UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Database Development for Engineering Laboratory Management.

Sesi Pengajian : 2006/2007

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DATABASE DEVELOPMENT FOR ENGINEERING LABORATORY MANAGEMENT

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Especially for my loving mum, dad and to all my brother and sister. Thank you for everything.

ACKNOWLEDGEMENT

First and foremost, I would like to give thanks to Allah SWT, for blessing and helping me through the obstacles that I encountered during ht work of this project.

I would like to express my appreciation to my supervisor, Mr. Ja'afar bin Adnan for his support and guidance throughout this whole project. His wisdom, insight and knowledge, the social grace with which he delivers his idea are a constant inspiration. He guided me so that I will continue to be in the correct path during the development of this thesis. He provides a motivating and enthusiastic atmosphere during the many discussions we had. It was a great pleasure to do this thesis under his supervision.

I would like to thank my beloved family for their encouragement and never ending support. Their support and lovely companionship is another important source of strength for me. They spend all their time and effort on me. Without their devoted love and sacrifices, none of this would have been possible. My deepest appreciation goes to all my fellow friends for their companionship, fruitful suggestions, proof reading and wishes.

Lastly, I would like to acknowledge every individual who give me a helping hand in order to achieve this accomplishment.

ABSTRACT

This thesis provides the reader with the information about web-based database or database-driven web. The project is to develop an interactive Guest User Interface (GUI) web-based database management system that is suitable to be used in managing the electronic laboratories within the Faculty of Electronic Engineering and Computer Engineering. The web interface was designed by using the Macromedia Dreamweaver version 8.0, the web server for database by using the Internet Information Services (IIS), the technology server by using Active Server Page (ASP), while the database by using Microsoft Access. Web-based database management systems simplify the task of maintaining and retrieving a large quantity of data. The development includes the list of equipments, maintenance activities and also laboratory contact hours. The system's database is design based on the rules and theoretical backgrounds of relational database, which are the more common type of database, begin use in the market. By using the records from the database, the system is able to perform certain applications. A well organized Engineering Laboratory Management Database System (ELMDS) will provide an organized way of keeping, reviewing and analyzing lab management data. It will also act as a communication path between its user and management staff to exchange information. By having such a system, the overall effectiveness of the facility can be improved. It seems necessary to develop a suitable ELMDS within the laboratory in Faculty of Computer Engineering and Electronic Engineering. This ELMDS will provide a useful tool for students, teaching staff and the laboratory management staff to access the laboratory's information more conveniently.

ABSTRAK

Tesis ini menyediakan pembaca tentang maklumat jaringan pangkalan data atau pangkalan data didorong jaringan. Projek ini adalah untuk membangunkan sistem interaktif Antara-Muka-Pengguna (*GUI*) pengurusan pangkalan data secara jaringan berpangkalan, iaitu sesuai digunapakai dalam menguruskan makmal-makmal elektronik di Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer (FKEKK). Antara muka web telah direka dengan menggunakan *Macromedia Dreaweaver 8*, jaringan pelayan menggunakan *Internet Information Service (IIS)*, teknologi pelayan menggunakan *Active Server Page (ASP)* dan pangkalan data dengan menggunakan *Microsoft Access*. Pengurusan pangkalan data secara jaringan berpangkalan mempermudahkan tugas memelihara dan mendapatkan semula data dalam satu jumlah yang besar. Pembangunan pangkalan data ini adalah untuk aktiviti penyimpanan peralatan, aktiviti-aktiviti penyelenggaraan dan juga aktiviti tempoh penggunaan makmal. Sistem pangkalan data direka berdasarkan kaedah-kaedah dan latarbelakang teori pangkalan data secara rangkaian, yang mana pangkalan data itu kini lebih lazim dan mula digunakan dalam pasaran. Dengan menggunakan rekod-rekod daripada pangkalan data, sistem dapat menjalankan aktiviti tertentu. Makmal kejuruteraan yang mempunyai sistem pengurusan pangkalan data *(ELMDS)* yang terancang akan menyediakan kaedah yang mudah untuk merancang penyimpanan, menyemak dan menganalisis pengurusan data di makmal. Ia juga akan bertindak sebagai perhubungan laluan antara penggunanya dan kakitangan pengurusan untuk bertukar maklumat. Dengan memiliki sistem seperti ini, keseluruhan keberkesanan boleh diperbaiki. Ia kelihatan perlu bagi membangunkan satu *ELMDS* yang sesuai di FKEKK. *ELMDS* ini akan menyediakan satu sistem penggunaan yang berharga untuk penuntut, kakitangan pendidik dan kakitangan pengurusan makmal supaya dapat memasuki laluan maklumat makmal dengan lebih mudah.

