

FACULTY OF COMPUTER SCIENCE AND
INFORMATION TECHNOLOGY

DEALERSHIP E-COMMERCE PACKAGE
(ONLINE INVENTORY CONTROL SYSTEM)

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ABSTRACT

E-commerce business becomes very popular between the medium and large retailing companies in Malaysia. Some small companies face some problems like the cost and lack of computer knowledge when they consider venturing into Internet business. For my thesis, I have developed a Dealership E-commerce Package (DECP) that can overcome all these problems. I will focus on the part of Online Inventory Control System (OICS).

DECP is free package provided by the supplier to the dealers. This give benefits to the dealers especially for those who cannot afford to have their own web sites. OICS is an efficient system for dealers to manage their inventories online. OICS consists of two major sections: administrator section and user section. Administrator section consists of 6 modules: Authentication module, Category Management, Product Management, Stock Management, Purchase Order and Manufacturer Address Book. User sections consist of Online Product Catalog.

In order to develop my OICS in short time and low cost, I have chosen some efficient tools in developing my system. Tools that I used include Windows 2000, PHP4, Apache, MySQL, EditPlus, Microsoft Internet Explorer, and Macromedia Dreamweaver. JavaScript and Adobe Photoshop 6.0. Since I have experience in using PHP and MySQL during my industrial training, I feel confident and comfortable to use these tools.

DECP is still a new concept in Malaysia. Therefore, in my opinions, OICS of DECP is a potential system for local dealers to maximize their business profits through Internet. This can enhance and increase Malaysia's economic strength.

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1.0 Introduction

1.1 Overview

Electronic Commerce (e-commerce) has become a popular online retailing business nowadays. There is a lot of retailing companies that involve in e-commerce has gain high revenue and performance in their business, such as myflowers.com. However, many small and medium retailing businesses still remain the traditional way and conduct business at physical stores only. The most probably reasons they do not involve in e-commerce are lack of Information Technology (IT) knowledge and high cost to have their own web sites.

At the beginning period of e-commerce business, a retailer who wants to maximize his business through Internet will ask the web consulting company to develop a web site for his company. The web consulting company has expert web developers and designers to develop and sell the solution to retailer. The solution is a copyright e-commerce package that owned by the retailing company. The cost of an e-commerce package depends on how many features demanded by the retailing company and normally is around RM10, 000++. Many medium and large companies in Malaysia to promote their products through Internet currently use this e-commerce package. However, the expensive pay still makes a lot of retailers not affordable.

Currently, in foreign country, e-commerce package has a new definition among the foreign e-commerce market. Many foreign e-commerce web sites provide e-commerce package to their members and dealers. This package is different from what is available in Malaysia. By using this new package, users can build their own online stores with powerful store back inventory system to maintain their sites. Users do not need any expert computer knowledge to manage their sites. Users just need to pay little for monthly to own a retailing web site.

This e-commerce packages still a new concept in Malaysia, yet there is no commerce web site that sell e-commerce package to dealers. This concept will be introduced into my project, Dealership E-Commerce Package (DECP) and Online

Inventory Control System (OICS) will be modified to meet the needs of users in Malaysia.

The comparison between the e-commerce package that available in Malaysia and foreign country currently has been summarized as below:

E-Commerce Package available in Malaysia	E-Commerce Package available in foreign country
Developed to meet the needs of a particular retailing company.	Developed to meet the needs of all retailing companies in the e-commerce marketplace.
Web site is developed and maintained by technical staff (web developers and designers).	Web site is developed and maintained by users who are non-technical people.
Static design and layout, changed by web designer and developer, maybe involve coding.	Dynamic design and layout can be changed and updated by users without any coding.
High cost.	Low cost.

Table 1-1 Comparison of Inventory System in Malaysia and Foreign Country

1.2 Project Motivation

Inventory is the main asset of a business. Thus, managing stock or inventory is one of the important and critical tasks of a retailing business. Efficient inventory control system will help dealers to manage stock systematically. This enables the business to increase its revenue and reduce minimum cost.

1.2.1 Current Inventory Control System

Inventory control system that currently used by dealers in retailing business is the traditional way that all records done by manually. For examples, stock card or stock book usually used by dealers to record daily inventory transaction, stock volume and stock ordering. For a small number of mediums retailing business, they use computer to handle their inventory. They use simple application that only can run on one individual PC without connected to any LAN network or Internet.

1.2.2 Problem of Current Inventory Control System

❑ Time-consuming and inefficient

Current inventory system involves a lot of paper work because all records done by manually. It is inefficient because all done by handwriting and easily make human mistakes. It is also time-consuming when comes to decision-making where all the relevant document have to be dig up.

❑ Wastage of space storage

Information and transactions of inventories recorded in documents that need a lot of space to store. It is wastage of space storage compare with IT system that only needs a hard disk or diskette to store information of inventories.

❑ Hard to estimate time to reorder stock

Current inventory system unable to construct good just-in-time strategy, that is order stock when it is needed thus efficiently use the storage space. It is hard to estimate the most effective time to take order.

❑ **Inefficient Purchase Order**

Current inventory system did not provide online purchase order from suppliers.

Dealers have to order stock by phone or go to the suppliers' shops that would be waste time and inefficient.

1.2.3 Solution for Current Inventory Control System

OICS in DECP is the solution for the problems of current inventory control system.

Dealership E-Commerce Package (DECP) is a solution that freely provided by a supplier company to all their dealers. The package suitable to be used by the public include IT dummies or non-technical person. Dealers can own their own web sites with a condition that they agree to display supplier's products in their web sites. Dealers just need to have Internet access to online maintain their web sites and databases, which hosted on the supplier's server.

The DECP contains an important part: Online Inventory Control System (OICS) for dealers to manage their inventory and stock ordering. OICS has efficient store back inventory management that contains ease-of-use and user-friendly web-based application to built an online catalogue and efficient stock reordering system and store front to display online product catalogue and product search.

1.3 Project Definition

The title of this project is Dealership E-Commerce Package (DECP). This project is a tailor-made package for dealers in order to provide an avenue to the dealers to venture into e-commerce business. This package consists of four independent modules: Configurable Web Templates, Online Inventory Control System, Online Shopping Cart and Ordering System and E-Payment System.

By using DECP, dealers can build their own online stores to sell products and manage their inventory online. Considering most users of this package or dealers have no knowledge on web developing, DECP is developed based on the concept of user-friendly and easy-to-use. Thus, dealers do not need to have any expertise on web developing or designing.

Web sites that created by dealers using DECP can be defined as dynamic because elements of the web sites include web design and web layout configured according to dealers' like through the configurable web templates. Any changes made by dealers' admin in the store back office will be reflected on the storefront of web sites.

Besides that, DECP also developed for dealers to promote and sell their products to customers through their online stores. Customers can buy and pay for their products through Internet. The business transactions on the storefront of dealers' web sites can be categorized into business-to-customers commerce (B2C). The B2C includes online shopping cart and ordering system and e-payment system.

The module that will be carried out in my thesis is Online Inventory Control System (OICS). OICS is one of the four modules in this project. Inventory can be defined as stocks, goods or products. Inventory control means the manipulation of stocks. Inventory Control System is developed for business to control and manipulate stocks include add, edit, delete and order stocks from supplier. In other words, OICS is used to keep track of the records of stocks, stock purchase order and suppliers info in business.

OICS is different from the current inventory system in the market which mostly only available on intranet. Online Inventory Control System (OICS) is developed on web-based which can be accessed by users/dealers from different states through Internet without the limitation if geographical barrier.

1.4 Project Objectives

The objective of develop the Online Inventory Control System (OICS) within the environment of Dealership E-Commerce Package (DECP) are:

- ❑ **Save management time and save storage space.**

Traditional inventory system needs a lot of paper work and storage space to store all the documents. OICS can save management time and storage space. This can increase productivity of business.

- ❑ **Develop fast and easy-to-use web-based application to build a dynamic e-commerce catalog.**

OICS provides ease-of-use and user-friendly application to allow dealers to build product catalogue on their own web sites. Dealers can add products descriptions, price and photos on the product catalogue. It is dynamic because dealers can change/update product details and will be reflected on the catalogue.

- ❑ **Easy to keep track the record of stock**

By using OICS, dealers can keep track of the stock on hand more effective and easily to estimate when is time to reorder stock from supplier or other manufacturers. Dealers just need to click a button to see all the record of stocks instead of dig up all the documents like what the most dealers do currently.

- ❑ **Provides efficient system for dealers to manage purchase order stock from supplier.**

Dealers can order stock from supplier by sending order form through OICS instead of use phone ordering or go to the physical store of supplier. This is more convenient and save time.

1.5 Project Scope

Dealership E-Commerce Package (DECP) consists of four independent modules:

1. Online Inventory Control System (OICS)
2. Configurable Web Template
3. Online Shopping Cart and Ordering System
4. E-Payment System.

My module is **Online Inventory Control System (OICS)**. OICS can be divided into three parts: dealer registration section, dealer administrator section and user section. The dealer registration section is the supplier web site that introduce DECP and let the dealer to sign up as new member. The dealer administrator section is developing for dealers to manage stocks and update products details. The user section is a web site for customers to view online product catalogue, hotdeals special and search product through powerful search engine. Any product details that updated in administrator section by admin will be reflected on the user section or the web site.

The project scope of OICS for Dealer Registration Section includes:

- ❑ Develop a web site for host supplier to introduce DECP.
- ❑ Develop a web-based application that allows dealer to register as new member.
- ❑ Provide a link for dealer/member to login and access to DECP store back office.

The project scope of OICS for Dealer Administrator Section includes:

- ❑ Develop a web-based application that allows dealers to build online product catalogue.
- ❑ Develop a web-based application that allows dealer to add, edit, delete and sort categories of products (Category Management).
- ❑ Develop a web-based application that allows dealer to add, edit, delete and search products for dealer and host supplier. (Product Management).
- ❑ Develop a tools to allow dealers to upload their own product photo which can be browsed from the local directories. (Product Management)
- ❑ Develop a tool that allows dealer to add, edit, delete and search stock. (Stock Management)

- ❑ Develop a tool that allows dealer to know when is the time to order stock by keep track of the stock quantities and stock level. (Stock Management)
- ❑ Develop a tool for dealer to order stock from the host supplier by sending the order form to the host supplier.
- ❑ Develop a tool for dealer to order stock from other manufacturers through e-mail. (Purchase Order Management).
- ❑ Develop a tool for dealer to add, edit, delete and list manufacturer record. (Manufacturer Address Book).

The project scope of OICS for User Section includes:

- ❑ Display products with product descriptions and price according to categories of products on the of web site.
- ❑ Display cross-selling products on the bottom of each categories.
- ❑ Display hotdeals special that specified by the dealers admin.
- ❑ Develop a powerful product search engine for customers to search products for the dealer's products and the host supplier's products..

1.6 Expected Outcome

Expected outcomes of the OICS for **Dealer Registration Section** include:

- ❑ Web sites that introduce DECP.
- ❑ Registration form for dealer to sign up as new member.
- ❑ Generate new database for new member/dealer.
- ❑ Send e-mail for new account notification.

Expected outcomes of the OICS for **Dealer Administrator Section** include:

- ❑ Category management contains user-friendly application form for dealers to add, edit, sort and delete categories of products from database.
- ❑ Product management contains user-friendly application form for dealers to add, edit and delete products from database.
- ❑ Powerful search engine for dealers to search products from dealer's and the host supplier's product table.
- ❑ Efficient stock management system for dealers to keep track of the stock record, includes the stock quantities and stock level and contains user-friendly application form for dealer to update stock details in database.
- ❑ Ease-of-use stock purchase order system for dealers to order stock from the host supplier and other manufacturers.
- ❑ Manufacturer address book contains information about manufacturers and user-friendly application form for dealers to add, edit and delete manufacturer from database.

Expected outcomes of the OICS for **User Section** include:

- ❑ Online product catalogue that display dealer's products and supplier's products.
- ❑ Cross-selling products section in the bottom of each categories in catalog.
- ❑ Hot Deals page that display products in special promotion.
- ❑ Powerful product search engine for users to search from the host supplier's and dealer's products.

1.7 Project Schedule

Project Stage	June				July				Aug				Sept				Oct				Nov				Dec				Jan	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	
	Preliminary Study and Planning																													
Literature Study																														
System Analysis																														
System Design																														
Prototype																														
Development and Coding																														
Unit Testing																														
System Testing																														
Documentation																														
Implementation and Maintenance																														

Table 1-2 : Project Schedule

2.0 Literature

2.1 Analysis Studies

The main purpose to have analysis studies is to analyze the feasibility of developing OICS in the fundamental of DECP. A few case studies had been carried out to study on the current inventory system in Malaysia and foreign country. The advantages and weaknesses of current system has been analyzed in order to build a better inventory system for dealers. The good concept of current inventory system will be accepted into OICS whereas the weaknesses will be modified to meet the needs of dealers in Malaysia.

2.1.1 Case Study 1

Inventory System of Foto-Zzoom Sdn. Bhd.

A study on the inventory system of Foto-Zzoom Sdn. Bhd has been carried out to analyse the current inventory control system.

Foto-Zzoom Sdn Bhd. is a company that provides services like takes photo, processes photos, sells products like films and cameras. Foto-Zzoom is one of the Canon dealer that situated in Selayang Baru.

According to Mr. Chan, the owner of Foto-Zzoom Sdn Bhd, he manages business inventory by manually. He keeps track the daily transactions of the stock-in and stock-out using stock card (see Appendix B- Figure 1.0).

2.1.1.1 Result of study

Stock card is a traditional and the most economically way to manage business's inventory. However, it needs a lot of writings and space to keep the stock cards. Careless writing mistakes or spelling error will mess up the inventory system. Besides that, there is a problem when Mr. Chan want to revise the record of stocks in past few years. He has to find back the stock cards in past few years and it takes much time to do that.

To manage inventory more effectively and productive, Mr. Chan needs an online inventory control system. Mr. Chan faces some problems when he considers to have an online inventory system:

1. Not enough money to have own web site and online inventory system
2. He is a dummy in operating a computer and knows nothing about Information Technology.

The problems that faces by Mr. Chan has been solved in the concept of DECP and OICS. DECP is a package that will be offered free by suppliers to dealers, so that Mr. Chan can have a free own web sites to sell their products through Internet. OICS is a very user-friendly system and easy-to-use by technical or non-technical staff.

2.1.2 Case Study 2

Canon Marketing (Malaysia) Sdn Bhd

(<http://www.canon.com.my>)

A study on Canon web site has been carried out to analyze the relationship between supplier and dealers and the feasibility of DECP.

Company Info:

Canon Inc. conducts worldwide business operations in countries over the world in North America, South America, Japan, Europe, Africa and Asia. Canon Marketing (Malaysia) Sdn Bhd was established in 1987, with the objective of providing excellent products and support to Malaysian users by its direct presence and channel development.

What does the company sells?

Products Canon includes camera, business machine and optical products.

How does the company sell?

Canon sells their products to agents, dealers and customers through physical store and web site: <http://www.canon.com.my>. The Canon web site contains products information, FAQ, registration of dealers, company info and shopping cart to allow

customers or dealers order through internet and provides online payment service that allow buyers to pay through internet. Agents and dealers usually buy products from Canon through Canon's headquarter office in Shah Alam or branches whereas customers usually buy products from the shops of Canon's dealers.

How do customers get to their dealers?

Canon has a lot of dealers in every states of Malaysia. Customers usually will buy Canon products from the nearest dealer's shop. From the Canon web site, customers can search and view the list of the dealers' stores in Malaysia sorted by states. Information such as company name, location and contact number of dealers are provided (see Appendix B-Figure 2.0).

2.1.2.1 Result of study

From the study above, a weakness can be found on the Canon web site, that is the only way customers get to their dealers is to check the location from the Canon web site and go to the dealers' physical store to buy products. The problem occurred is some dealer's store situated in a small place and difficult to be found by customers or customers can not find any dealer's shop near their place.

This weakness can be solved by apply the concept of DEDP, which means provide a free e-commerce package by Canon to dealers. This dynamic e-commerce package allows dealers to build their own web site, promote products, and manage their inventory and sales of products online. Dealers can maximize their business through Internet without any cost or knowledge on Information Technology.

Instead of go to dealers' shops, customers can visit to the dealers' web site to buy and pay online. Any purchase can be done just a click away. Customers can choose dealers' web site from the list of dealers on the Canon web site and click on the company name to link to the particular dealer's web site.

