	<button>Open</button>	<button>Apply</button> <button>View</button>

Showing 1 to 7 of 7 entries
NOTE : For cancellation training, please contact HR department for further inquiries.

(i) In training management, will have 3 type of display:

- Open – List of training is open for register
- Registered – List of training which has registered
- Complete – List of training which has completed

(ii) Type of status:

- Full – Hit the maximum quota
- Open – The training still opening for register
- End – training finished
- Pending 1st approve – pending head of department to approve the training
- Pending 2nd approve – pending admin to approve the training
- approve – training have been fully approve

3.4. Attendance

The screenshot shows the HSSTMS system's Attendance module. The main interface includes a sidebar with links to Dashboard, Subordinate's Training, Training management, and Attendance. The central area is titled 'Dashboard / Attendance' and displays a table of training entries. One entry is visible:

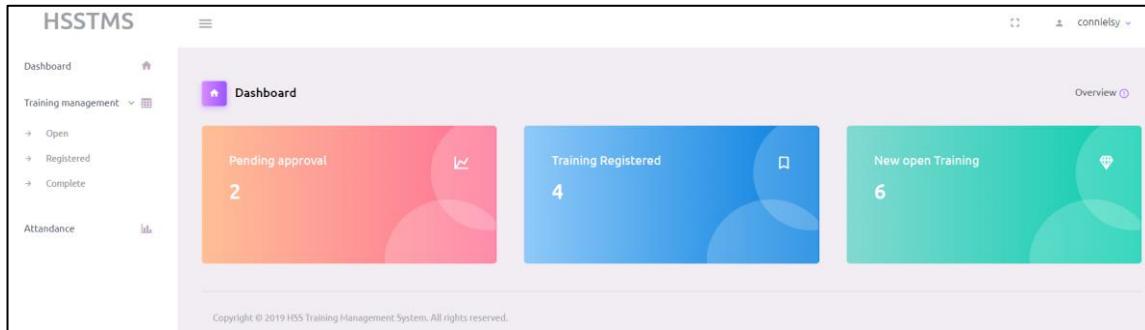
No #	Training Title	Training Type	Training Start	Training End	Quota	Status	Actions
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	4 / 4	Approved	<input checked="" type="checkbox"/> Mark

Below the table, it says 'Showing 1 to 1 of 1 entries'. Navigation buttons for 'Previous' and 'Next' are at the bottom right.

- (i) Mark the attendance through system when attend the training in order for to show the list of attendance in trainer view side.
- (ii) Only can mark once for the attendance.

4. Employee

4.1. Employee Dashboard



- (i) This screen will show the analysis data in total amount for pending approval, training register and new open training.
- (ii) There are three main menu which are Training Management and Attendance.
- (iii) There will be 30 minutes time out and auto logout for all the user who did not do any action within 30 minutes.

4.2. Training management – Employee

The screenshot shows the HSSTMS Training Management - Open Register page. The left sidebar has categories: Dashboard, Subordinate's Training, Training management (with Open, Registered, Complete), and Attendance. The main area title is 'Dashboard / Training Management - Open Register'. It displays a table with 7 entries:

No #	Training Title	Training Type	Register Start	Register End	Quota	Status	Actions
1	Microsoft Word (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	2 / 2	Full	View
2	English For Business Communication Skills	Communication Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 30	Open	Apply View
3	Microsoft VISIO (Basic To Advance Levels)	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	Apply View
4	Microsoft Visio - Level 2	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	Apply View
5	Microsoft Visio - Level 3	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	Apply View
6	Microsoft Visio - Level 4	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	Apply View
7	Microsoft Visio - Level 5	Microsoft Skill	2019-05-01 09:00:00	2019-05-08 18:00:00	0 / 25	Open	Apply View

Showing 1 to 7 of 7 entries
NOTE : For cancellation training, please contact HR department for further inquiries.

- (i) In training management, will have 3 type of display:
 - a. Open – List of training is open for register
 - b. Registered – List of training which has registered
 - c. Complete – List of training which has completed

- (ii) Type of status:
 - a. Full – Hit the maximum quota
 - b. Open – The training still opening for register
 - c. End – training finished
 - d. Pending 1st approve – pending head of department to approve the training
 - e. Pending 2nd approve – pending admin to approve the training
 - f. approve – training have been fully approve

4.3. Attendance

The screenshot shows the HSSTMS software interface with the title 'HSSTMS' at the top. On the left, there is a sidebar with navigation links: Dashboard, Subordinate's Training, Training management, and Attendance. The 'Attendance' link is highlighted. The main content area is titled 'Dashboard / Attendance'. It displays a table with one entry:

