



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF MONITORING SYSTEM
DATABASE FOR INVENTORY AND MATERIAL
HANDLING**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.

by

ANGELINE CHIEW YUEN HUEI

B071510291

951015-04-5142

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
TECHNOLOGY

2018

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: Development of Monitoring System Database for Inventory and Material Handling

Sesi Pengajian: 2019

Saya **ANGELINE CHIEW YUEN HUEI** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

SULIT*

Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

TERHAD*

Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

TIDAK
TERHAD

Yang benar,

Angel

ANGELINE CHIEW YUEN HUEI

Alamat Tetap:

138, JALAN TENGGERA,

75200 MELAKA.

Disahkan oleh penyelia:



AHMAD NIZAMUDDIN BIN

MUHAMMAD MUSTAFA

Cop Rasmi Penyelia

AHMAD NIZAMUDDIN BIN MUHAMMAD MUSTAFA
Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan
Universiti Teknikal Malaysia Melaka

Tarikh: 12 Disember 18

Tarikh: 8/1/2019

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled Development of Monitoring System Database for Inventory and Material Handling is the results of my own research except as cited in references.

Signature: *Angel*

Author : ANGELINE CHIEW YUEN HUEI

Date: 22 November 2018

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

Signature: 

Supervisor: AHMAD NIZAMUDDIN BIN
MUHAMMAD MUSTAFA

Signature: 

Co-supervisor: NORFADZLIA BINTI MOHD YUSOF

ABSTRAK

Projek ini adalah untuk membangunkan satu sistem pengurusan inventori makmal untuk mengendalikan inventori dan bahan-bahan yang membolehkan pengguna makmal untuk mengesan item inventori dengan adanya pangkalan data dan memvisualisasikan semua maklumat inventori secara atas talian. Penggunaan sistem ini adalah untuk mengatasi masalah-masalah di sistem inventori semasa yang mengendalikan inventori secara manual. Menurut penolong jurutera makmal, semua proses permohonan peminjaman dan pemulangan dalam sistem semasa adalah dalam bentuk kertas. Perkara ini menyebabkan kesukaran dalam mengesan pergerakan keluar dan masuk inventori. Perkara ini juga akan menyebabkan kes terlepas pandang terhadap inventori yang sudah sampai tarikh tamat tetapi belum dikembalikan oleh kakitangan staff. Sistem semasa memerlukan tenaga manusia untuk menjana laporan dan mengumpul data untuk membuat analisis kerana kesemua data adalah dalam bentuk kertas. Tidak kurang daripada itu, langkah menyemak rekod kakitangan staff untuk mendapatkan nombor telefon untuk membuat panggilan amat menyusahkan dan memakan masa yang lama. Justeru, projek ini direka dengan adanya tiga jenis pengguna yang akan menggunakan sistem ini untuk memainkan peranan masing-masing. Sistem ini dirancang untuk mempunyai fungsi menghantar emel secara automatik kepada kakitangan staff pada pukul 5 petang untuk memaklumkan mereka bahawa status untuk peminjaman inventori telah tamat tempoh sekiranya mereka tidak memulangkan inventori sebelum pukul 5 petang. Dengan adanya sistem ini, pengguna dapat lihat semua transaksi dalam talian dan dapat mengatasi masalah terlepas pandang terhadap inventori yang tamat tempoh. Secara ringkasnya, sistem ini dapat meningkatkan kecekapan sistem semasa.

ABSTRACT

This project is on developing the Laboratory Inventory Management System for inventory and material handling which allow the users to track the inventory item with the use of database and able to visualize all the information of the inventory online. The use of this inventory management system is to overcome the problem of the current inventory system that handle the inventory manually. According to the assistant lab engineer, all the application of borrowing and returning of the current system is on paper form, so it is very hard to track in and out of the inventory. There is a possibility of overlooked on the inventory that has not return by the staff after the due date. The current system requires manpower to generate the inventory report for analysis due to all the data are in paper form. Moreover, the step on checking the inventory record files and call the staff for notifying them on the overdue of borrowing period is very troublesome and wasting time. Thus, the project is to design and develop a system with three type of users which are going to use the system with its own functionalities based on the problem faced in the current system. The system is designed to have an automatic email notification sent to the staff at 5pm to inform status of overdue of the item borrowed if the staff did not return the item borrowed before 5pm. With the developed system, the user able to view all the transaction online, this can overcome the problem of overlooked on the item overdue. In short, this system can increase the efficiency of the current inventory system.

