

LABORATORY EQUIPMENT TRACKING SYSTEM

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Dedicating my thanks to my parents, supervisor (En. Muhammad Noorazlan Shah bin Zainuddin), lectures, friends and the FKEKK technicians for their supports and help.

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ABSTRACT

Monitoring laboratory equipment record is very important to ensure every item is always in place. Generally, in and out equipment is handled manually by technician by writing down the equipment information, including time and date in equipment circulation form. To automate this process, Radio Frequency Identification (RFID) is one of the most practical and applicable in real implementation in line with the nature where most of the systems are made computerized.

In this paper, a solution has been provided for the problem encountered in laboratory equipment monitoring system using RFID technology. This project consist four main parts: the tag, tag reader, system development and networking system. The RFID tag is tagged on the laboratory equipment information and RFID reader is located at the door of each laboratory room. This monitoring system enables the head of laboratory and technician to monitor in-out equipment in actual environment and also increase the efficiency in managing equipment in the laboratory.

Benefits of the system include the enhancement of the safety of University Teknikal Malaysia Melaka (UTeM) asset and reduce losses of assets and enhancement of the laboratory inventory control of equipment.

ABSTRAK

Sistem Mengesan Barang Makmal adalah satu sistem yang membantu ketua makmal dan pembantu teknikal makmal mengesan keluar masuk barang makmal dan juga meningkatkan kecekapan dalam mengetahui lokasi barang makmal. Sistem ini juga memastikan keselamatan barangan hak milik university dan juga mengurangkan kehilangan barangan universiti berserta meningkatkan kecekapan untuk mengetahui lokasi asset dalam makmal. Mengawal rekod makmal adalah penting untuk memastikan setiap barang pada tempat asalnya. Kini, masuk keluar barang dari makmal dikawal melalui sistem manual di mana informasi barang, tarikh dan masa ditulis dalam borang. Bagi menjadikan sistem ini sistem digital, RFID digunakan kerana teknik RFID lebih berkesan.

Dalam projek ini, satu penyelesaian telah diberi bagi masalah mengesan barang makmal dengan menggunakan teknik RFID. Projek ini mempunyai empat bahagian: RFID tag, pembaca RFID, pembangunan sistem, dan sistem network. RFID tag dalam sistem is mengesan maklumat dari tag dengan menggunakan RFID pembaca. Pembaca RFID dipasangkan pada pintu masuk setiap makmal. Sistem ini membantu pembantu makmal dan ketua makmal mengesan keluar masuk barangan makmal dan meningkatkan kecekapan untuk mengetahui lokasi asset dalam makmal.

Kebaikan sistem in adalah untuk memastikan keselamatan barangan hak milik university dan juga mengurangkan kehilangan barangan universiti.

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LIST OF ABBREVIATIONS

RFID	- Radio Frequency Identification
GUI	-Graphical User Interface
VB	-Visual Basic
WMS	-Warehouse Management System
UHF	-Ultra-high frequency

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CHAPTER 1

INTRODUCTION

Chapter one of this report explains the objective, scope of laboratory equipment tracking system and problem statement of the system that is currently used in the Laboratory of Faculty of Electronics and Computer Engineering (FKEKK).

1.1 Project Introduction

Laboratory Equipment Tracking System (LETS) project is developed to ensure laboratory equipments are in place. In Fakuliti Kejuruteraan Elektronik Dan Kejutureaan Komputer (FKEKK), UTeM there are about seventeen (17) laboratories.

Each laboratory equipped with many expensive equipments. These equipments have to be managed efficiently. Inefficient managing the equipments will cause many losses of assets in the university. Currently, the in and out of the equipments handled manually by the technicians. The technicians write down the equipment information, date and time in record book. This manual system is inefficient because technicians are humans, they tend to make errors and this system consumes a lot of time. To automate this process, Radio Frequency Identification (RFID) is one of the most practical and applicable in real implementation with the nature where most of the systems are computerized. Laboratory Equipment Tracking System (LETS) has four main parts – tag, tag reader, system development and networking system. The RFID tag is tagged on the lab equipment where the tag consist lab equipment information and RFID reader is located at door of each laboratory room.

The importance of the project it enables the head of laboratory and technicians to monitor in and out of equipments in real environment and also increase the efficiency in managing equipment in the laboratory. It enhancement of the safety of university asset and reduce the losses of assets and enhancement of laboratory inventory control of equipment. This system also records data about an object without using human to read the data.

Studies had been done on a few systems which related to tracking system. One of the tracking systems is Asset Tracking System. The Asset Tracking System uses barcode to track and locate the assets. This system has some drawbacks so RFID used because it is most practical and applicable in real implementation. By using RFID, the equipment does not have to place directly under reader unlike barcodes. Other drawbacks of barcode system start up costs can be high depends on the amount and complexity of the system. Another drawback, the management needs to train technicians on how to use new system, enter information and print labels. In RFID, the information can be automatically entered or read. RFID is faster compared to barcode, it can also scan multiple items at once.

1.2. Project Objectives

The project proposes to develop laboratory equipment tracking system using RFID technology. This system consist two parts software and hardware. The hardware part is using RFID technology. The system will communicate to the hardware tracking component and manage the tracking activity.

Secondly, this project is also to create Graphical User interface (GUI) for proper equipment tracking system. GUI will be prepared to display the result of tracking activity in a graphical mapping format. This system can be managed easier and suitable for all level of literacy.