2.1.3 Case Study 3

Free Trial Automobile Dealership Online Inventory and Web Site System from Walkthelot.com

Walkthelot.com is a foreign company that provides dealer the automobile dealership with an easy, professional and affordable solution for putting dealership and automobile inventory on the web.

A dealer has to pay RM50 per month to have a web-site complete with reliable and fast SQL server technology inventory online. The package includes dealer's own web-site (if needed), web site hosting, inventory search and list, photos, staff module, credit applications, qualified leads, online inventory, online web-site management and much more.

To study further about the inventory system provided by Walkthelot.com, I have signed up for a free 30 days trial automobile dealership online inventory and web site system offered by Walkthelot.com at <http://www.walkthelot.com>.

Features that provided in the inventory system by Walkthelot.com include:

Store Back :

Add Item

Edit Item

List Item

Upload photo

Delete Item

Store Front:

Search Inventory

Lease Special

Clearance Special

Meet our staff

2.1.3.1 Result of study

After study on the dealership e-commerce package by Walkthelot.com and review on the feedback by the dealers that had tried this package, I found that dealership online inventory system can help dealers to maximize their business and manage their stocks effectively and economically.

However, from the study on the Online Inventory provided by Walkthelot.com, I had found some weaknesses on the system that can be improved.

1. No side navigation in every page of the system. Side navigation should always appear in every page so that users can easily go to the link they like.
2. No confirmation message displayed when users apply any changes on their inputs. Pop-up confirmation message box should be displayed to warn the users when deleting or changing the info of the system.
3. Product search in store back office is in pull down menu. This is not efficient and not powerful if the products had increased. The alternative is powerful product search engine that users can search products by expert keywords (ie product ID or product name or category)
4. There is no management of stock provided in this system, such as purchase order from suppliers or view the stock level.
5. No keep track of suppliers' info.

The solution of the problems occurred in this system will be applied in my OICS to improve the effectiveness of my system.

2.2 Software Architecture

There are a few software architecture available now: mainframe architecture, client-server architecture, two-tier architecture and three-tier architecture.

2.2.1 Mainframe Architecture

In mainframe system architecture, all operation is within the central host computer. User interacts with the host through a terminal that captures keystroke and sends that info to the host. Mainframe architecture is not tied to a hardware platform. User interaction can be done using PCs and UNIX workstations. A limitation of mainframe architecture is that it does not easily support graphical user interface or accesses to multiple database from graphically dispersed sites.

2.2.2 Client-server Architecture

Client

Client is a networked information requester, usually a PC or workstation, that can query database and/or other information from a server. Clients rely on servers for resources, such as files, devices, and even processing power. [1]

Server

Server is a computer, usually a high-powered workstation, a minicomputer, or a mainframe, that houses information for manipulation by networked clients. [1] Server is dedicated to managing disk drives (file servers), database (database servers), printers (print servers), or network traffic (network servers).

Client-server

Client-server is a network architecture in which each computer or process on the network is either a client or a server. [1] Client-server architecture implies a cooperative processing of requests submitted by a client, or requester, to the server, which processes the requests and returns the results to the client. The client manipulates the data and presents the result to the user.

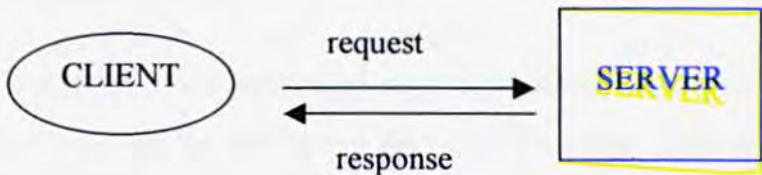


Figure 2-1 : One-to-One Client Server

Client-server solutions can be in a many-to-one design, that is more than one client typically makes requests of the server.

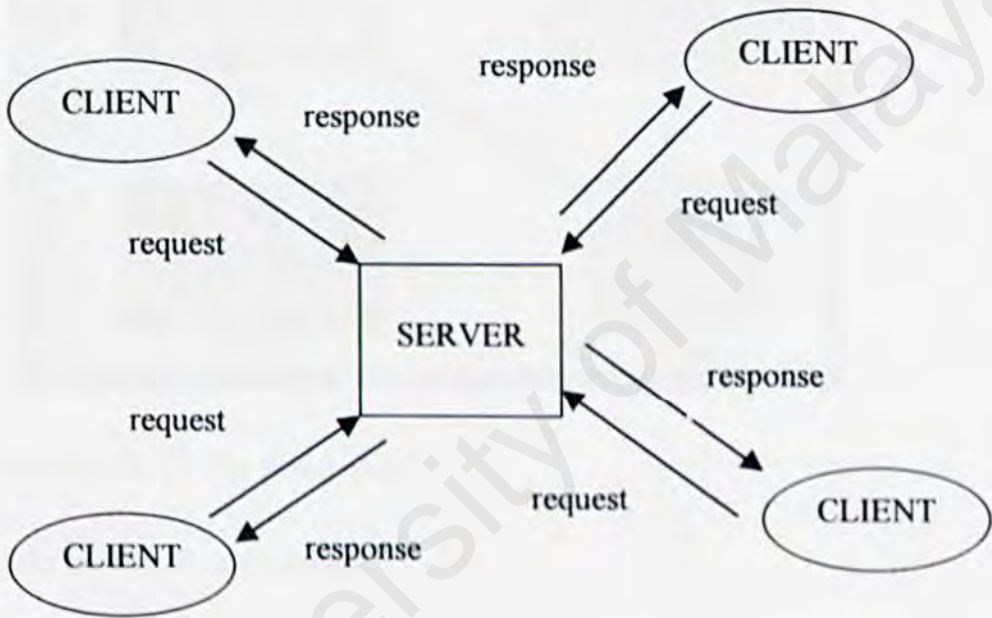


Figure 2-2 : Many-to-One Client Server

2.2.3 Two-Tier Architecture

2 tier architecture refers to client/server architectures in which the user interface runs on the client and the database is stored on the server. The actual application logic can run on either the client or the server. There are only the architecturally tiered data server and client.[1]

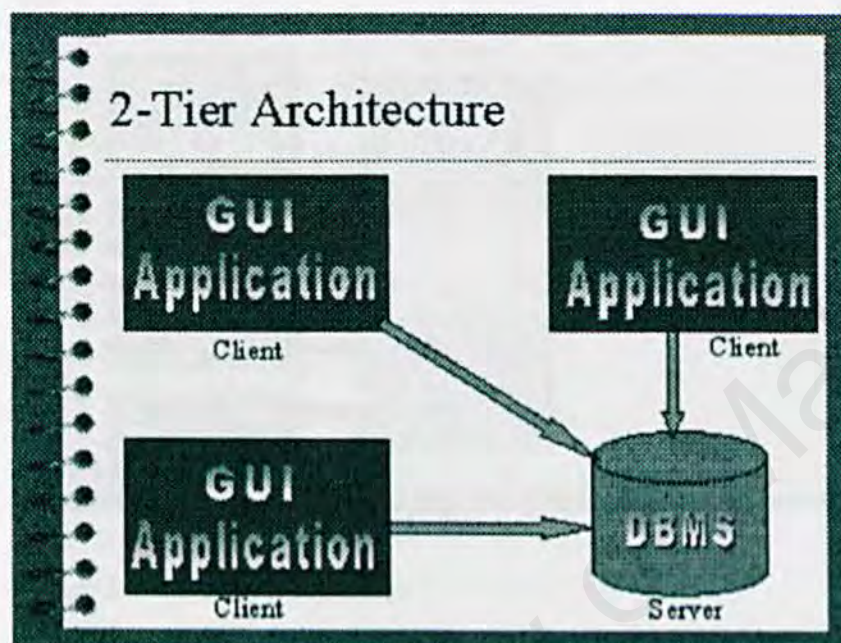


Figure 2-3 : 2-Tier Architecture

2.2.4 Three-Tier Architecture

Three-tier architecture is a special type of client/server architecture consisting of three well-defined and separate processes, each running on a different platform: [1]

The three tiers consist of:

1. Client-tier

Client-tier is the user interface, which runs on the user's computer.

2. Application-server-tier

Application-server-tier is the functional modules that actually process data. This middle tier isn't present in 2-tier architecture in this explicit form. This tier protects the data from direct access by the clients.

3. Data-server-tier

Data-server-tier is a database management system (DBMS) that stores the data required by the middle tier.

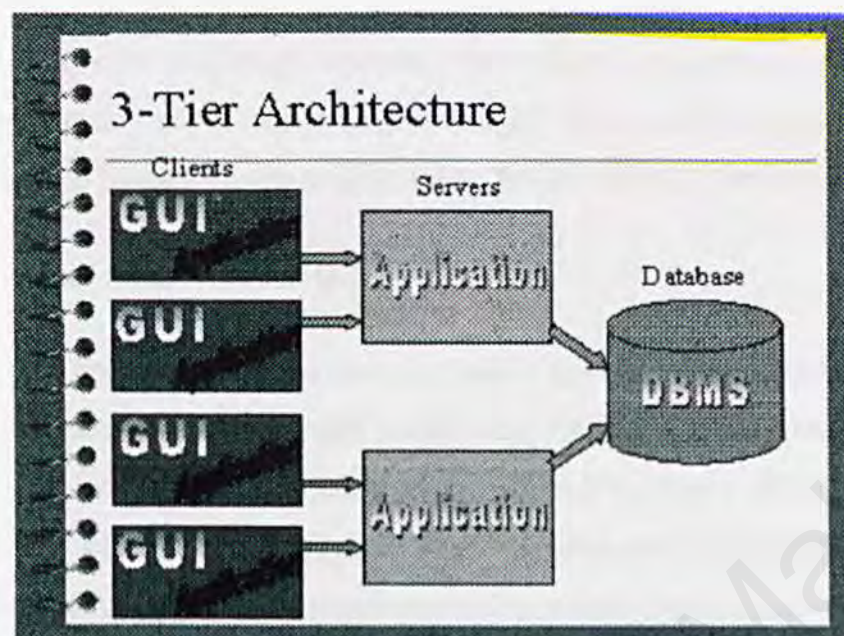


Figure 2-4 : 3-Tier Architecture

2.2.5 Conclusion for Software Architecture

The three-tier architecture is chosen for this project because it is easier to implement and design. The three-tier design has many advantages over traditional two-tier or single-tier designs, the chief ones being:

- ❑ The added modularity makes it easier to modify or replace one tier without affecting the other tiers.
- ❑ Separating the application functions from the database functions makes it easier to implement load balancing.

In this project, the three tiers consists web browser as client-tier, web server as application-server-tier and database server as the data-server-tier. A web server can be defined as a computer program that receives HTTP requests from web browser for document. Web server will achieve and process the data from database server. Web server return both the document and the document type to the client so that the client

knows what to do with the document or data once it is received. The most common document type transferred between web server and client is HTML.

2.3 Network

A network is nothing more than two or more computers connected together by a cable so that they can exchange information. [2] There is a few types of network can be considered to be used in this project: LAN, WAN, internet, intranet and extranet.

2.3.1 Local-Area Network (LAN)

A LAN is a connection between two or more computers which allows users to share files, programs, or data with a minimum of effort. A LAN is usually local; this means that the machines are located in one physical location -- like a building or just one floor of a building. A LAN tends to use just one set of networking options. For example, a LAN generally uses one network operating system, one type of cable, and one logical topology. A LAN is usually set up for a small group of people such as a department or a division. A LAN is not limited to any particular computer operating system. DOS, Macintosh, and UNIX can all run across a LAN. Actually, they can all run across the same LAN at the same time, if the right software is used.

2.3.2 Wide-Area Network (WAN)

While the geographic distinctions of "local" and "wide" area networks imply a difference in the distance between network nodes, that is not always the case. By definition, a Wide Area Network (WAN) is a government-regulated public network or privately owned network that crosses into the public network environment. It doesn't matter whether the area being bridged is across the country or across the street. If the geographical separation crosses over a public thoroughfare, a WAN is required to make the connection.

The WAN is typically used to connect two or more local area networks (LANs). As you know, a LAN is a privately owned communications system that is designed to allow users to access and share resources (computers, printers, servers) with other users. LANs that are interconnected by a WAN may be located in the same geographical area,

such as an industrial park or campus setting, or in geographically separate areas, such as different cities or even different regions.

2.3.3 Internet

Internet is a collection of communication networks interconnected across 2 or more LANs or sub-networks. It is a global network connecting millions of computers. More than 100 countries are linked into exchanges of data, news and opinions.

Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community.

There are a variety of ways to access the Internet. Most online services, such as America Online, offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

2.3.4 Intranet

Intranet is a term used to refer to the implementation of internet technologies within a corporate organization rather than for external connection to the global Internet. It is a network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols.

2.3.5 Extranet

Extranet is a new buzzword that refers to an intranet that is partially accessible to authorized outsiders.[1] Whereas an intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an extranet provides various levels of accessibility to outsiders. User can access an extranet

only if user has a valid username and password, and user's identity determines which parts of the extranet user can view.

2.3.6 Conclusion for Network

Since this is an online inventory control system of an e-commerce project, internet is the most suitable network to be used in this project. Users from different states can access to this online inventory system if they have internet access. This means that users can manage their business's inventory system at anytime and anywhere despite of the limitation of geographical barrier.

2.4 Security Technology

Security is an important part in developing a web site. Without a good security system, a web site can be hacked and scare off visitors of web site. SSL is considered for securing the transport of information in DECP.

2.4.1 Secure Sockets Layer (SSL)

SSL is a security protocol designed to ensure data moving between a browser and a server remains private. In theory, someone could intercept information, such as a credit card number while it is in transit between the browser and the server. One solution to prevent information from being usable if it is intercepted is to encrypt it. The most widely implemented encryption system for the web at present is SSL.

SSL is an open, non-proprietary protocol developed by Netscape Communication. It uses industry, accepted RSA public key cryptography for authentication and encryption. The SSL protocol was designed to provide a data security layer between TCP/IP and application protocols such as HTTP, Telnet, NNTP or FTP. SSL provides data encryption, server authentication, message integrity and optional client authentication for TCP/IP connection.

The advantage of the SSL Protocol is that it is application protocol independent. A "higher level" application protocol (e.g. HTTP, FTP, TELNET, etc.) can layer on top of the SSL Protocol transparently. The SSL Protocol can negotiate an encryption algorithm and session key as well as authenticate a server before the application protocol transmits or receives its first byte of data. All of the application protocol data is transmitted encrypted, ensuring privacy.

2.5 Web Server

A Web server is a program that serves Web pages upon request. Every Web server has an IP address and possibly a domain name. For example, if an user enter the URL `http://www.pcwebopedia.com/index.html` in your browser, this sends a request to the server whose domain name is `pcwebopedia.com`. The server then fetches the page named `index.html` and sends it to the user's browser. Web servers and browsers communicate using HTTP (Hypertext Transfer Protocol), a simple but effective language for requesting and transmitting data over a network.

Web servers come in various shapes and sizes. They run under a variety of operating systems, have varying levels of power and complexity, and range in price from rather expensive to free. Studies on several web server will be carried out: Apache, Microsoft Internet Information Server (IIS) and Personal Web Server (PWS).

2.5.1 Apache

Apache is a high-end enterprise-level server developed by a loosely-knit group of programmers. The original version of Apache was written for UNIX, but there are now versions that run under OS/2, Windows and other platforms. Apache has become the world's most popular Web server. By some estimates, it is used to host more than 50% of all Web sites in the world.

The keys to Apache's attractiveness and popularity lie instead in the qualities listed above and its extensibility, its freely distributed source code, and active user support for the server. And version 1.3.0, now in official release, is already being touted as the most stable and fastest version of Apache ever.

Among the most notable features are its cross-platform support, protocol support (HTTP/1.1), modularity (API), security, logging, and overall performance and robustness. Apache distributes a core set of modules that handle everything from user authentication and cookies to typo correction in URLs.

2.5.2 Internet Information Server (IIS) v5.0

IIS is the best Web server available for Windows NT. This version, which comes exclusively as part of the Windows 2000 Server operating system, contains many new features along with performance and reliability enhancements. [3]

IIS v5.0 is good as both a first-time Web server for those familiar and comfortable with Windows operating systems, and a high-end server for hosting providers and large corporate installations. It handles the basics well and is better integrated in Windows than previous versions. IIS v5.0 also comes with performance and feature enhancements that will be attractive for mission-critical tasks.

The ideal computer to run IIS on is at least a 200 MHz Pentium with 128 MB of RAM. Organizations should plan on doubling the RAM and CPU speed if they intend to run Advanced Server's clustering, SQL or Transaction services on the same machine as the Web server.