DEDICATION

To my beloved parents.

ACKNOWLEDGEMENTS

I would like to express my deep gratitude Encik Ahmad Nizamuddin bin Muhammad Mustafa, my project supervisor and Madam Norfadzlia binti Mohd Yusof, my project co-supervisor, for their patient guidance, encouragement and valuable support of this project work. Their in-time feedback, insight, and advice were influential and essential throughout my project.

Next, I would like to thank Madam Norashikin, the assistant lab engineer of Mikroproses dan Mikropengawal laboratory under JTKEK department for her help in providing information of the current inventory management system.

Last but not the least, I would like to thank my parents and fellow friends for their support and encouragement throughout my studies and my life in general.

TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	x
LIST OF TABLES	xiv
LIST OF FIGURES	xv
LIST OF APPENDICES	xviii
LIST OF ABBREVIATIONS	xix
CHAPTER 1 INTRODUCTION	1
1.0 Introduction	1
1.1 Background of Study	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Scope	4
1.5 Project Significance	5
1.6 Summary	5
CHAPTER 2 LITERATURE REVIEW	7
2.0 Introduction	7
2.1 Faculty Background	7
2.2 Analysis of The Current Inventory System in Managing Assets and Inventory at the Laboratory	8

2.3	Related Research on Material Management System	9
2.3.1	Overview on Development of Library Management System	9
2.3.2	Overview on Development of Warehouse Management System	10
2.4	Software Implementation	11
2.4.1	Database Management System	11
2.4.2	Software Process Model	14
2.4.3	Software Tools	17
2.4.3.1	PHP	17
2.4.3.2	MySQL	18
2.4.3.3	XAMPP	19
2.4.4	System Design	20
2.4.5	Database Design	22
2.4.6	Software Testing	23
2.5	Comparison of the Advantage and Disadvantage of All the Existing System	25
2.6	Summary	30
CHAPTER 3	METHODOLOGY	31
3.0	Introduction	31
3.1	Project Methodology	32
3.2	Requirement Definition	32
3.2.1	Problem That Exist in The Current System	33
3.2.2	Proposed Solution to the Current System	33

3.3	System Design	34
3.3.1	Use Case Diagram	35
3.3.1.1	Admin Functionalities	36
3.3.1.2	Assistant Lab Engineer Functionalities	36
3.3.1.3	Lecturer Functionalities	36
3.3.2	System Workflow	37
3.3.3	System Flowchart	38
3.3.4	Database Design	46
3.4	System Implementation and Unit Testing	51
3.5	Integration and System Testing	52
CHAPTER 4	RESULT AND DISCUSSION	53
4.0	Introduction	53
4.1	Structure of Database	53
4.2	Webpage Design	54
4.2.1	Webpage Design for All Users	54
4.2.1.1	Login Page	54
4.2.1.2	Change Password Page	55
4.2.1.3	Forget Password Page	56
4.2.2	Webpage Design for Admin Functionalities	57
4.2.2.1	Add New Item Page	57
4.2.2.2	Staff Summary Page	59

4.2.2.3	Inventory Report Page	61
4.2.3	Webpage Design for Lab Engineer Functionalities	62
4.2.3.1	Item Request Approval Page	62
4.2.3.2	Overdue Notification Page	64
4.2.3.3	Inventory Report Page	65
4.2.4	Webpage Design for Lecturer Functionalities	66
4.2.4.1	Item Request Application	66
4.3	Discussion on Coding	68
4.4	Analysis of the System	71
4.4.1	Test Case	71
4.4.2	Performance Test	72
4.5	Limitation	75
CHAPTER 5	CONCLUSION	76
5.0	Introduction	76
5.1	Summary	76
5.2	Recommendation	76
REFERENCES		78
APPENDIX		81