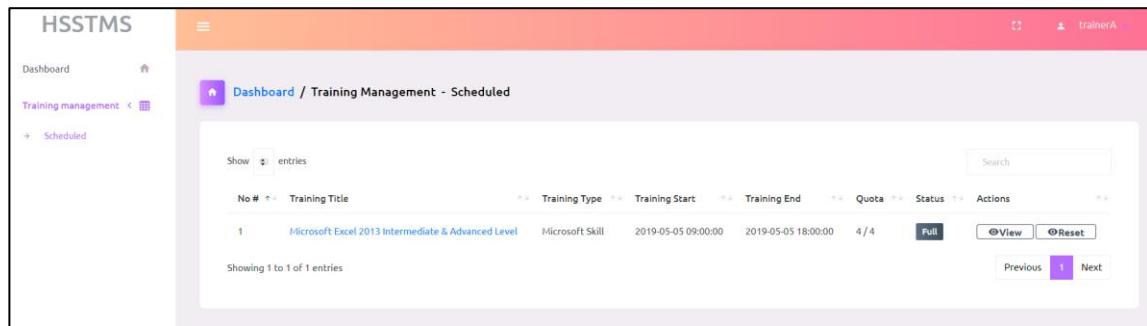
No #	Training Title	Training Type	Training Start	Training End	Quota	Status	Actions
1	Microsoft Excel 2013 Intermediate & Advanced Level	Microsoft Skill	2019-05-05 09:00:00	2019-05-05 18:00:00	4 / 4	Approved	<input checked="" type="checkbox"/> Mark

Below the table, it says 'Showing 1 to 1 of 1 entries'. There are 'Previous' and 'Next' buttons at the bottom.

- (i) Mark the attendance through system when attend the training in order for to show the list of attendance in trainer view side.
- (ii) Only can mark once for the attendance.

5. Trainer

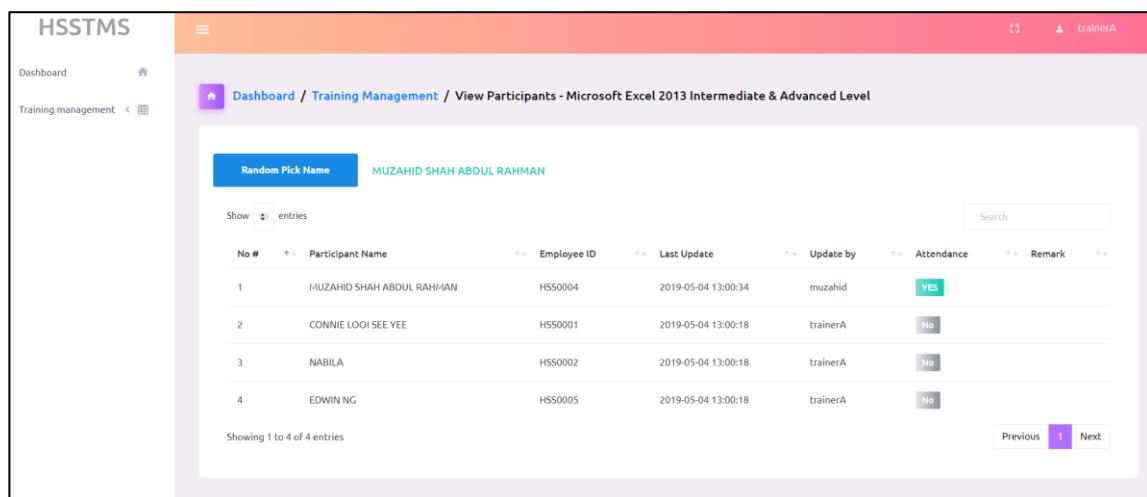
5.1. Trainer Dashboard



The screenshot shows the HSSTMS Trainer Dashboard under the 'Training management' section, specifically the 'Scheduled' tab. The main content area displays a table of training entries with the following columns: No #, Training Title, Training Type, Training Start, Training End, Quota, Status, and Actions. A single entry is visible: 'Microsoft Excel 2013 Intermediate & Advanced Level' (Training Title), 'Microsoft Skill' (Training Type), '2019-05-05 09:00:00' (Training Start), '2019-05-05 18:00:00' (Training End), '4 / 4' (Quota), and 'Full' (Status). The 'Actions' column contains buttons for 'View' and 'Reset'. Navigation buttons for 'Previous' and 'Next' are at the bottom right.

- (i) This screen will display all list of training which under by this trainer.