Thirdly, this project proposed to develop an internal database that makes a complete dynamic system that can trace a real time condition and also keep the history of the previous activity that happened. This system manages the asset more systematically as well as enhances the security assets in the laboratory. The system able to store, detect and track the asset in the lab with just a few clicks. It reduces lost of assets in the laboratory.

Fourthly, this system can create a system that could edit, save, delete, update, store and view the laboratory components, equipments and hardware. This system should able to perform like electronic file management which can edit, save, and update the information and maintenance in 17 laboratories at FKEKK. Besides, investigation of the website technology and database technology is needed to create some kind of communication path between these users.

1.3 Problem Statement

UTeM has been investing in costly equipments such as computers, oscilloscopes, flat screen monitors, software, components and etc to provide the best facilities to the students and staffs of the university. Different laboratories provide

different types of equipments based on the requirement of the laboratory. Therefore, equipments borrowing service is available between laboratories, lectures and students. Due to easy movement of the equipments, the probability of the equipment misplacing, unreturned and equipment lost has increased dramatically. So, it is very important to monitor the in and out of the equipments to avoid it has been lost. It is also very necessary to monitor all the laboratory items so that we no need spend money again to buy the same equipment. It also required a suitable system to manage the database of laboratory equipments.

The system used by the lab management of FKEKK will be the main consideration. All of the transactions in the laboratory are based on manual documentation. The documents of each category are separated into different files such as reservation of equipment or reporting malfunction of the equipment. There a lot of documents inside each file. The Laboratory Assistant face difficulties when they need to find information of a specific equipment because they need to search manually through the shelves or cabinets for the documents with the same PT Number or Serial Number as the equipment that is labeled onto it. The PT Number and Serial Number is the same for both equipment and equipment document. Thus, it is time consuming for the Laboratory Assistant to find specific date of the selected equipment that might not even be where it is supposed to be.

It is very important to trace where the equipment lost to prevent any lost. So, we can suggest a solution to monitor the laboratory using CCTV technology. The problem from CCTV system it is very hard to supervise in large area and capacity. This system also needs a supervisor to recognize each and every action. Moreover, this system is not so efficient and need regular maintenance.

1.4 Scope of Project

This section id described in three categories which is system operability, system functionality and user of this system.

1.4.1 System Operability

Laboratory Equipment Tracking System is specifically developed for the laboratories in FKEKK. This system is specifically developed to be operated using FKEKK local server and is designed to be internal database that makes a complete dynamic system which can trace a real time condition and also keep the history of previous activity that happened. This system is a web based system and it is suitable for multiple laboratories as it uses the Local Area Network (LAN) to connect within the university campus which means that the user will be able to log in into this system as long as within university network. This system will be only used for FKEKK laboratory equipment management only. The tags are only located on expensive asset in the laboratory since the RFID tags are expensive.

1.4.2 System Functionality

This system transmits data from RFID tag, which is read by an RFID reader and processed according to the needs of a particular application. This system also develop a application software to control, manage and monitor the whole tracking system and processing the data transmitted by a RFID reader. This system will visualize the real time result but the whole system activities will be recorded in an appropriate data form to represent the activities log. This software will do task such as reading database, display location and storing data. There are three main areas in this system which adds equipment, search equipment and view available equipment in each laboratory.

1.4.2.1 Add Equipment

All information of the equipment in the lab is registered in the system by keying in the equipment name, ID, location, date and time and additional information will be saved in database.

1.4.2.2 Searching Equipment

When we enter the RFID, the location of the equipment can be traced if it is located within the laboratories.

1.4.2.3 View Available Equipment in each Laboratory

While we search each laboratory, the available equipments in each lab can be viewed.

1.4.3 System User

The user of the system will be technicians, head of laboratories and staffs of laboratories. This system can be used within the laboratories only. The staffs can not access this system when they are out of laboratories.

1.4.3.1 Administrator

The administrator is basically the superior among the types of users available in the Asset Tracking System. An Administrator will be allowed to register a new Head of Laboratory or Laboratory Assistant for a specific laboratory within the FKEKK. The Administrator is allowed to view the report for each transaction in every laboratory in the faculty and search for availability of equipment in every laboratory.

1.4.3.2 Head of Laboratory

Head of Laboratory can search equipment by entering its ID. They also can view available equipment in their laboratory. They are allowed to view the report for each transaction in their respective laboratory.

1.4.3.3 Technicians

Technicians are able to register new equipment and search equipment for their own laboratory. The technician will update the database on in and out of the equipment from the laboratory. They also can search the equipment by entering its ID. They also can view available equipment in their laboratory. They are allowed to view the report of each transaction in their respective laboratory.

1.5 Project Methodology

Project methodology or software process is a set of activities that leads to the production of a project. A methodology is used as a development strategy. The methodology is chosen based on the nature of the project and application, the method and tool to be used, and the control and deliverables that are required. There are many types of software process. The waterfall model had been chosen to develop this LETS system.

Waterfall approach was the first process model to be introduced and followed widely in Software Engineering to ensure success of the project. In “The Waterfall” approach, the whole process of software development is divided into separate process phase. The phases in Waterfall model are: requirements definition, system and software design, implementation and unit testing and operation and maintenance.

The reason to choose waterfall model is it assumes the requirements to remain static during the life of the project, so there is little chance of incorporating new changes to the software once work begins. If changes are tried to be incorporated it leads to more confusion and further delays.