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2. 1:	Comparing Object oriented model to that of relational model in data modelling. (Ghongade and Pursani, 2014)	12
Table 2. 2:	Comparison of the software process model that discussed.	16
Table 2. 3:	Comparison among all the current laboratory inventory system that available in the market.	25
Table 2. 4:	Comparison among all the current automated warehouse inventory system that available in the market.	27
Table 2. 5:	Comparison among all the current library management system that available in the market.	28
Table 3. 1:	Staff Table.	46
Table 3. 2:	Access Level Table	46
Table 3. 3:	Item Table	47
Table 3. 4:	Inventory table.	47
Table 3. 5:	Approve table.	48
Table 3. 6:	Request table.	48
Table 3. 7:	Status table	49
Table 3. 8:	Approve Table	49

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2. 1:	Data Shown on the Average Execution Time. (Bassil, 2012)	13
Figure 2. 2:	Data Shown Average CPU Utilization. (Bassil, 2012)	13
Figure 2. 3:	Data Shown Average Memory Usage. (Bassil, 2012)	13
Figure 2. 4:	The Waterfall Model.(Sommerville, 2010)	14
Figure 2. 5:	Incremental Development.(Sommerville, 2010)	15
Figure 2. 6:	Boehm’s Spiral Model. (Sommerville, 2010)	15
Figure 2. 7:	Block diagram of the inventory system methodology.	20
Figure 2. 8:	Interface of the database using SQLyog.(Hashim and Arifin, 2013)	21
Figure 2. 9:	Block diagram of the interface development of the inventory database system.	22
Figure 2. 10:	Test Information Flow Diagram.(Trivedi, 2014)	24
Figure 3. 1:	Waterfall Model.(Sommerville, 2010)	32
Figure 3. 2:	The Use Case Diagram for The Whole System.	35
Figure 3. 3:	Block diagram for the system when the lecturer request online to get the asset.	37
Figure 3. 4:	Block diagram for the system when the lecturer borrows the inventory item from the shelf.	38
Figure 3. 5:	Flowchart for Login System.	39
Figure 3. 6:	Flowchart for The Admin to Insert New Staff.	40
Figure 3. 7:	Flowchart for The Admin to Insert New Item.	41

Figure 3. 8: Flowchart for The Admin to Delete Staff.	42
Figure 3. 9: Flowchart for The Admin to Delete Item.	43
Figure 3. 10: Flowchart of Assistant Lab Engineer for Approval on Request Application	44
Figure 3. 11: Flowchart of The Assistant Lab Engineer for Sending Email.	45
Figure 3. 12: Entity relationship diagram for the develop system.	50
Figure 4. 1: Database Design.	53
Figure 4. 2: Login Page for Inventory System.	54
Figure 4. 3: Error Message Displayed when the Field is Empty.	54
Figure 4. 4: Alert Box Showing the User Entered Invalid Id or Password.	55
Figure 4. 5: Output Page for Change Password.	55
Figure 4. 6: Output Page for Forget Password.	56
Figure 4. 7: Forget Password Email Notification Sent to Requester.	56
Figure 4. 8: Admin Dashboard.	57
Figure 4. 9: Output Page of add.Php.	57
Figure 4. 10: Output Page on add.Php with Error Message.	58
Figure 4. 11: Output Page when All the Field are Filled.	58
Figure 4. 12: Alert Box Showing Success to Add Item.	58
Figure 4. 13: Output Page of staff.Php.	59
Figure 4. 14: Output Page on staff.php with Error Message.	59
Figure 4. 15: Error Display Below the Field when Invalid Format of the Field is Filled.	60
Figure 4. 16: Alert Box Showing Success to Add Staff.	60
Figure 4. 17: Alert Box Requesting Confirmation from Admin to Delete.	60
Figure 4. 18: Output Page when Admin Clicked "Update".	60