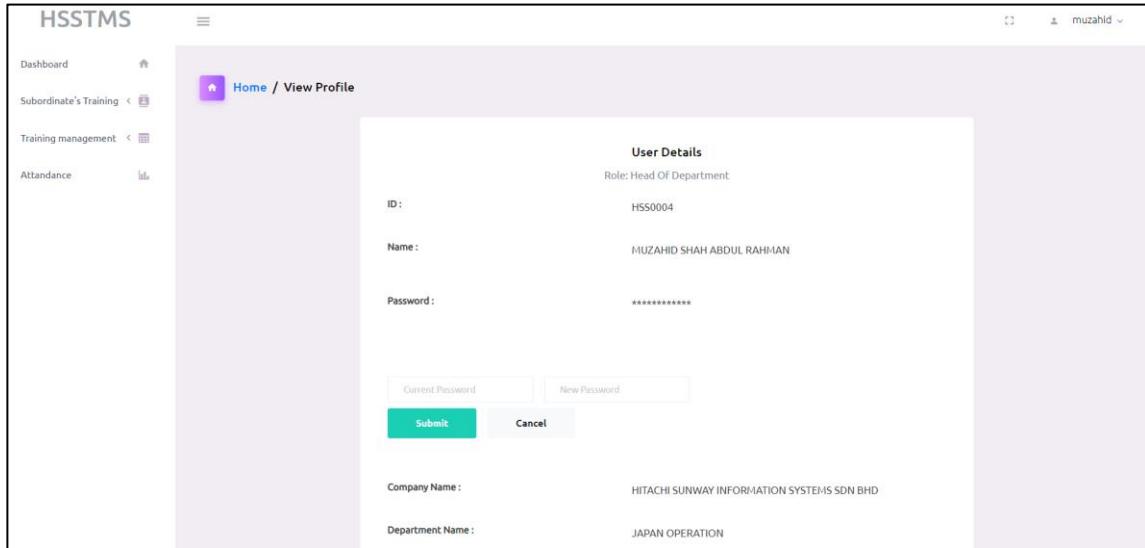
5.2. Trainer View Participant



The screenshot shows the HSSTMS Trainer View Participant screen under the 'Training management' section. It displays a table of participants for the 'Microsoft Excel 2013 Intermediate & Advanced Level' session. The columns include No #, Participant Name, Employee ID, Last Update, Update by, Attendance, and Remark. The table lists four participants: MUZAHID SHAH ABDUL RAHMAN, CONNIE LOOI SEE YEE, NABILA, and EDWIN NG. MUZAHID SHAH ABDUL RAHMAN has 'YES' in the Remark column and a green 'YES' button. The other three participants have 'No' in the Remark column and a grey 'No' button. The 'Attendance' column shows 'muzahid' for the first participant and 'trainerA' for the others. Navigation buttons for 'Previous' and 'Next' are at the bottom right.

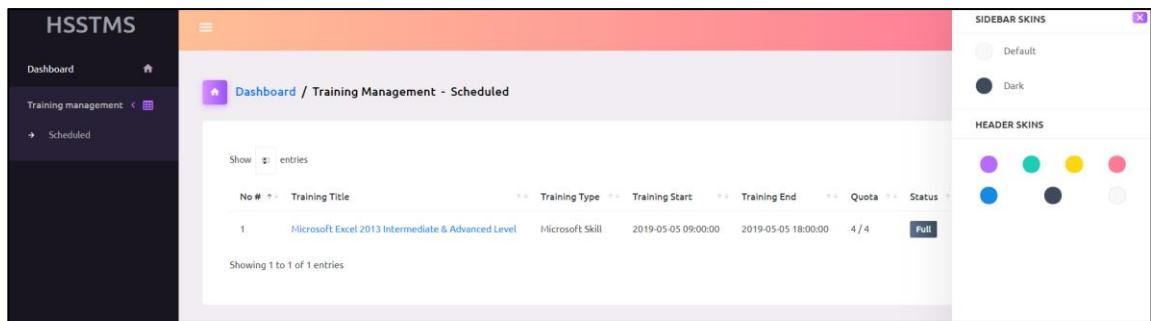
- (i) This screen will display all list participant under a training.
- (ii) The list enable trainer to view the attendance.
- (iii) Trainer can click “Random Pick Name” to random pick one of the participant to answer a question.

6. Change Password



- (i) All user are enable to change their password in the system.
- (ii) The password strength password are required at least 8 characters long and together with alphanumeric and numeric.