2.5.3 Personal Web Server (PWS)

PWS is entry-level/mid-range server for Windows 9x/NT platforms. It is a scaled-down version of the commercial Information Internet Server (IIS) included with the Server edition of Microsoft Windows NT. PWS is a great entry-level Web server that makes it easy to publish personal home pages, serve small Web sites, and share documents via a local intranet.

PWS is one of the best servers available for helping to get users up and running quickly. Wizards are included to guide users through the process of setting up home pages and sharing files, and the PWS administrator reduces the complexity of actually running the Web server itself. Users can also use the familiar Explorer interface or PWS's Personal Web Manager to share directories, start and stop the server, and view Web site statistics.

One of the best uses for PWS is as a platform for testing out Web sites on Windows 95/Windows NT Workstation computers before hosting them on the Internet.

This allows users to check the validity of links, scripts, and applications as well as to ensure that the overall organization of the site is functioning correctly.

PWS presents the ability to develop transactional Web applications using the Microsoft Transaction Server. Overall, while most large enterprises will likely bypass Microsoft's Personal Web Server for the high-end Internet Information Server, PWS will remain one of best available options for individuals wanting to serve their own personal home pages and for small organizations needing to host their own Web sites.

2.6 Operating System

Operating system (OS) is a platform that performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

Besides that, the OS makes sure that different programs and users running at the same time do not interfere with each other. For security, OS ensures that unauthorized users do not access the system. OS provides a software platform to allow application programs run on it.

The most popular operating systems currently are UNIX, Windows 98, Linux and Windows 2000.

2.6.1 UNIX

UNIX is a much older operating system, that was created in the late 1960s. UNIX is designed to provide a multiuser, multitasking system for use by programmers.[4] It began as an open source project that became widely used in Universities, scientific labs, and by the U.S. government.[5] The philosophy behind the design of UNIX was to provide simple and powerful utilities that could be pieced together in a flexible manner to perform a wide variety of tasks. Over the years,

hundreds of talented programmers contributed their own improvements to Unix making it extremely robust, stable, and fast.

However, UNIX is more difficult to learn and isn't as widely supported as Microsoft Windows 2000. [5]

2.6.2 Windows 98

Windows 98 is based on the popular Microsoft Windows 95 Operating System, and is designed for the consumer market. Windows 95/98 were designed for backward compatibility with older DOS and 16bit programs, as well as providing a platform for the newer (back in 1995) 32 bit programs.[5]

Windows 98 works better by making it simple to access the Internet and by providing better system performance along with easier system diagnostics and maintenance. With Windows 98, users' system plays better as well with support for the latest graphics, sound, and multimedia technologies, the ability to easily add and remove peripheral devices with support for Universal Serial Bus (USB), and it also enables users to watch TV on PC. Besides that, Windows 98 is compatible with more software (including games) and hardware.

2.6.3 Linux

Linux has gradually become a popular operating system for Internet/intranet serving purposes. With a host of performance enhancements that will benefit Web sites and Internet sites of all sizes, Linux is a stable and high-performance operating system for Internet usage.

Linux has made progress, primarily in functionality important to Internet infrastructure and Web server capabilities, including a greater selection of drivers, easier installation, GUI-based front ends for Web administration and window management.

2.6.4 Windows 2000

Windows 2000 is Microsoft's latest version of popular Windows NT Operating System. Windows 2000 Server has big improvement over Windows NT 4.0. The changes, both fundamental and cosmetic, have made Windows 2000 faster, more reliable, heavier-duty, and easier to use.

2.7 Database Server

A database is a structured collection of data. To add, access, and process data stored in a computer database, a database server is needed. There are several database server available currently: Oracle, PostgreSQL and MySQL.

2.7.1 Oracle

Oracle is a multi-user database. It provides unprecedented ease-of-user and is pre-tuned and pre-configured for today's dynamic workgroup and line-of-bus environment.

Oracle includes a fully integrated set of easy-to-use management tools, full distribution, replication and web features. Oracle also provides the highest levels of availability through fast failover, easier management, and zero data loss disaster protection, with Data Guard, the only complete data protection solution available on the market.

Oracle can run on UNIX, Linux and Windows platform. However, it is expensive and separate licences are required for each of its database engine.

2.7.2 PostgreSQL

PostgreSQL is a sophisticated Object-Relational DBMS, supporting almost all SQL (Structures Query Language) constructs, including subselects, transactions, and

user-defined types and functions. It is the most advanced open-source database available anywhere.

PostgreSQL is an enhancement of the POSTGRES database management system, a next-generation DBMS research prototype. While PostgreSQL retains the powerful data model and rich data types of POSTGRES, it replaces the PostQuel query language with an extended subset of SQL. PostgreSQL is free and the complete source is available.

PostgreSQL runs on Solaris, SunOS, HPUX, AIX, Linux, Irix, FreeBSD, and most flavours of Unix.

2.7.3 MySQL

MySQL is a relational database management system. MySQL stores data in separate tables rather than putting all the data in one big storeroom. This adds speed and flexibility. The tables are linked by defined relations making it possible to combine data from several tables on request

MySQL is a small, compact, easy to use database server, ideal for small and medium sized applications. It is client/server implementation that consists of a server and many different client programs. It is available on a variety of UNIX platforms, Linux, Windows NT, Windows 95/98 and Windows 2000.

MySQL is Open Source Software. Open Source means that it is possible for anyone to use and modify. Anybody can download MySQL from the Internet and use it without paying anything. Anybody can study the source code and change it to fit their needs.

2.8 Data Access Technology

OICS will require data access technology to enable communication and access to its various database. A few of the Microsoft Data access strategy and technology is reviewed and considered.

2.8.1 Universal Data Access (UDA)

UDA is a high-level specification developed by Microsoft for accessing data objects regardless of their structure. The strategy of Universal Data Access is to assure open, integrated, standards-based access to all types of data, that is from SQL to non-SQL to even unstructured data across a wide variety of applications, from traditional client/server to the web. The main components of UDA is ADO, OLE DB and ODBC.

2.8.2 ADO (Active Data Object)

Active Data Object (ADO) is the Microsoft's newest high-level interface for data objects that most applications developers will use.

ADO is designed to eventually replace *Data Access Objects (DAO)* and *Remote Data Objects (RDO)*. Unlike RDO and DAO, which are designed only for accessing relational databases, ADO is more general and can be used to access all sorts of different types of data, including web pages, spreadsheets, and other types of documents.

ADO provides consistent access to data for creating a front-end database client or middle-tier business object using an application, tool, language, or even an Internet browser. ADO is the single data interface for developers creating 1- to n-tier client/server and Web-based data-driven applications.

2.8.3 OLEDB

OLE DB Providers are the data access engines or services, as well as the business logic components that these applications can use in a highly interoperable, component-based environment.

OLE DB is a set of interfaces that are designed to provide data access to *all* data, regardless of type, format or location. It effectively "componentizes" database and related data processing functionality, breaking it up into interoperable components that can run as middleware on the client or server across a wide variety of applications. The OLE DB architecture provides for components such as direct data access interfaces, query engines, cursor engines, optimizers, business rules and transaction managers.

The concept of OLE DB is to explode the database into its basic parts. OLE DB delivers components, external to the database, that provide this typical database functionality in a reusable component architecture. And these components, because they are not directly linked to the database itself, can be shared across multiple applications, systems and data stores to provide a higher level, universal interface.

2.8.4 ODBC (Open DataBase Connectivity)

ODBC is a standard database access method developed by Microsoft Corporation. The goal of ODBC is to make it possible to access any data from any application, regardless of which database management system (DBMS) is handling the data. ODBC manages this by inserting a middle layer, called a database *driver*, between an application and the DBMS. The purpose of this layer is to translate the application's data queries into commands that the DBMS understands. For this to work, both the application and the DBMS must be *ODBC-compliant* -- that is, the application must be capable of issuing ODBC commands and the DBMS must be capable of responding to them. Since version 2.0, the standard supports SAG SQL.

2.9 Programming language

2.9.1 ASP

ASP is a server-side scripting technology. ASP is indeed HTML page with an .asp extension. ASP allows for HTML and a scripting language such as VBScript, JScript or Perl to be interspersed in a Web page. When a browser requests an ASP page, the Web server generates a page with HTML code and sends it back to the browser.

One of the most important features about ASP is that it allows user to easily access data and put it on a Web page. User can simply display data from an ODBC-compliant database, or use ASP to make decisions about what to display on a Web page. User can then format the results in any way that they please.

Another important ASP feature is the ability to use cookies to store and retrieve information. The Request object has a Cookie collection, and user can use this in data processing.

2.9.2 PHP

PHP Hypertext Preprocessor is a open-source server-side, HTML embedded scripting language used to create dynamic Web pages for e-commerce and other Web applications.[6] In an HTML document, PHP script (similar syntax to that of Perl or C) is enclosed within special PHP tags. Because PHP is embedded within tags, the author can jump between HTML and PHP (similar to ASP and Cold Fusion) instead of having to rely on heavy amounts of code to output HTML. And, because PHP is executed on the server, the client cannot view the PHP code.

PHP offers excellent connectivity to most of the common databases (including Oracle, Sybase, MySQL, ODBC and many others). PHP also offers integration with various external libraries, which allow the developer to do anything from generating PDF documents to parsing XML.

PHP is the natural choice for developers on Linux machines running Apache server software, but runs equally well on any other UNIX or Windows platform, with

Netscape or Microsoft Web server software. PHP also supports HTTP sessions, Java connectivity, regular expressions, LDAP, SNMP, IMAP, COM (under windows) protocols. It also supports WDDX complex data exchange between virtually all Web programming languages.

2.9.3 ColdFusion

ColdFusion is a product created by Allaire Corporation of Cambridge, Mass. that includes a server and a development toolset designed to integrate databases and Web pages. Cold Fusion web pages include tags written in Cold Fusion Markup Language (CFML) that simplify integration with databases.

Coding for ColdFusion pages is much more straightforward and intelligible than JavaScript, VBScript, C++ or Java, even while providing high levels of functionality. The tags themselves conform to the basic HTML syntax of tag name followed by tag attributes, and are enclosed in the familiar HTML brackets (<>). Most tags are two-sided, and can be combined with each other and with HTML elements to create custom tags for use in ColdFusion applications.

2.9.4 JSP (JavaServer Pages)

JavaServer Pages™ (JSP) is a web-scripting technology that can mix static HTML content with server-side scripting to produce dynamic output. By default, JSP uses Java as its scripting language; however, the specification allows other languages to be used, just as ASP can use other languages (such as JavaScript and VBScript). While JSP with Java will be more flexible and robust than scripting platforms based on simpler languages like JavaScript and VBScript.

JSP provides a number of server-side tags that allow developers to perform most dynamic content operations. So developers who are only familiar with scripting, or even those who are simply HTML designers, can use JSP tags for generating simple output. Advanced scripters or Java developers can also use the tags, or they can use the full Java language if they want to perform advanced operations in JSP pages.

2.9.5 Javascript

Javascript is a scripting language developed by Netscape to enable web authors to design interactive sites. Javascript is different from Java. Although it shares many of the features and structures of the full Java language, it was developed independently. Javascript can interact with HTML source code to enable web authors to spice up their sites with dynamic content.[1] JavaScript is endorsed by a number of software companies and is an open language that anyone can use without purchasing a license. It is supported by recent browsers from Netscape and Microsoft, though Internet Explorer supports only a subset, which Microsoft calls Jscript. [7]

2.10 Authoring Tools

2.10.1 Microsoft Visual InterDev

Microsoft Visual InterDev is a Web development tool designed for programmers to create an interactive Web page with data is as simple as dragging and dropping, setting some properties, and saving the page. No coding is required in using Visual InterDev.

Visual InterDev includes site design tools that help user easily plan pages, organize their links, and apply a consistent theme to your Web site. Visual InterDev includes three ways to view your HTML and ASP pages.

These three views are the cornerstone of Visual InterDev. They replace the simple source code editor included with Visual InterDev 1.0 and supports design-time controls (DTCs), debugging, statement completion, and object browsing.

The new data environment provides easy commands for making Web application data-driven. Instead of burying complex SQL statements deep within an .asp file, the statements are now exposed, maintained, and reused at the application level through the data environment under the Global asp file. Instead of modifying the query within each page, developers can modify the data command and changes are incorporated into files that reference that data command. Developers also can drag fields from the command directly onto HTML or ASP page.

However, for those so inclined, Visual InterDev exposes a full object model that allows developers to fine-tune their application, perform client validation, and have full control of Web application. Visual InterDev supports not only full-reach applications, using the ASP engine to produce simple HTML pages for the client, but also DHTML and Microsoft Internet Explorer 4.0 data binding for a richer client experience.

2.10.2 Notepad

Notepad is the world's most versatile HTML editing tool absolutely free when purchase this software: Windows version 2.0 and above

Notepad has one of the simplest user interfaces of any Internet Web authoring tools. The menus are logically laid out, conforming to all standards in design, so users can understand them before use Notepad.

Notepad has the same interface for all versions of Windows, so moving over to the latest version of Windows should not hamper HTML code creation. The Notepad web authoring tool is compatible with every single standard of Internet presentation medium yet devised. Notepad was designed to have a very small application footprint, taking up as little space as possible in computer's memory, and a minimum of disk space.

Notepad gives clear, easy to read and full HTML. There is no code hidden, and users have control over all parts of the HTML code. JavaScript is also fully supported by Notepad. All parts of the JavaScript are fully available through Notepad, without the need of complex tools.

2.10.3 EditPlus

EditPlus is an Internet-ready 32-bit text editor, HTML editor and programmers editor for Windows. While it can serve as a good replacement for Notepad, it also offers many powerful features for Web page authors and programmers.

EditPlus supports powerful and customizable syntax highlighting for HTML, CSS, PHP, ASP, Perl, C/C++, Java, JavaScript and VBScript by default. Also, users can

create their own syntax file to support other programming languages, such as ASP, Java and PHP.

EditPlus includes features:

❑ Internet features

Seamless web browser for previewing the content of HTML document or Java applet without leaving the editor. Browser window also has common browser commands so users can browse Internet web sites as well as local HTML files. FTP commands for uploading local files to FTP server or for editing remote files directly. Highlights URL and e-mail addresses in normal text files and lets you activate them with a single keystroke (F8) or 'Ctrl + double-click'.

❑ HTML toolbar

The HTML Toolbar allows users to insert common HTML tags quickly and easily. It also supports useful tools such as HTML Color Picker, Character Picker, Table Generator and Object Picker.

❑ Document selector

The Document Selector offers quick mouse access to all document windows currently loaded. Much faster than selecting on Window menu or pressing Ctrl+Tab key multiple times.

❑ User tools

EditPlus supports user-defined tools, help files and keystroke recording files. The output of tool execution can be captured in the Output Window, so that users can double-click the error line to automatically load the file and locate the cursor to that line.

❑ Auto-completion

Auto-completion is a time-saving feature which changes a short abbreviation into a complete string. It supports Perl and C/C++ by default. Also, users can create their own auto-completion file to support other programming languages.

- Cliptext window

The cliptext window is collection of text clips for quick and easy access. Users can easily customize them, and can also create on cliptext file..

- Document template

Document template offers a quick start when create a new document.

2.10.4 Macromedia Dreamweaver

Macromedia Dreamweaver is professional visual editor for creating and managing web sites and pages. It gives developers the productivity of a visual web page layout tool, the control of an HTML text, editor and support for new web techonologies, all in one software packing.

Developers can use it to create web sites visually, with confidences that HTML being generated is concise and always editable. It includes advanced features that takes advantage of the latest innovations on the web, such as dynamic HTML and CSS, while still ensuring that web pages work well in a variety of web browsers. All of the code generated by it is carefully created to work on as many platforms and browsers as possible.

Others features include easy integration of Active X components, Java applets, Plug-ins for improved web page interactivity. It also integrate seamlessly with other components of Macromedia, such as Flash Movies, Shockwave, and Fireworks, which are essential for the development of interactive web pages.

2.10.5 Adobe Photoshop

Adobe Photoshop is the most popular image-editing available for Macintosh and Windows-based computers. It is used as drawing, painting and designing purposes. Users can retouch an image, apply special effects, swap details between photos, introduce text and logos, adjust color balance, and even add color to a grayscale scan. All these functions are included under a set of user-friendly editing tools in Adobe Photoshop. It contains graphical icons to represent every functions of each button.

Besides that, it also provides many shortcut keys that is easier and save time for users and for those who do not like to use mouse.