Figure 4. 19: Output Page that Display Inventory Table.	61
Figure 4. 20: Lab Engineer Dashboard.	62
Figure 4. 21: Output Page Displays List of Items Requested to Borrow.	62
Figure 4. 22: Output Page when Lab Engineer Clicked “Approve”.	63
Figure 4. 23: Output Shows Item is Approve by Lab Engineer.	63
Figure 4. 24: Approval Email Sent to Lecturer.	63
Figure 4. 25: Reject Notification when Lab Engineer Clicked “Reject”.	63
Figure 4. 26: Reject Email Sent to Lecturer.	64
Figure 4. 27: Output Page which Shows the List of Items Overdue.	64
Figure 4. 28: Overdue Email Notification Sent to Lecturer.	65
Figure 4. 29: Output page of inventory report.	65
Figure 4. 30: Lecturer Dashboard.	66
Figure 4. 31: Output Page when Lecturer Clicked “Item Request Application” Button.	66
Figure 4. 32: Output Page of request.php with Error Message.	67
Figure 4. 33: Result when User Successfully Requested for Item.	67
Figure 4. 34: Test Case for Login Page.	71
Figure 4. 35: Test Case for Add New Item Page.	71
Figure 4. 36: Test case for item request approval page.	72
Figure 4. 37: Test Case for Request Page.	72
Figure 4. 38: Summary Report of the Test Plan.	73
Figure 4. 39: Aggregate Graph that Shows the Average Time.	73
Figure 4. 40: Load Test for 50 Threads at a Time.	74

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Coding for index.php	81
Appendix 2	Coding for adminfp.php	82
Appendix 3	Coding for add.php	83
Appendix 4	Coding for staff.php	85
Appendix 5	Coding for itemrequest.php	89
Appendix 6	Coding for approval.php	90
Appendix 7	Coding for request.php	93

LIST OF ABBREVIATIONS

PHP	Hypertext Preprocessor
DBMS	Database Management System
HTML	Hypertext Markup Language
CSS	Cascading Style Sheet
XAMPP	Cross Platform, Apache, MariaDB/MySQL, Perl, Php
ID	Identification Detail
ERD	Entity Relationship Diagram
RFID	Radio Frequency Identification

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter, the whole concept about the project that going to develop is mentioned. These includes the background study of the project based on keywords such as database, inventory system, laboratory, problem statement, objective, scope, project significant and summary of the whole project.

1.1 Background of Study

Database is well-known as a set of structured data that can store a huge amount of data and records efficiently. The data in the database can be access, sort and manage easily by having a database management system. In present, database management system is the most reliable system that can organize the collections of data and allow the data to be search, create and update. Database management system is being used in several fields such as library management system, warehouse management system, laboratory management system and many more. There are several different types of database available in the market. However, the most common one that used are the object-oriented database and the relational database. Both the type of databases have its pros and cons that will be discuss in the next chapter.

As inventory is a collection of items such as property that had in a place, thus it is a must to have records of all items that can track the status of the item. Whenever a process is related to inventory, it will definitely use up lots of paper or form that has to be filled manually by the user to track the information of items. Thus, there is the need of having

inventory management system using database to establish the inventory process works in a more efficient manner. Furthermore, the inventory system that used database offers better protection in term of security than in paper form.

With laboratory inventory management system, all the inventory item can be monitored and all the item in the laboratory can be track whether the items borrowed were returned safely back to the shelf. It offers lot of advantages if the system is implemented in the laboratory. The system that designed can lessen manpower on handling those items and all the information about the item can be retrieve in a faster manner.

1.2 Problem Statement

The current inventory system that had in the laboratory is mainly handled by using paper form or book. This leads to an inefficient inventory system as all the forms are written manually and kept in the files. Whenever, the assistant lab engineer needs to keep track of the inventory item in the laboratory, it may lead to overlooked on inventory item that had overdue and no action is done immediately. When the assistant lab engineer rechecked on the application form and notice on the overdue status on item, the assistant lab engineer will call the lecturer. This is very troublesome as the phone number of the lecturer is not included in the inventory form and the lab engineer need to check out the phone number somewhere else to make a phone call. Whenever there is an inventory item neither in the shelf nor borrowed by staff, it is difficult to track who are the one took the item if all of these inventory item does not interface with the inventory system using database.