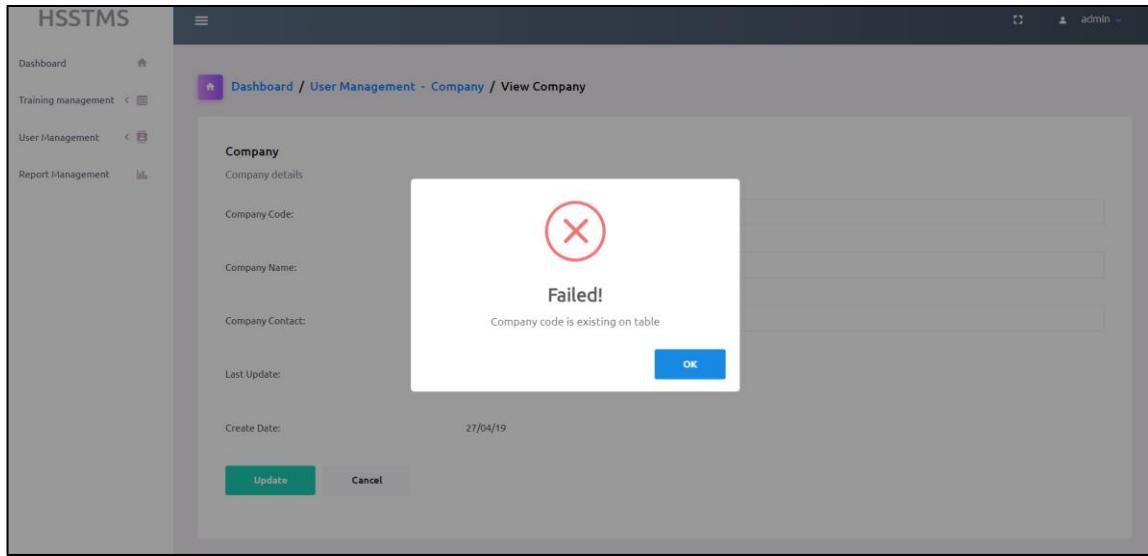
7. Change Theme



- (i) All user are enable to change the theme.
- (ii) The theme will be save in the user account separately.

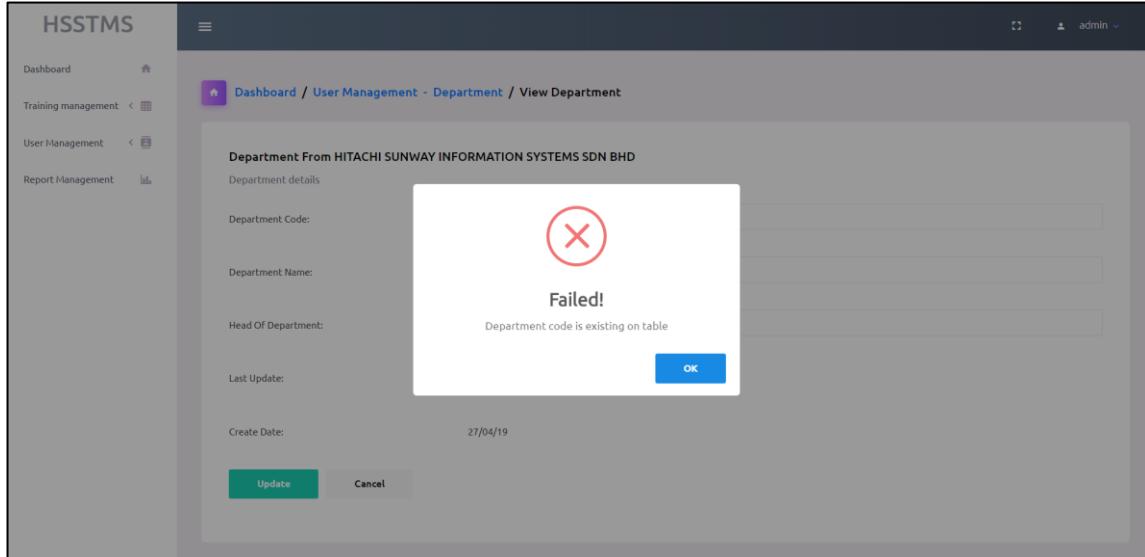
8. Validation guideline

8.1 Company Code



- (i) Please make sure new company code is not existing company code in the system
- (ii) An error will popup, when admin enter an existing company code

8.2 Department Code



- (i) Please make sure new department code is not existing department code any in the system
- (ii) An error will popup, when admin enter an existing department code

8.3 New username

The screenshot shows the HSSTMS application interface. The left sidebar has navigation links: Dashboard, Training management, User Management (selected), and Report Management. The main content area is titled 'New Admin' and contains fields for 'Username' (admin), 'Password', 'Confirm Password', and 'Remark'. A message 'Please key in admin details' is above the fields. An error message 'Username has already been taken' is displayed next to the 'Username' field. Below the fields are 'Submit' and 'Cancel' buttons. The footer includes a copyright notice: 'Copyright © 2019 HSST Training Management System. All rights reserved.' and a URL: '140.0.4.104:8084.com/HSSTMS/index.php'.

- (i) Please make sure new username code is not existing username in the system due to username is unique.
- (ii) System will check the username, if existing will prompt error “Username has already been taken”.