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CHAPTER I

INTRODUCTION

1.1 Introduction

A well organized lab management database system will provide an organized way of keeping, reviewing and analyzing lab management data. It will also act as a communication path between its user and management staff to exchange information. By having such a system, the overall effectiveness of the facility can be improved. It seems necessary to develop a suitable lab management database system within the laboratories in Faculty of Electronic Engineering and Computer Engineering (*FKEKK*) because it will provide a useful tool for students, teaching staff and the laboratory management staff to access the laboratory's information more conveniently. Thus, Engineering Laboratory Management System (ELMS) was developed in order to cure all the problems when handling with the equipments and components within the laboratories in *FKEKK*.

1.2 Problems Statement

There are 19 laboratories in the *FKEKK* at the Universiti Teknikal Malaysia Melaka (UTeM). These labs are accessible by thousand of students including staffs. The laboratories are not only used for practical section, project development, also used by students and staffs for their research activities. These laboratories are also related to the academic as most of them teach in subject that included practical section as part of the subject assignment. It is so no surprise that each year the total amount spends on purchasing lab materials and instruments are significantly large. Besides, need to notice that all the laboratories equipments and component cost about millions. So, it is very necessary that all the laboratory management is controlled by a suitable system.

In order for those laboratories to operate smoothly, and so to provide the users with the most effective resources, management staff require large amount of time and effort. These large amounts of resources are managed by technical staffs (within the faculty alone). The technical staffs have spent large amount of time and effort in managing the resources in those laboratories in order for them to operate smoothly and provide the most effective facility to the large amount of users.

1.3 Objectives

This project is to design an entirely web-based database that focuses on data related to electronic engineering and computer engineering laboratories so that it can benefit different types of laboratory users. Besides, it is necessary to make the system creates a storage space for the entire laboratory maintenance and relevant information, which can act as a toolbox of applications for them to make use of those data.

Furthermore, this project should able to perform like electronic file management, which can edit, save and update the information and maintenance in 19 laboratories at *FKEKK*. Besides, investigation of the web site technology and database technology is needed in order to create some kind of communication path between those users.

1.4 Scopes of Works

- Designed the web-based database management system to manage 19 laboratories within the Faculty of Electronic Engineering and Computer Engineering.
- The system could edit, save, delete, update, store and view the components, equipments or hardware.
- The system was like web-based database.

- Administrator could edit all the system, technicians can edit at their own lab working, while lecturers and students just can view the web site.
- Macromedia Dreamweaver 8 will be used to design web site interface, Active Server Page (ASP) as server technology and Microsoft Access as the database.

1.5 Methodology

This project, it started with the understanding of web-based database technology include the properties of web site creation, graphical design and the operation of database server. The journal, article reviews, reference books include the softwares that will be used, need to be analyze and decide. Then, study on the operation of intranet (local host) is needed, which was then the Internet Information Service is installed as a web server. After that, the web site interface design and their source code are concentrated. Then, proceed to the database server development. Lastly the successful system will be uploaded to the intranet (local host) to become web-based database. Evolution and maintenance are needed to change the software in response to changing demands.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

There are 19 laboratories in the Faculty of Electronic Engineering and Computer Engineering at the Universiti Teknikal Malaysia Melaka. These labs are accessible by thousands of students including staffs. All these labs have their own specialization such as practical session, project development and also research activities. Besides, total amount spends for these labs significantly large (MILLIONS) and the management staffs require large amount of time and effort to make sure these labs operate smoothly.