University of Malaya

3.0 System Requirement Analysis

3.1 Methodology

Methodology means life cycle model. The system development methodology is method to create a system with a series of steps or operations or can be defined as system life cycle model. The diagram shown below is system development process. Every system development process model (see Figure 3-1) includes system requirements (user, needs, resource) as input and a finished product as output.

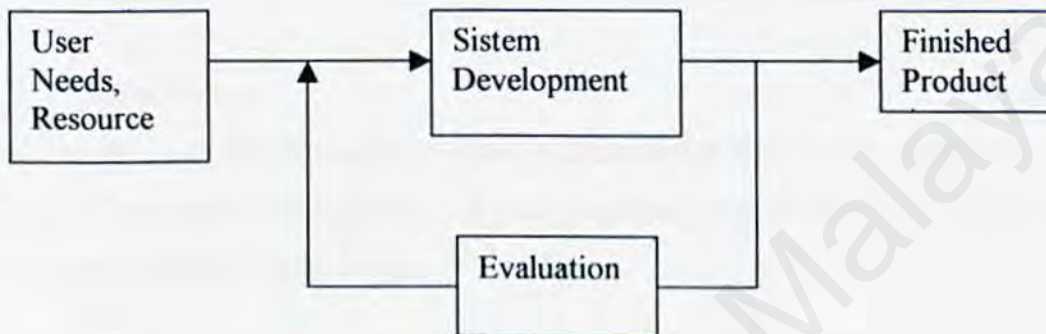


Figure 3-1 : System Development Process Model

There are several process models in system development:

1. Waterfall Model with prototyping
2. V Model
3. System Development Life Cycle (SDLC)
4. Spiral Model

Waterfall Model with prototyping is chosen for OICS because:

- ☐ A good specification to begin with.
- ☐ Easy to use
- ☐ Systematic
- ☐ Scope of project well understand
- ☐ Project risks have been accessed and are considered to be low.

3.1.1 Waterfall Model with Prototyping

Waterfall Model with prototyping consists of eight stages that are depicted as cascading from one to another (see Figure 3-1). Each development stage should be completed before the next begins. The eight stages are:

1. Requirements Analysis

Understanding and determining users need by having brainstorming, eliciting and analysing user requirements by having interview, survey or questionnaire session, collecting and specifying all the user requirements and validating requirements.

2. System Design

Outlining system functional by having feasibility studies or case studies on current system, determining and specifying hardware or software architecture and verifying system design.

3. Program Design

Determining and specifying program design and database design and verifying program design.

4. Coding

Involving programming personal planning, tool acquisition, database development, component level documentation and programming management.

5. Unit and Integration Testing

Testing on units separately and integrating the tested units. Testing on the integrated units.

6. System Testing

Combining all the integrated units into a system. Testing on the system. Specifying, reviewing and updating of the system test and validating of system.

7. Acceptance Testing

Testing on system completed. The system is delivered.

8. Operation and Maintenance

Controlling and maintaining of the system and revalidating of system.

The system has to be validated and verified during the stage of system testing.

The verification is to make sure that the function in the OICS works correctly and to check the quality of the implementation.. The validation is to ensure that OICS has implemented all the requirements in the specification.

Prototyping is a sub-process [8] and prototype is a partially developed product or a simple simulator of the actual system to examine the proposed system and overview on the functionalities. A prototype of OICS will be built regarding to the project scope and the analysis of the system before start to build the actual system.

Prototyping is very important in OICS because:

- To ensure the system meet the performance goals or constraints.
- To ensure the system are practical and flexible.
- To ensure the system fulfill the users' requirement.
- To have an insight of how the module and sub-modules interact with each other.

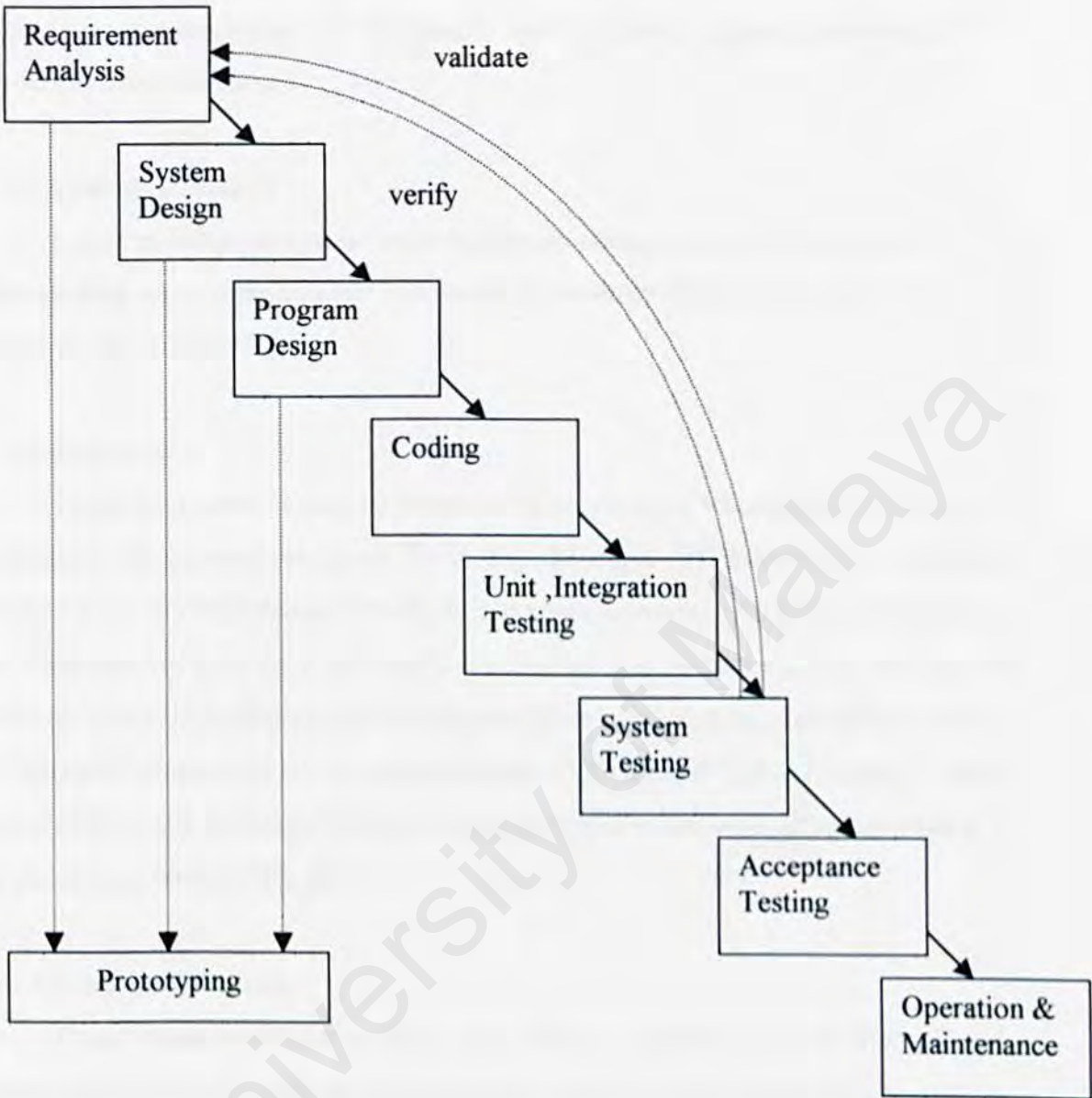


Figure 3-2 : Waterfall Model with Prototyping

3.1.2 Techniques Used To Define Requirements

Effective and appropriate techniques must be used to define and elicit users requirements. Research methods that usually used are library research, interview, internet research and survey.

3.1.2.1 Library Research

I went to library to search books related to e-commerce to have a deeper understanding on e-commerce and how does an inventory system work in the e-commerce environment?

3.1.2.2 Interview

I have interviewed Encik Mohammed Iqbal, who is a Macromedia Certified Professional. He currently works as Technology Manager of GettingHere Technologies Pte Ltd. He is very experienced in web development including web programming and web designing. He gave me a deep understanding on how to create a good web site and shared his precious knowledge and experience on web developing. According to him, the concept of Dealership E-Commerce Package (DECP) and Online Inventory Control System (OICS) still fresh and have not been developed in Malaysia although it quite popular among foreign web sites.

3.1.2.3 Internet Research

I have found the definition of the term "Online Inventory Control System" and studied on the currently available web sites that related to DECP and OICS to analyze on the concept and weaknesses of the system. This will help me to develop an online system that will meet the demand of local market and users' need.

3.1.2.4 Survey

In order to make my survey success, I have prepared 15 sets of questionnaire (see Appendix b). My respondents consist of dealers around Sungei Wang, Imbi Plaza and Low Yat Plaza. The objective of my questionnaire is to know what are the reasons they do not want to have their own online inventory system and how many percent of

dealers intend to have online inventory control system(OICS) provided free by supplier through the concept of DECP.

The respondents were asked to answer the questionnaire on the spot to ensure I can get back all the 15 sets of questionnaire. Each of them took no more than 20 minutes to answer the questionnaire.

After collecting all the questionnaires, I analyze the data and have come out with two bar charts and one pie charts regarding to result of my survey.

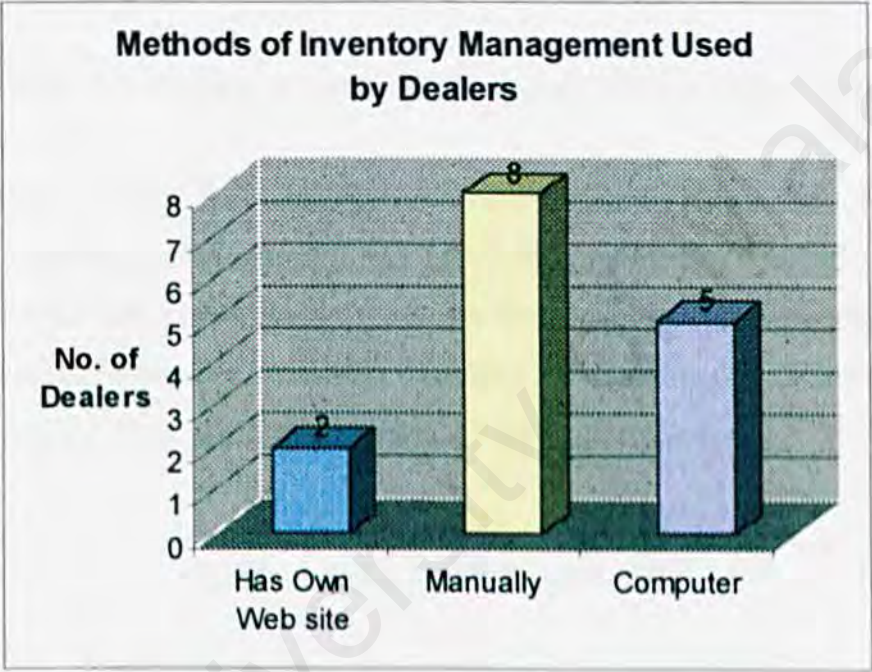


Figure 3-3 : Bar chart on methods of Inventory Management by dealers

The above bar chart (see Figure 3-3) shows that 8 out of 15 of dealers manage their inventory manually in traditional way of management. Another 5 dealers manage their inventory using computer. They use computers to keep track of the daily stock-in and stock-out transactions. Only 2 dealers already have their own web sites and they manage their inventory through internet.

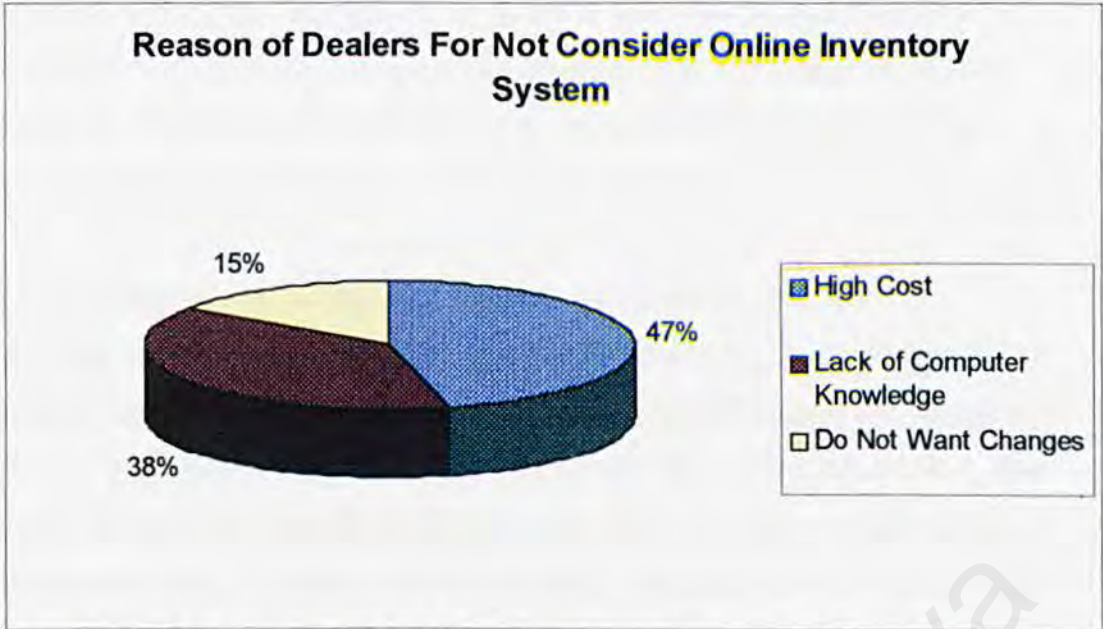


Figure 3-4 : Pie chart on reason of dealers for not consider online Inventory System

The above pie chart (see Figure 3-4) shows that the reason most dealers do not consider online inventory system is high cost, that supported by 6 out of 13 dealers excluded the 2 dealers that already have their own online inventory system. The second reason is lack of computer knowledge that cited by 5 dealers. Only 2 dealers give reason that they do not want to make any change of their current system.

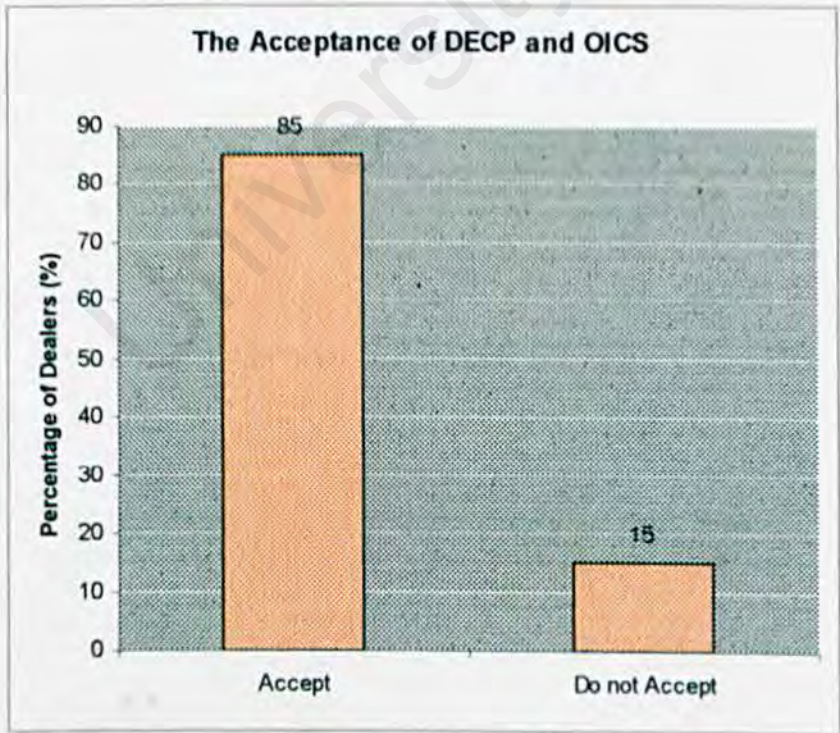


Figure 3-5 : Bar chart on the acceptance of DECP and OICS

The second bar chart (see figure 3-5) shows that 86% of dealers accept the concept of DECP and OICS that I proposed in this project, which means that mostly dealers would like to have online inventory system provided free by supplier. Only 2 dealers insist to manage their inventory manually in traditional way.

As a conclusion from the survey, I found that most dealers still use the traditionally way to manage their inventory of business. Most of them do not consider online inventory system is because of the high cost and lack of computer knowledge. These two main problems have been overcome in the concept of DECP and OICS. The Dealership E-Commerce Package(DECP) is provided free by suppliers to their dealers so that dealers can manage inventory and also sell their products through internet. The DECP and OICS is very user-friendly and easy to be used by dealers. It is just a click away for dealers to manage their inventory online. Besides that, the features that expected by dealers in their online inventory control system include view and print report, search products, view stock level and manage purchase order from suppliers will be categorized as users requirements for OICS.