Furthermore, the process of borrow and return of the inventory item in the laboratory requires both the parties of assistant lab engineer together with the one that wants to borrow or return item to come face to face and request. If the assistant lab

engineer did not allow the inventory item to be borrow by the staff due to some situation, the lecturer will waste his time going there without get to borrow anything.

Moreover, the current inventory system is only for tracing the movement of the item. It does not have warning system that reminds the user about the overdue notification of the item borrowed from the inventory. If the item is overdue, it is hard to track as there is no system to remind the borrower on overdue status.

1.3 Objectives

Objectives can be defined as the goals or target that needed to be achieved at the end of the project or study. Each project has their own objectives that keep the project on the right path and to make the project become more clearly defined. The objectives of this project are as below.

- 1) To study and analyze the problem that exist in the current inventory management system from the past research.
- 2) To design an automated laboratory inventory management system that can track the inventory item using suitable software.
- 3) To integrate the inventory management system that can visualize all the inventory information online.

The first objective is to study and analyze the problem that exist in the current system where the next chapter will discuss. It is basically important to understand the problem or weaknesses in the current system so that in the proposed project, the weaknesses can be improved and new requirements from the user can be added to build a better system. The second objective is to design an automated laboratory inventory management system that can track the movement of the inventory items in real time. In

developing automated inventory management system, it is important to choose a suitable software tools according to circumstances such as cost, language and user-friendly purposes. The third objective is to highlight on how to integrate the inventory management system that visualize all the inventory information online by having a web page that is user friendly.

1.4 Scope

The project is on developing the laboratory inventory management system for inventory and material handling. Thus, the scope of this project will cover the laboratory at Faculty of Engineering Technology (FTK) in UTeM. All the laboratories in this faculty uses the same method in handling inventory item. In FTK, there are lots of laboratories under different departments. In this case, the Microprocessor and Microcontroller Laboratory (MMPMP) under the Department of Electronics & Computer Engineering Technology (JTKEK) is chosen to implement this system. The current inventory system covers all the furniture, inventory and assets as inventory item in the laboratory of FTK. In this project, a scalable system that can cater different kind of assets is implemented where the all the assets for the laboratory which is categorized as inventory will be included. All the inventory items that can be borrowed are included. However, this does not include consumable assets due to the reason of budget and quantity.

This project will only cover software design, implementation, software testing but not hardware design, hardware implementation although after implementation of the system design on the software component, the system designed will integrate with hardware component. How the hardware component sends the information of the inventory item that borrowed by the staff to the server through Arduino and how the

software component received the data from the API server of the Arduino will not be discussed.

1.5 Project Significance

Nowadays, handling material and inventory is a critical issue that faced by all the organization. The concept of handling material and inventory normally uses basic method such as manually written in paper form. These goes the same to the laboratory management on handling inventory. The conventional system should be replaced by an inventory management system that uses database. This is due to the inventory form that handle manually may leads to misplace in the files if too many inventory items stored in the laboratory. With the used of the system database, it will help to identify the identities of the staff that borrow or return the item and monitor the process of borrow or return in a systematic way.

1.6 Summary

This project is basically start with a background study on the database, inventory system, laboratory inventory management system from the past research based on journal, thesis, online website and book. Then, the problem exists in the current inventory system is analyzed. The objectives for the project are then defined as the goals that need to achieve when implementing the project. This will ensure the entire project will concentrate on the aspect listed in the objectives. The scope for the project is then stated to discuss where is the limitation for the entire project that is going to develop. The scope for this project is focuses on inventory item which costs less than RM3000 that locates on the shelf in the MMPMP lab and the software development for the system only. There are five chapters that will discuss in this report. Chapter 1 consists of the introduction of