Resources and equipments in these labs must be managed carefully in order to provide the most effective facility to the large amount of users. The development of web-based database was necessary to overcome all the problems arise. By investigating the type of tasks and the type of data that are required in laboratory management, the functional web-based database is designed and developed in this project.

2.2 Background Study on Web Applications

A web application is a collection of web pages that interact with visitors, with each other, and with various resources on a web server, including databases. Before start building web applications, the concepts of web applications should be familiarized.

A web application is a website that contains pages with partly or entirely undetermined content. The final content of a page is determined only when the visitor requests a page from the web server. Because the final content of the page varies from request to request based on the visitor's actions, this kind of page is called a dynamic page. Web applications are built to address a variety of challenges and problems

2.2.1 Common Uses for Web Applications

Web applications have many uses for both site visitors and developers, including the following:

- Let visitors find information quickly and easily on a content-rich website. This kind of web application gives visitors the ability to search, organize, and navigate content as they see fit.
- Collect, save, and analyze data provided by site visitors. In the past, data entered in Hyper Text Markup Language (HTML) forms was sent as e-mail messages to

employees for processing. A web application can save form data directly into a database and also extract the data and create web-based reports for analysis.

- Update websites that have constantly changing content. A web application frees the web designer from continually updating the site's HTML. Content providers such as news editors provide the web application with content, and the web application updates the site automatically.

2.3 How a Web Application Works

A web application is a collection of static and dynamic web pages. A static web page is one that does not change when a site visitor requests it: The web server sends the page to the requesting web browser without modifying it. In contrast, a dynamic web page is modified by the server before it is sent to the requesting browser. The changing nature of the page is why it's called dynamic. For example, there could design a page to display fitness results, while leaving certain information (such as employee name and results) to be determined when the page is requested by a particular employee.

2.3.1 Processing Static Web Pages

A static website comprises a set of related HTML pages and files hosted on a computer running a web server. A web server is software that serves web pages in response to requests from web browsers. A page request is generated when a visitor clicks a link on a web page, selects a bookmark in a browser, or enters a Uniform

Resource Locator (URL) in a browser's address text box. The final content of a static web page is determined by the page designer and doesn't change when the page is requested. Every line of the page's HTML code is written by the designer before the page is placed on the server. Because the HTML doesn't change once it's on the server, this kind of page is called a static page. When the web server receives a request for a static page, the server reads the request, finds the page, and sends it to the requesting browser, as shown in the following Figure 2.0:

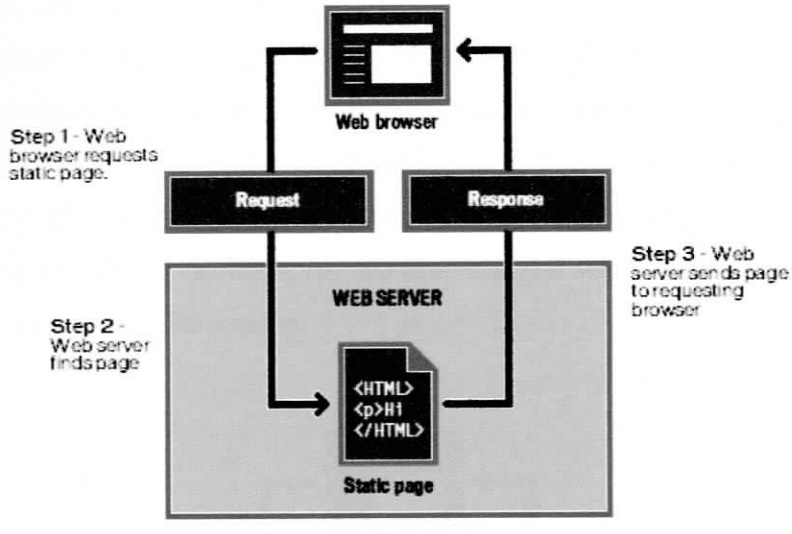

Figure 2.0 Processing Static Web Pages

In the case of web applications, certain lines of code are undetermined when the visitor requests the page. These lines must be determined by some mechanism before the page can be sent to the browser. The mechanism is discussed in the following section.