3.2 Functional Requirement

Functional requirement is a statement of the service or functions that a system should provide how the system react to particular inputs, and how the system should behave in particular situations. [Sommerville, 1998]

The functional requirement for OICS consists of three main parts: Dealer Registration Section, Dealer Administrator Section and User Section. For Dealer Registration Section, functional requirement consists of register module. For Dealer Administrator Section, functional requirement includes authentication module, category management, product management, stock management, purchase order and manufacturer address book. For User section, functional requirement consists of the online product catalog.

3.2.1 Register Module

The register module is available in the host supplier's web site (escom.com) where there is a brief introduction for DECP (Dealership E-Commerce Package). For the registration module, new dealer/member has to fill up a register form to sign up as a member of DECP. When a new dealer submits the form, a confirmation message will be displayed to inform dealer that the registration has been done successfully. At the same time, dealer will also receive an E-mail from host supplier (escom) to confirm the username and password to log in to DECP store back office. When the registration has been done, a new account will be generated and a new database will be created to the dealer that named according to the dealer id, e.g. the second dealer who has dealer id 2 will be assigned a new database named 'dealer2'. Database 'dealer2' will contains all the tables needed by the dealer.

3.2.2 Authentication Module

Authentication module consists of two sub modules. First is a new member/dealer registration, another is dealer admin login.

For dealer admin login, a dealer must key in the appropriate **username and password** to access to the administrator store back of OICS. **Username and password** will be validated to make sure only the authorized dealer can access to the administrator site to change details of inventory system. Dealer will be warned if **there are missing** fields or invalid username and password.

3.2.3 Category Management

Category management is a web-based application for dealers to add, edit/ delete, list and sort sequence of categories and view categories list that has been inserted. The category details include category ID, category name and cross-selling categories of products. The categories of products will be displayed on the side navigation of the front store. Dealers can sort the sequence of categories that will be resulted on the front store. The categories can be sorted by category name by ascending or descending.

3.2.4 Products Management

Products management is a web-based application for dealers to add, edit/ delete and list products according to the categories. The product details include product ID, product name, category name, product description, manufacturer, price and image. Dealers can browse from the local directory to upload the product photo to the server. All the details edited in this module will be resulted on the front store. This module also allows dealers to search products that have been inserted and also the host supplier's products. The host supplier is the party who provides DECP to dealers and host dealers' web sites. However, for host supplier's products, dealers just can view the product details but cannot edit. All the products can be search by product ID, product name, category name and category ID.

3.2.5 Stock Management

Stock management is a web-based application for dealers to edit, delete and search stock. Products that have been inserted in product management will be automatically showed in the stock list of stock management. The purpose of the stock

management is to adjust or update the stock details. Dealers can manually adjust the current stock quantity for reconciliation of stock between the sales transactions on the web and physical store. The stock details include product ID, product name, stock price, quantity of current stock, quantity of reorder level and stock level. Dealers can search stock by product ID or stock level to know which products need to reorder by viewing the stock level. Stock level divided into Normal, Low and Critical. Normal means quantity of current stock more or same with the quantity of reorder level. Low means the quantity of current stock lower than the quantity of reorder level, and Critical means quantity of current stock is zero. For stock in Low and Critical level, dealers can reorder stocks from manufacturers manually or can order in order management module through sending e-mails.

3.2.6 Order Management

Order management is a web-based application for dealers to order and receive stocks from the host supplier and other manufacturers. If dealers want to order stock from the host supplier, dealers have to fill up a stock ordering form which contains product ID, product name, order quantity and manufacturer. When dealers submit the form, it will be sent through e-mail to the host supplier or manufacturer and a notification that shows e-mail has been sent successfully will be displayed. Dealers can search order by date of order, product ID and product name. Order status divided into ODD (Order-On-Delivery) and OR (Order-Receive). OOD is a status where the stock form has been sent to the host supplier or other manufacturers and stock is on delivery to the dealer. OR is a status where the ordering stock has been received. The order status will be changed from OOD to OR after dealer receives stock from the supplier and update manually in order management. If the stock provided by supplier is not complete or maybe some has been spoilt, dealer can e-mail to the relevant supplier through order management to report for the incomplete order received. At the same time, dealer can take notification about the failure of ordering by writing comment regarding to the order. The comment will be inserted into database for dealer own reference. If the order has been received successfully, the stock level for the particular stock will change automatically from Critical or Low to Normal.

3.2.7 Manufacturer

Manufacturer is a module for dealers to keep track of the manufacturers' info. Manufacturers' info includes manufacturer name, company phone, company fax, company address, e-mail address and description. Description field is used to record some extra information about the manufacturer. Dealers can use the web-based application to add, edit and delete manufacturers' info.

3.2.8 Maintenance

Maintenance module is designed for dealers to maintain their own profiles and other record that cannot be grouped in other module. Maintenance module divided into two sub modules: My Profile and Discount Voucher. 'My Profile' is used by the dealer to change company info or change username and password in order to access to the administrator site. 'Discount Voucher' is used to create voucher that will be displayed on the front store for promotion use. Dealer can edit their own description and also decide whether want to publish it on the web or not.

3.2.9 Online Product Catalog

Online product catalog will display all the products that has been added by dealers sorted by categories. Online product catalog also display the host supplier's products with product details that retrieve from supplier's database.

Online product catalog presented in two sections: side-navigation and main section of web site. Side navigation will list down all the categories that can be linked to main section. This is needed for ease-of-use of customers. When a customer click-on a category, main section will display all the products under that category. Customers can click-on the name of the particular product to view the detailed information of the products.

The content of products catalog includes product code, product name, description, price and photo if got. All the details are retrieved as what the dealers have inputted in store back administrator. Online Product Catalog Module contains cross-selling products, hot deals special and product search.

Products search lets user to search products of the host supplier or the dealer. The advanced product search lets customer to search by product code and product name.

For additional features, user can print discount voucher from the dealer's web site by clicking the animated discount voucher logo if provided by the dealer. User can use this voucher to buy products from the dealer's store with special price or can get some special gift.

3.3 Non-functional Requirements

Non-functional requirement can be defined as the constraints on the services or functions offered by the OICS. [Sommerville, 1998]

3.3.1 User Friendliness

The application of OICS is required to be as user-friendly as possible because most of the users are company staffs who are non-technical users. The system can be presented with Graphical User Interface (GUI) approach to give a better understanding and visual effect for users. The suitable captions and icon can help users to use the system with more confidently.

3.3.2 Usability

The system should also display a confirmation message or prompt message for any non-trivial processes such as deletion and data updating.

3.3.3 Correctness

Correctness is the extent to which OICS satisfies its specification and meet the requirements of dealers and customers and how OICS fulfills the objectives of the mission.

3.3.4 Efficiency

Efficiency means a process or procedures in OICS can be called or accessed in an unlimited of times to produce similar outcomes or outputs at creditable pace or space.

3.3.5 Consistency

The universal term such as Next, Submit, Send that used in the application of OICS has to be consistent in every function of the system to avoid any confusion by users.

3.3.6 Reusability

Some code and functions of the system maybe similar and can be reused. The reusability of code can save a lot of development time and prevent the code redundancy.

3.3.7 Robustness

Every modules in the OICS has to be tested to ensure each module achieve it's expected outcome. After the completion of the modules, the modules will be integrated into system and being. Any error occurred during the system has to be solved immediately to make sure the robustness of the system to its expected level.

3.3.8 Reliability

The application of OICS shall be reliable and shall not cause unnecessary and unplanned of the overall environment. OICS is said to have reliability if it does not produce dangerous or costly failure when it id used in a reasonable manner.

3.3.9 Security

Admin must login with correct user ID or password to prevent unauthorized access to the admin store back.

3.4 Database Requirement

DECP can be defined as a medium-sized e-commerce project. So, there is quite a large amount of data is required to store in the OICS. Therefore, a database that capable of handle large amount of data is required. Since the OICS is an online application and need to access to internet to achieve data, a database server that stores data through Internet is required.

One or two database maybe required in OICS and various tables will be created to store all the data in the system. Relationship between tables must be designed carefully to ensure integrity of the data. The field name in each tables must declared clearly and cannot duplicated to avoid any confusion.

3.5 User Interface Design Requirement

Considering this system will be used by various level of person, the user interface design would be as user-friendly as possible. It must provide a fast learning curve for user of the system. The user interface itself must be self-explaining, user can understand the functions of the system just by trying out the user interface.

The user interface must be divided into main section and side navigation section. This will enable user to switch from one function to another easily. The design and the color of user interface cannot be too fancy or childish. The color scheme used for the user interface must be carefully selected in order to ensure it is pleasant to behold. The icon used must be able to clearly provide idea to user about the functions they represent. A general description of the features in each module must be given in the user interfaces to ensure user operate the system easily.

3.6 Development Tools

3.6.1 Consideration For Programming Language

3.6.1.1 Comparison Between PHP and ColdFusion

	ColdFusion	PHP
Language	Primitive and does not support standard operator syntax or user-defined functions.	Strong and very flexible.
File-System Support	Adequate, not feature-rich.	Comprehensive.
Cost	Free	High cost

Table 3-1 : PHP vs. ColdFusion**3.6.1.2 Comparison between PHP and JSP**

	JSP	PHP
Platform	Support only platform that have a virtual machine available.	Support all major platforms (UNIX, Window,) and any 32-bit or better platform.
Performance	Slow	Fast, as much as 3.5 times faster than JSP.
Scripting Language	Complex, difficult to learn.	Easy to learn and maintain.

Table 3-2 : PHP vs. JSP**3.6.1.3 Comparison between PHP and ASP**

	ASP	PHP
Speed	Slow	Fast
Memory Management	Load all the files.	Load include files that are required.
Hidden Cost	Need to buy ASPEncrypt for encryption, need to buy ServerObject's QMail for email management and need to buy Software Artisans SA-FileUp for file uploading.	Free, no hidden cost.

Table 3-3 : PHP vs. ASP**3.6.1.4 Conclusion for Programming Language**

As a conclusion, PHP is chosen as programming language to develop OICS. ColdFusion is usually used by large company to develop large-sized project. JSP is more difficult to learn compared with PHP. It is time-consuming to master JSP for developing OICS. PHP is free and can run faster than ASP. After compared with ColdFusion, ASP and JSP, PHP is the most suitable programming language to develop OICS.

The advantages to use PHP are:

- Speed – high speed of execution and will not slow down the rest of machine
- Stability – the possibility of system crash is very low, very stable because PHP uses its own resource management system, and has a sophisticated method for handling variables.
- Security -- PHP provides many levels of security which can be set in the .ini file to the desired level.
- Simplicity – easy to learn especially programmers with previous experience of C.
- Open Source – do not neither dependent on a manufacturer to fix things that don't work, nor pay for upgrades every year.
- Lots of database interfaces - PHP currently will work with MySQL, MS SQL, Oracle, Informix, PostgreSQL and many others.
- Run on (almost) any platform – can run on UNIX, Windows(95/98/NT/2000) and Macs.

3.6.2 Consideration for Web Server

3.6.2.1 Comparison between Apache and Internet Information Server (IIS)

Feature	Apache	IIS
Popularity (according to the Netcraft Web server survey)	60 percent of all public Web server.	21 percent of all public Web server.
Cost	Free.	Comes together with Windows Pack.
Functionality	Free source and has resulted rapid pace of functional enhancements	Limited in customization of functionalities. Depends on the Microsoft products.
OS dependency	Unix, Linux, Windows, OS/2.	Windows
Hardware Platform	Wide range of hardware supported by the different operating systems, including Intel and SPARC.	Those supported by Windows.
Distribution	Forks processing in response to incoming Web client requests, more resource-intensive.	Spawning threads within a process.

Table 3-4 : Apache vs. IIS

3.6.2.2 Comparison between Apache and Personal Web Server

PWS is a scaled-down version of IIS and more suitable to develop personal home page. PWS also less features compared with Apache which more suitable to develop an e-commerce site.

3.6.2.3 Conclusion for Web Server

After compared with IIS and PWS, Apache has been chosen as web server for OICS because Apache is :

- **Powerful** - Apache server is robust, stable and powerful.
- **Feature-Rich** - The Apache server includes features: XML support, Server-Side Includes (SSI), powerful URL-rewriting, and virtual hosting.
- **Extensible** - Apache is open source. Source code can be found on internet and has various online resources for reference.
- **Popular** - Apache holds a smidge under 60 percent of the web server market.
- **Free** - Apache is free. Easy to get, just download from internet.

Besides that, Apache is the most compatible web server to run PHP. PHP can perform very well on Apache compared with other web server like IIS and PWS.

3.6.3 Consideration for Database Server

3.6.3.1 Comparison between MySQL and PostgreSQL

MySQL is more suitable for developing OICS because it has more advantages to use MySQL compared with PostgreSQL.

Features	MySQL	PostgreSQL
Speed	Faster	Slower
Stability	Very stable	Less stable
Performance on Windows	Very good	Not stable
Upgrading	Easy to upgrade	Difficult to upgrade

Table 3-5 : MySQL vs. PostgreSQL

3.6.3.2 Comparison between MySQL and Oracle

Oracle is much more expensive compared with MySQL. Oracle also more suitable to be used to develop a large project and used by large company. Since OICS is a medium-sized e-commerce project, MySQL is more suitable to develop OICS.

3.6.3.3 Conclusion for Database Server

In order to develop OICS using PHP and Apache server, MySQL is most suitable and compatible database server to be used. PHP-Apache-MySQL is the best combination of tools to develop a medium-sized of e-commerce project, like OICS.

Besides that, MySQL is chosen as database server to develop OICS because the following features:

- ❑ **Fast** - MySQL is about three to four times faster than many other commercial databases.
- ❑ **Ease-of-use** - MySQL is easy to manage.

- ❑ **Cost advantages** - MySQL is an open source relational database and free of cost.
- ❑ **Large tables** - MySQL stores each table in the database as a separate file in the database directory. The maximum size of a table can be between a minimum of 4GB.

One advantage to use MySQL with PHP is can manage database easily using phpMyAdmin, a browser based MySQL administration page written in PHP4.[9]

phpMyAdmin has features (see Appendix B-Figure 3.0, Figure 4.0):

- Create/Delete/Edit/View Databases.
- Create/Delete/Edit/View/Describe Tables.
- Edit Table Columns Add/Delete Rows.
- Backup/Restore Databases.

3.6.4 Consideration for Operating System

3.6.4.1 Comparison between Windows 2000 and UNIX

UNIX is more difficult to learn compare with Windows 2000 and is not as widely supported as Microsoft Windows 2000. This project only takes about one year to develop, so it is time-consuming to learn UNIX for this project.

3.6.4.2 Comparison between Windows 2000 and Windows 98

Windows 98 lacks the security and stability of Windows 2000. Windows 98 is average designed for home users whereas Windows 2000 is designed for the corporate environment and web development environment as needed in this project. Besides that, Windows 2000 works at speeds 30 percent faster than Windows 98 on PCs with 64 MB of RAM or more.

3.6.4.3 Comparison between Windows 2000 and Linux

Linux is more complexity and has poor technical support compared with Windows 2000. Linux lacks of vendor depth and enterprise experience of Windows 2000.

3.6.4.4 Conclusion for Operating System

Windows 2000 has been chosen as operating system to develop OICS because it is easy-to-use, stable, good performance as a web development environment, good in technical support and security.

The features provided in Windows 2000 are:

1. Reliability

Windows 2000 includes fundamental improvements to prevent crashes and the ability for the operating system to repair itself.

2. Manageability

Windows 2000 is easier to deploy, manage, and support. Centralized management utilities, troubleshooting tools, and support for self-healing applications all make it simpler for administrators and users to deploy and manage desktop

3. Performance

With 64 MB of RAM, Windows 2000 was 32 percent faster than Windows 95 and 27 percent faster than Windows 98. It is also significantly faster than Windows NT 4.0 on configurations with 32 MB of RAM.

4. Security

Windows 2000 provides comprehensive security features to protect sensitive business data, both locally on desktop computer and as it is transmitted over local area network, phone lines, or the Internet.

5. Usability

Windows 2000 Professional also provides more wizards, a centralized location for common tasks, and menus that adapt to the way you work.

3.6.5 Consideration for Authoring Tools

3.6.5.1 Comparison between EditPlus and Microsoft Visual InterDev

Since PHP as a programming language to develop OICS, Microsoft Visual InterDev is not suitable to be chosen as authoring tool because it does not support PHP. EditPlus can be considered as authoring tool of OICS because it support PHP.

3.6.5.2 Comparison between EditPlus and Notepad

EditPlus and Notepad are web authoring tools that support PHP. Notepad has the simplest user interfaces and lack of powerful features and templates to help web authors or developers in developing web sites. EditPlus has rich and powerful features for web authoring, such as customizable syntax highlighting for HTML and other programming language, useful document templates and efficient user tools.

3.6.5.3 Conclusion for Authoring Tools

As a conclusion, EditPlus is the most suitable authoring tool for HTML and PHP editing because of its efficient, rich-features, flexible and powerful authoring tools and it supports PHP.

Adobe Photoshop also chosen as designing tools to create button and layout for the online product catalog of OICS.

Besides that, Macromedia Dreamweaver is chosen as visual web editing tool to create web site in OICS because its excellent visual design features coupled with great source-code editing.

Macromedia Dreamweaver 4.0 is the most latest version with full features include:

□ Integrated Text Editor

Can do editing in Design View and Code View. Using new Split View to see both Code and Design views simultaneously. The Code View's new live syntax coloring, tag balancing, and auto indenting make coding a snap.

□ Layout View

Easily design complex pages using the new Layout View. Draw table cells directly on the page and then specify how the layout changes as the page is resized. Easily drag cells around or group cells together to create a nested table. Powerful visual design features include drag-and-drop tables, images, and layers. Standard View provides a rich WYSIWYG environment for editing pages.

□ Macromedia Flash Text and button

Create editable vector graphics directly in Dreamweaver with the new Macromedia Flash Buttons and Macromedia Flash Text features. By using Macromedia Flash vectors instead of bitmaps for buttons and text, graphics are scalable, smaller in file size, and look great when printed.

□ Javascript Debugger

Debug client-side JavaScript directly in browser. The new JavaScript Debugger execute in Netscape Navigator or Internet Explorer.

□ Edit Non-HTML Documents

Use Dreamweaver as a text editor for non-HTML documents. Edit JavaScript, XML, and other text files directly in Code View.

3.6.6 Consideration for Web Browser

3.6.6.1 Comparison between Microsoft Internet Explorer and Netscape Navigator

Internet Explorer	Netscape Navigator
Fastest page rendering with performance improvements	Limited performance enhancements
Ease-of-use enhancements with Explorer bars	Limited usability enhancements
Best integrated offline browsing	Limited offline capabilities
User can choose any mail and news client	User forced to install Netscape mail and news client, even if not used
Mail and news completely integrated	Mail and news not integrated

Table 3-6 : Microsoft Internet Explorer vs. Netscape Navigator

3.6.6.2 Conclusion for Web Browser

The web browser that chosen for OICS is Microsoft Internet Explorer (IE) because it is free. IE is supplied free of charge along with Windows 2000. After compare with Netscape Navigator, it is a more compelling, productive and exciting solution.

3.7 Hardware Requirement

Hardware requirement that I used in OICS consists of:

Processor	Pentium III 450 MHz
Memory	192 MB
Hard Disks Space	10 GB

Table 3-7 : Hardware requirement

3.8 Software Requirement

Category	Tools/Software To Use
Operating System	Windows 2000
Web Server	Apache v1.3
Database Server	MySQL
Server-side language	PHP4
Markup Language	HTML
Scripting Language	Javascript
Editing Tools	EditPlus v2.01
Web Authoring Tools	Macromedia Dreamweaver 3.0
Designing Tools	Adobe Photoshop 6.0

Table 3-8 : Software Requirement

3.9 Summary

As a conclusion, the methodology that I use in my thesis is Waterfall model with prototyping. By using Waterfall model with prototyping, I can easily keep track of my development stage of my thesis and I can do my work more systematically.

System requirement can be divided into functional requirement and non-functional requirement. Functional requirement of OICS consists of Authentication module, Category Management, Product Management, Stock Management, Purchase Order, Manufacturer Address Book and Online Product Catalog. Non-functional requirement consists of user friendliness, usability, correctness, efficiency, consistency, reusability, robustness, reliability and security.

For development tools requirement, I have done some comparisons among the popular tools in the market in order to choose the best tool to develop my system. I will be using PHP4 as programming language to develop my system because it is free and easier to learn. This can help me to save time and cost to develop my system. Client-side language, Javascript used to validate user's data and create some special features, such as pop-up message box. Other software tools that I choose to use includes Windows 2000, Apache, MySQL, EditPlus, Macromedia Dreamweaver and Adobe Photoshop.

4.0 System Design

4.1 Introduction

System Design is a phase of the waterfall that all the requirement for the system are translated into system characteristics. The requirements for system are regarding to the analysis that had been discussed in the previous chapter. System design includes the following issues:

- System Architecture Design
- System Functionality Design
- User Interface Design
- Database Design

4.2 Overview of System Architecture of OICS

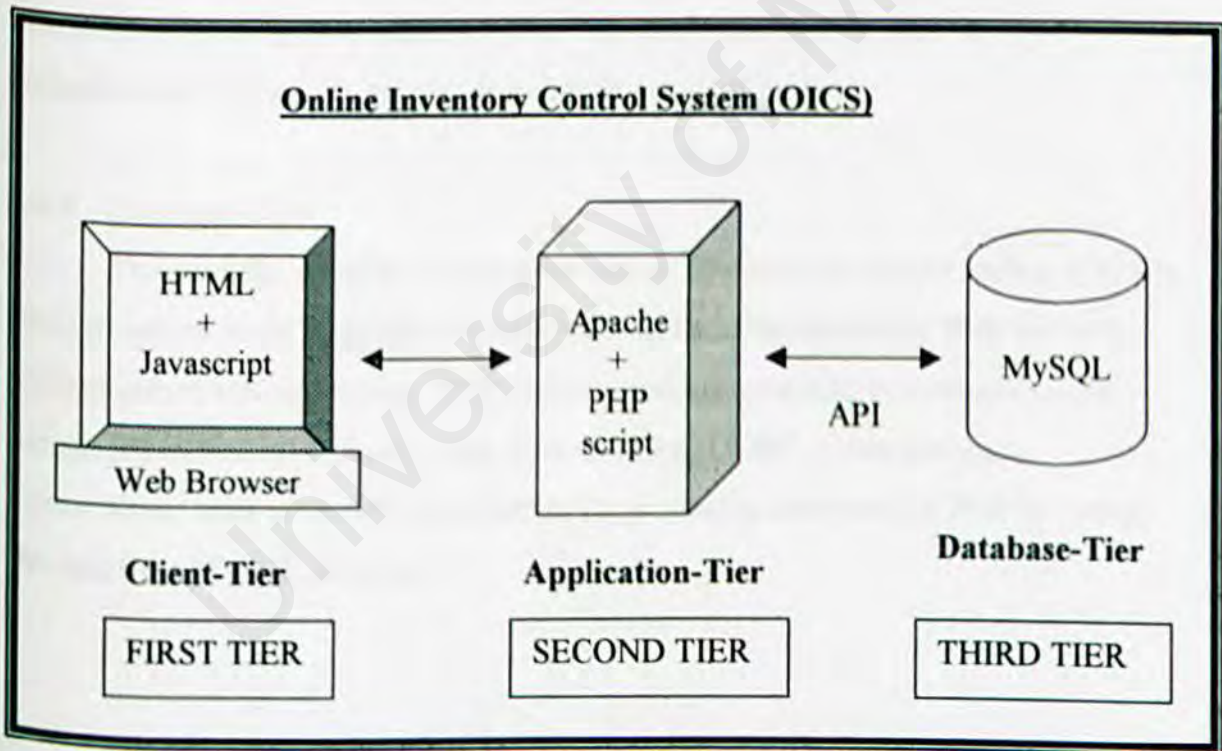


Figure 4-1 : System Architecture of OICS

Online Inventory Control System(OICS) will be using the client-server in three-tier architecture. The three tiers involved in OICS are client-tier, application-tier and database-tier (see Figure 4-1).

4.2.1 Client-Tier

The client-tier in OICS consists of user's web browser. The user requests the page by typing a URL in a browser using HTTP (HyperText Transfer Protocol). The browser will request the page from the Web server, Apache. After that, it will format the returned pages by processing HTML to display text, tables, graphics and other elements. The web browser will interpret client-side scripts, Javascript which is embedded in HTML documents. By using the Javascript, the browser validates user-supplied data before it is sent to the Apache server. This can save much time on returning the request pages by users.

4.2.2 Application-Tier

Application-tier in OICS consists of the web server, Apache that replies to requests from browsers. The main functionality of this tier is to process data in order to send back to the user regarding to the request. In OICS, Apache server performs server-side processing using PHP. Apache server also performs security and user authentication. It protects the data from direct access by user.

4.2.3 Database-Tier

The third tier consists of a database server. The database server used in OICS is MySQL server. MySQL database contains all the data that is needed by Web server to perform server-side processing. PHP program will execute SQL (Structures Query Language) statements to access data from database. ODBC (Open Database Connectivity) used as an API (Application Programming Interface) by PHP to access the data from MySQL database.

4.3 System Functionality Design

4.3.1 System Structure Chart

The objective of system structure chart is to show how the modules in OICS are related to each other in the fundamental of Dealership E-Commerce Package (DECP).

DECP consists of four modules: Online Inventory Control System, Configurable Web Template, Online Shopping Cart and Ordering System and E-Payment System.

(see Figure 4-2)

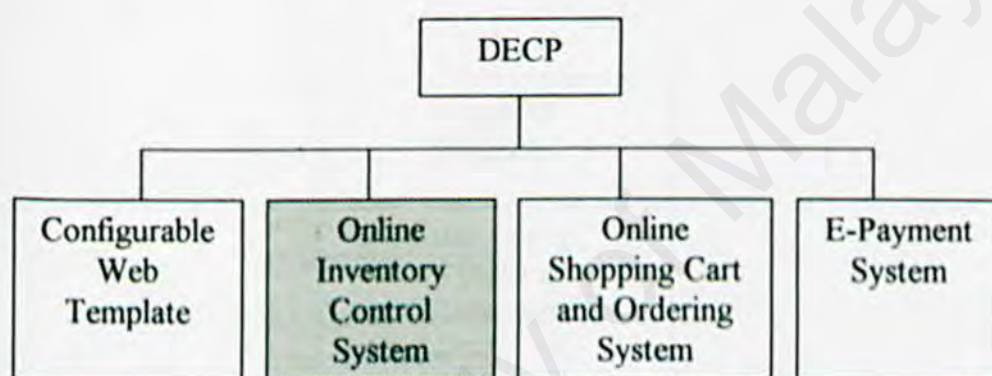


Figure 4-2 : Structure Chart for DECP



Figure 4-3: Structure Chart for OICS

My thesis module is Online Inventory Control System (OICS). OICS can be divided three main parts: Dealer Registration Section, Dealer Administrator Section and

User Section (see Figure 4-3). Dealer Registration Section is host supplier's web site that introduce the DECP and let the dealer to sign up. Dealer Administrator Section is developed for dealers to manage their own web site and manipulate inventory online. User Section is storefront web site that developed by dealers to promote their products online and for customers to view their products.

Dealer Registration Section consists of register module (see Figure 4-4).

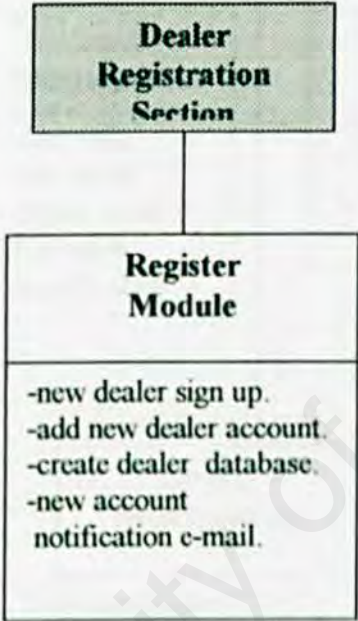


Figure 4-4: Structure Chart of Dealer Registration Section

Dealer Administrator Section consists of seven modules: authentication module, category management module, product management module, stock management module, order management module, manufacturer module and maintenance module (see Figure 4-5).

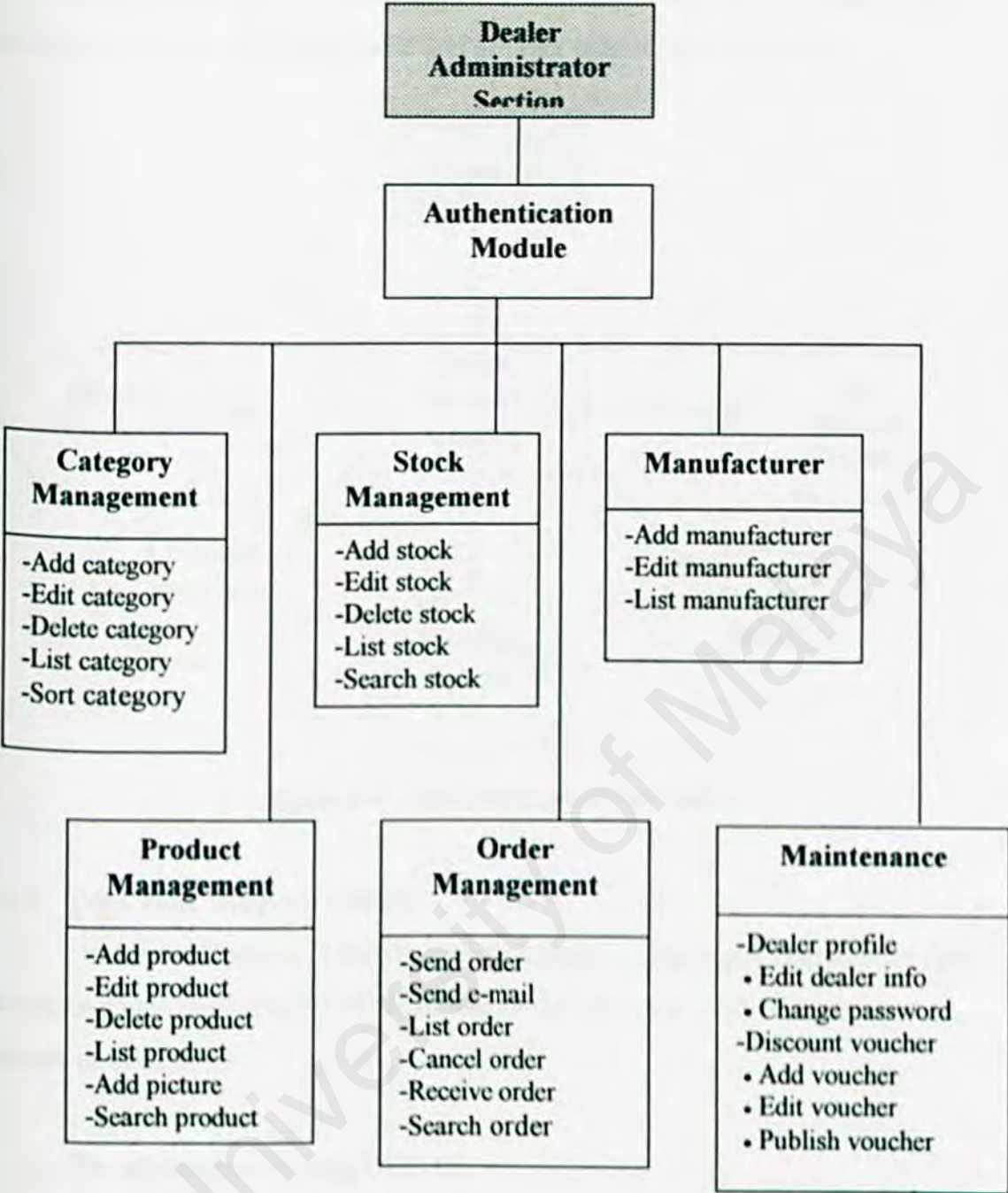


Figure 4-5: Structure Chart of Administration Section

User section consists of online product catalog module that includes display products, cross-sell, hotdeals special and product search (see Figure 4-6).

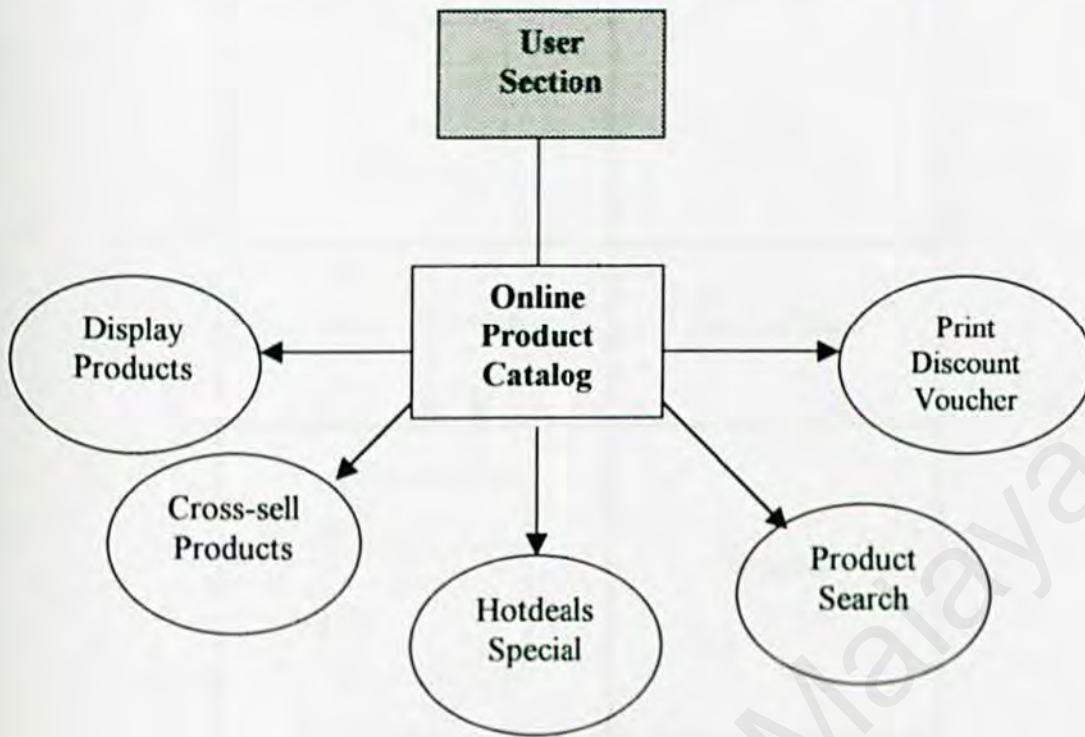


Figure 4-6: Structure Chart of User Section

4.3.2 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in OICS. DFD will depict the overview of the system inputs, process and outputs.

The advantages of using DFD are:

- Further understanding of the interrelatedness of modules and sub modules of OICS.
- Analysis of a proposed system to determine if the necessary data and processes have been defined.

DFD is easy to be understood as it has symbols that specify the physical aspects of implementation. There four basic symbols in DFD: entity, flow of data, process and data stores (see Table 4-1).




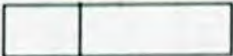
Symbols	Attribute
	Entity
	Flow of Data
	Process
	Data Store

Table 4-1: DFD Symbols

The convention, which is used to design DFD are based on the work by C.Gane and T.Sarson[10]. The data flow is conceptualized with a top-down perspective. So, the Diagram 0 will be drawn, followed by the child diagrams. Diagram 0 or Parent Diagram is an overview process of all the major modules in OICS that includes all the data stores , entities and process involved. Child diagram is an overview process of the modules and sub-modules of OICS.

Figure 4-6 shows the diagram 0 for OICS. Figure 4-8 to Figure 4-15 shows the child diagrams or modules of OICS.

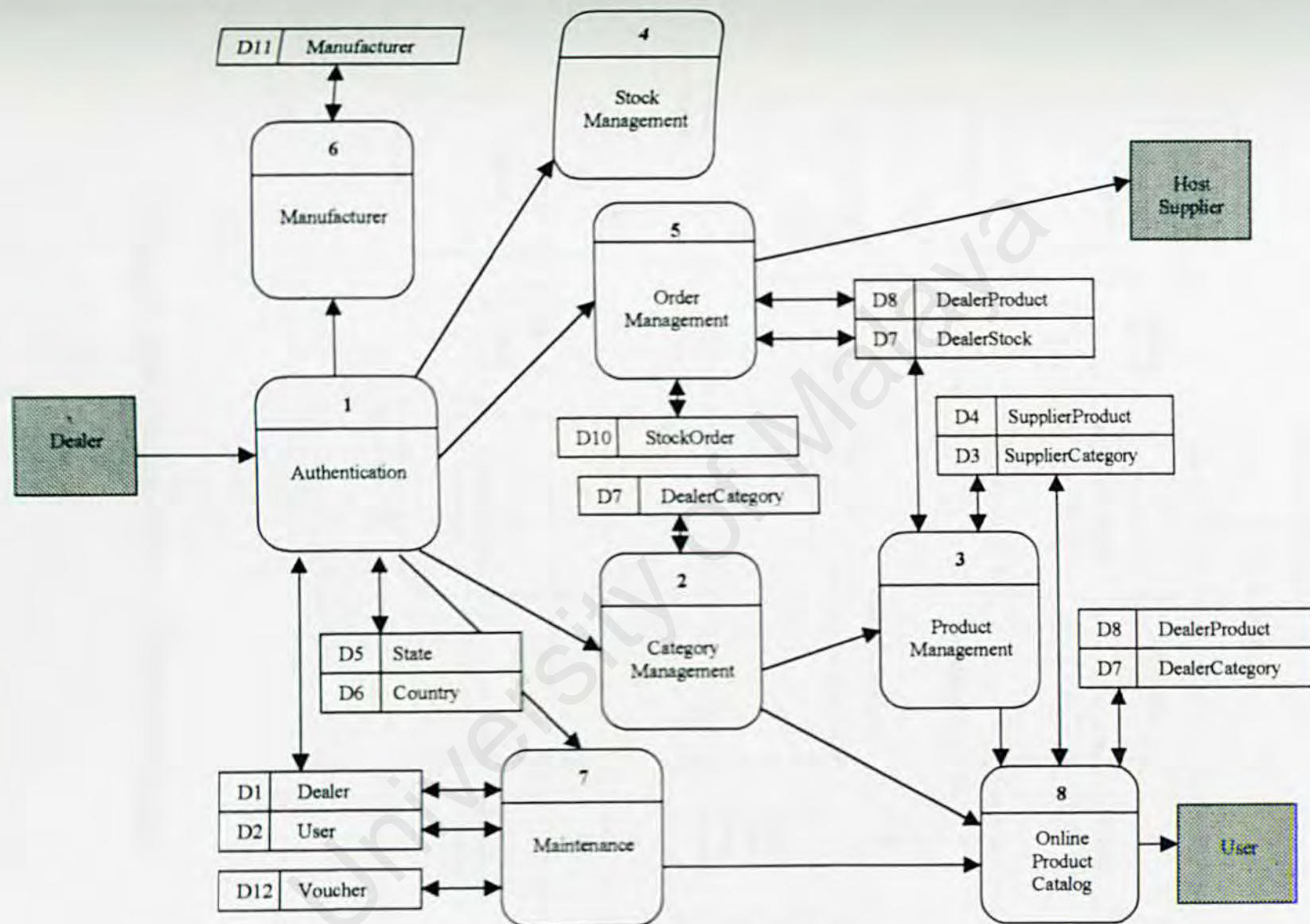


Figure 4-6 : Diagram 0 of OICS

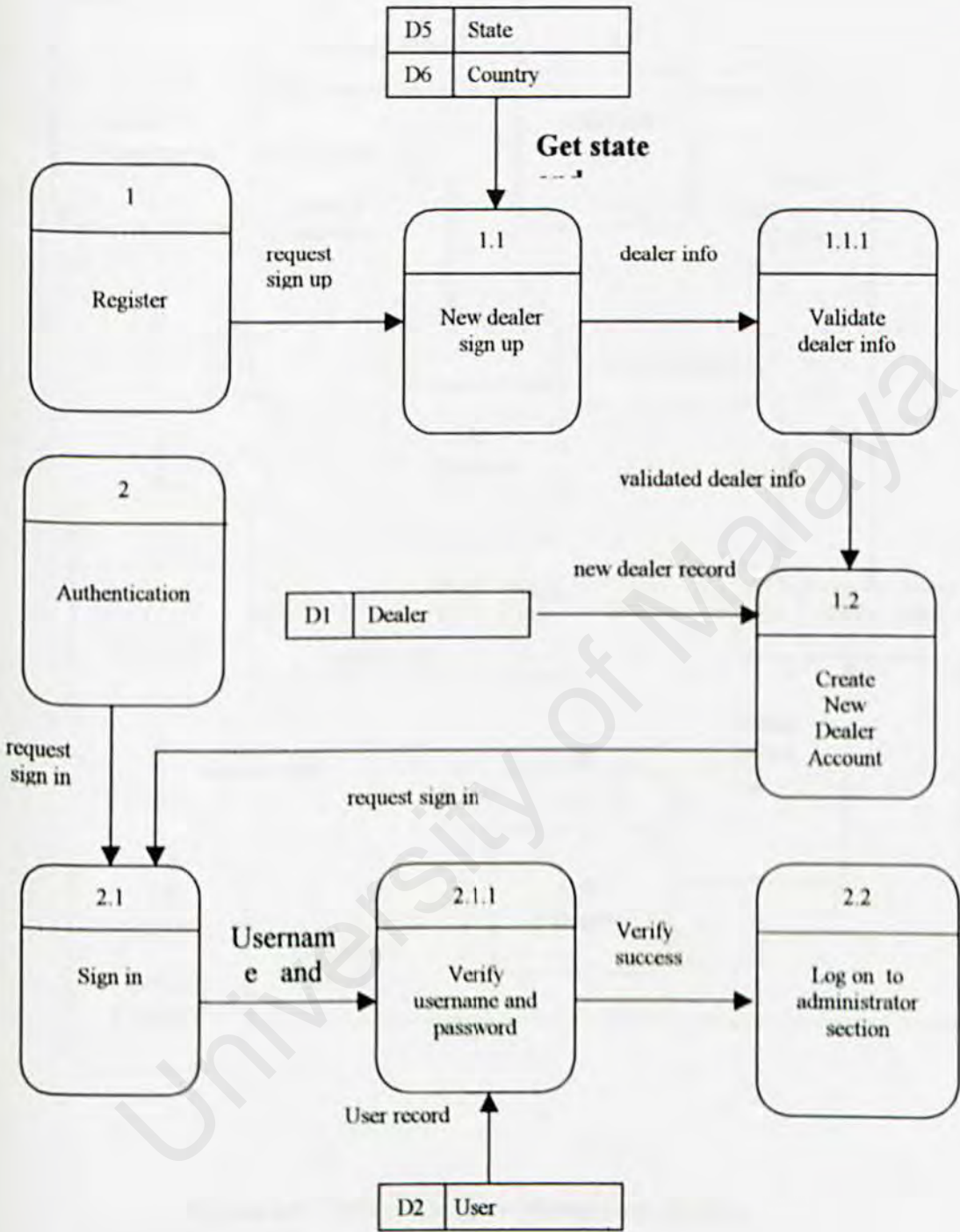


Figure 4-8 : DFD of Register Module and Authentication Module

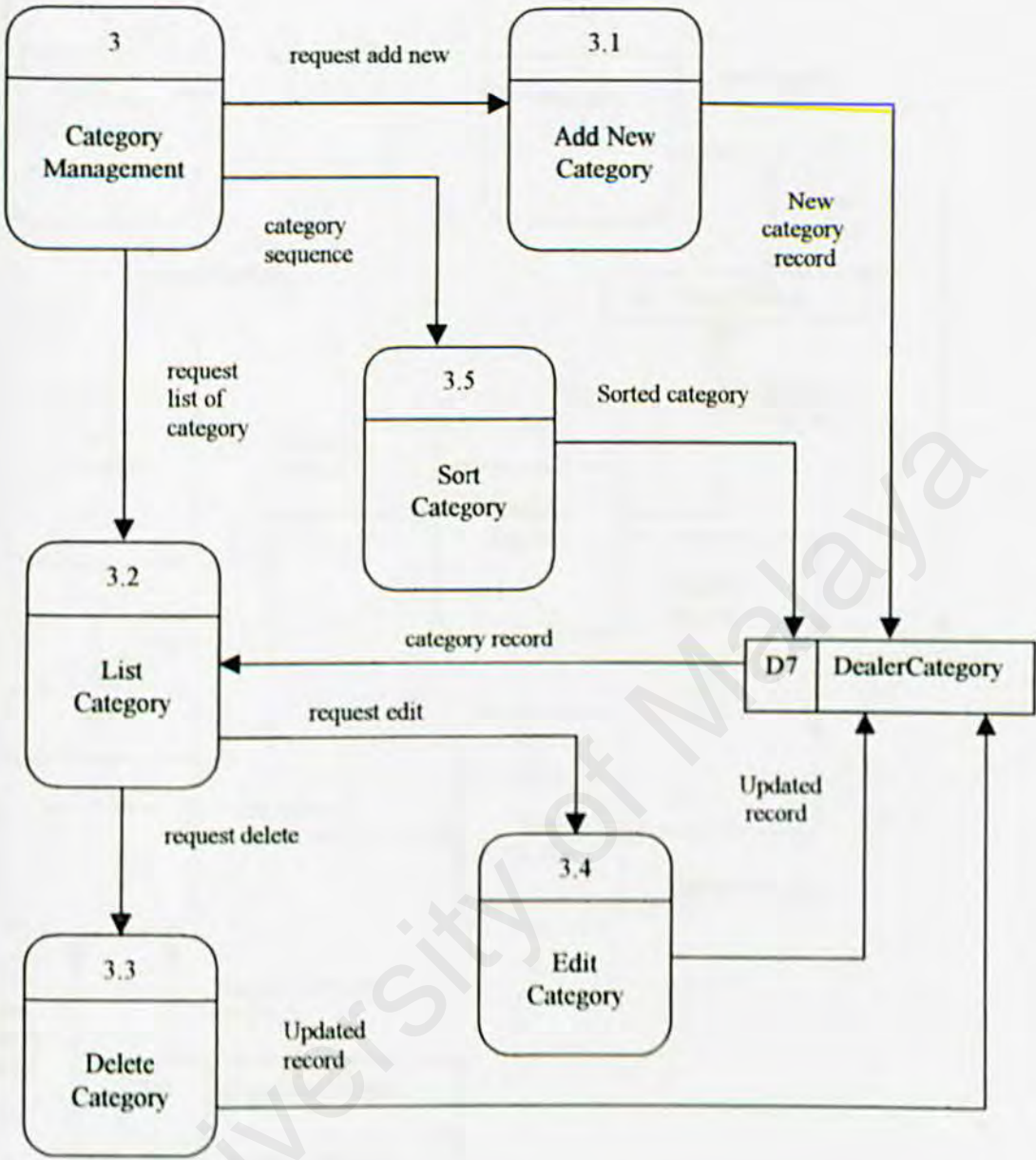


Figure 4-9: DFD of Category Management Module

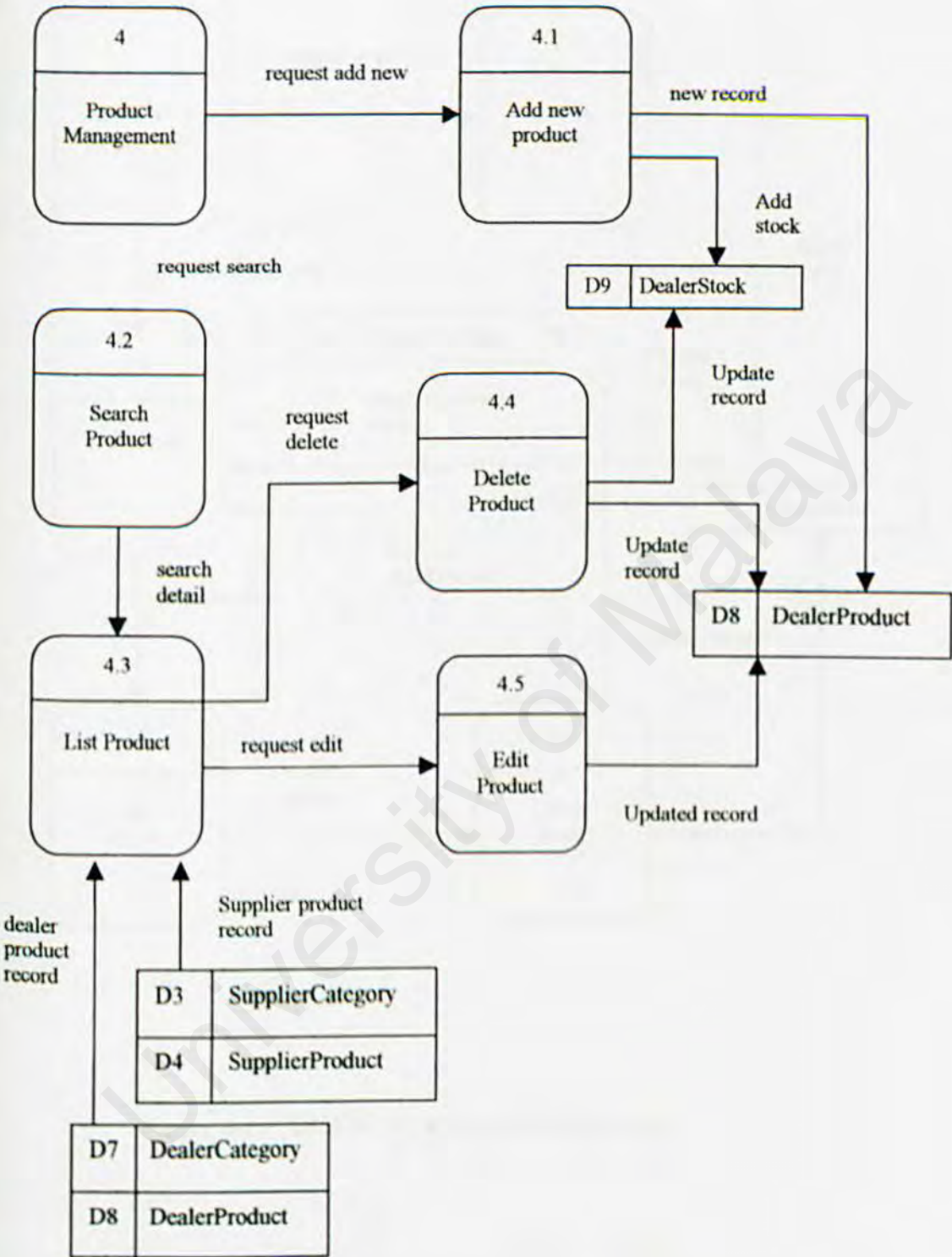


Figure 4-10 : DFD of Product Management

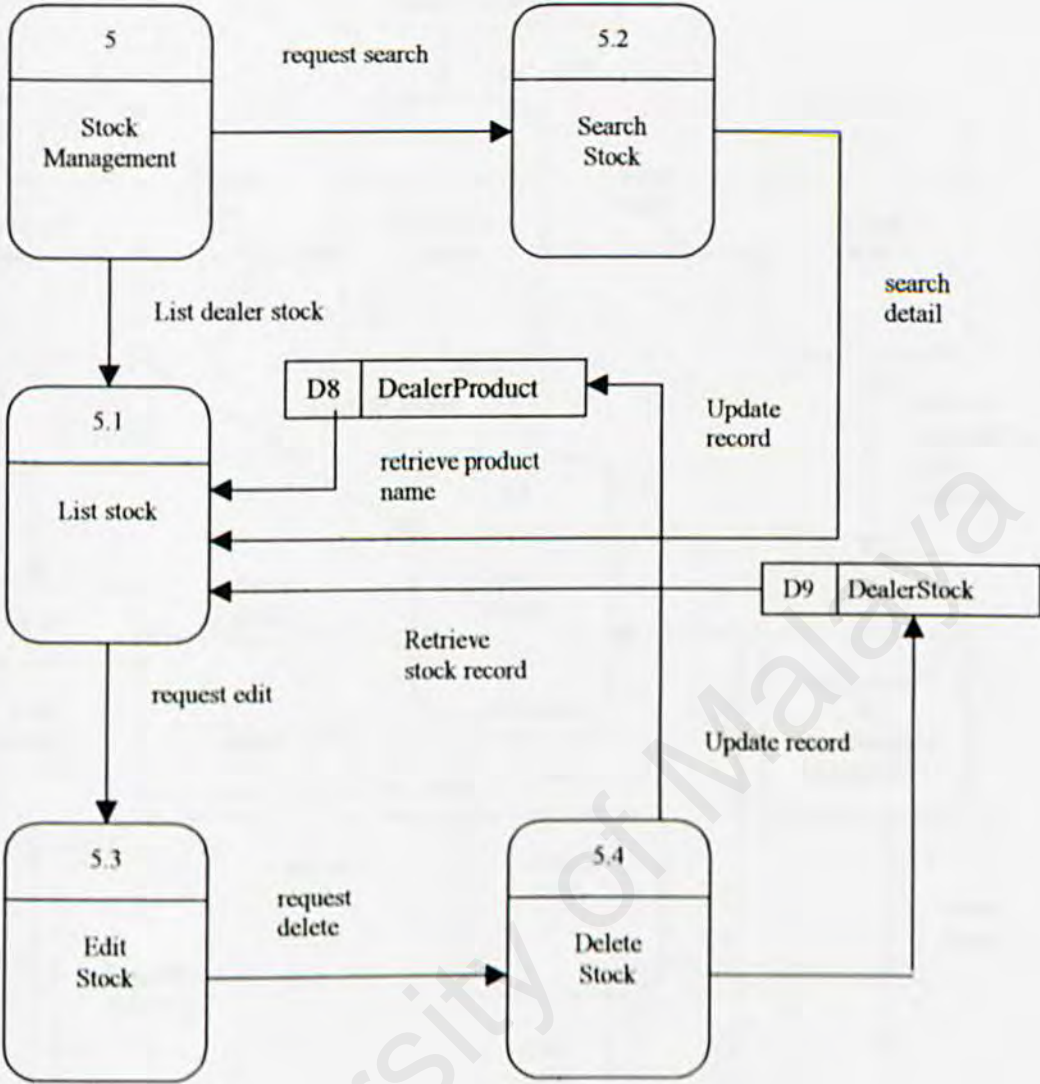


Figure 4-11 : DFD of Stock Management Module

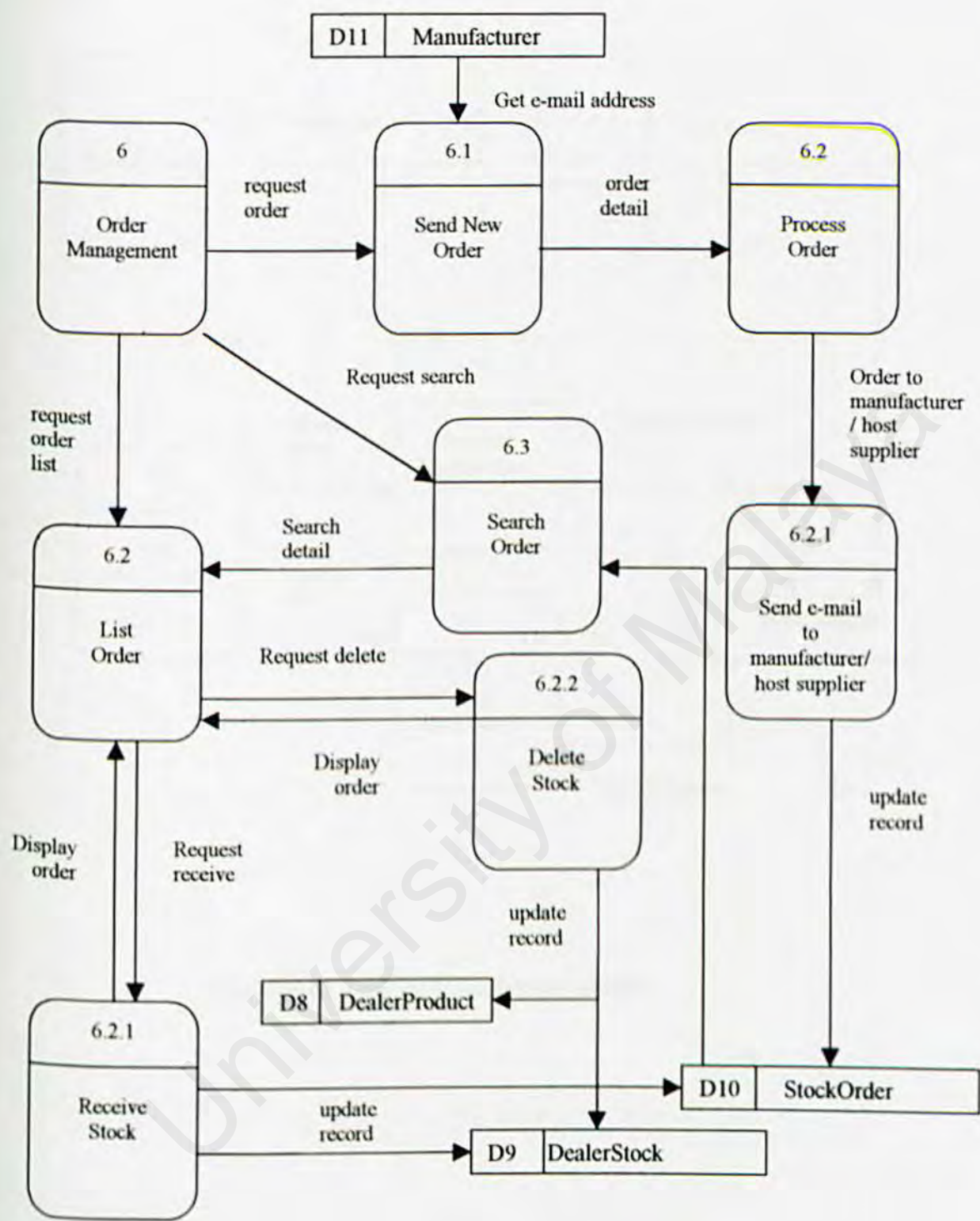


Figure 4-12: DFD of Order Management Module

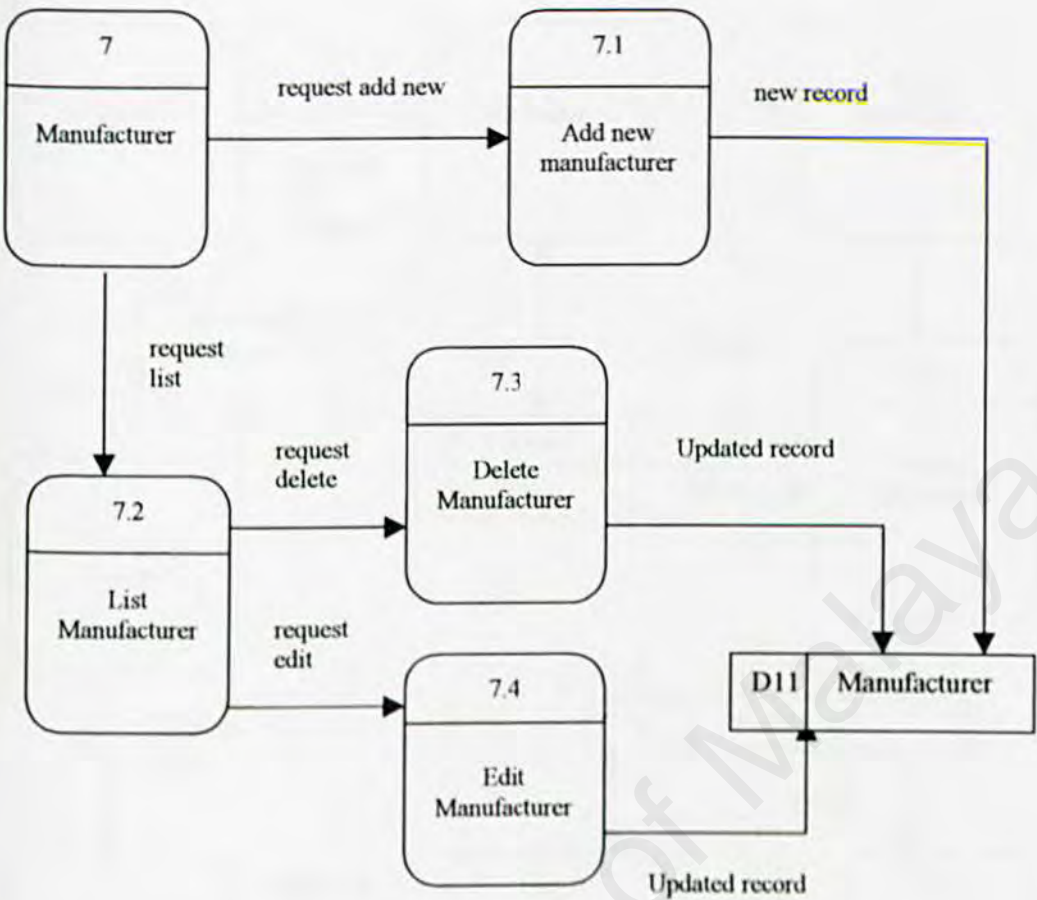


Figure 4-13: DFD of Manufacturer Module

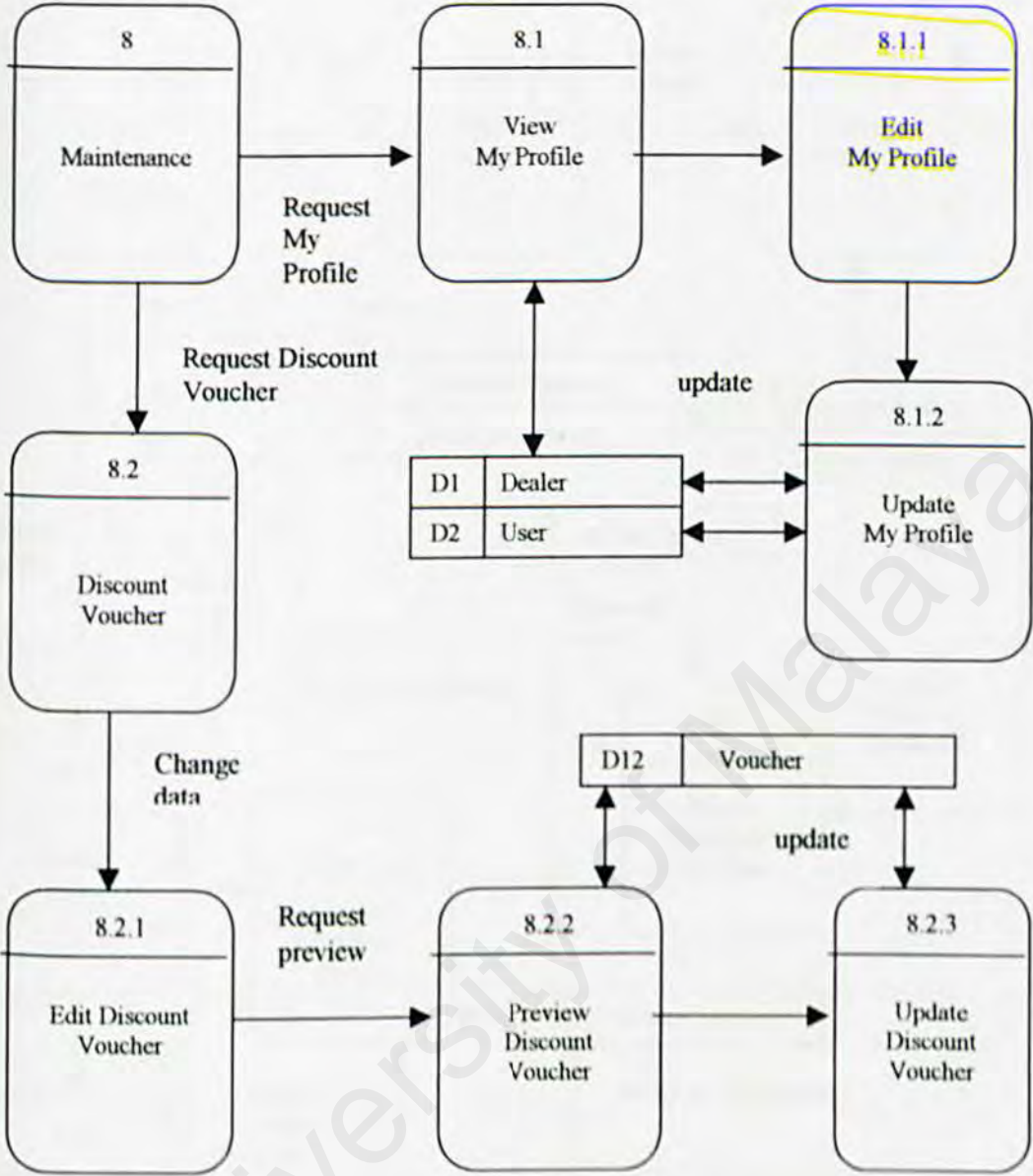


Figure 4-14: DFD of Maintenance Module

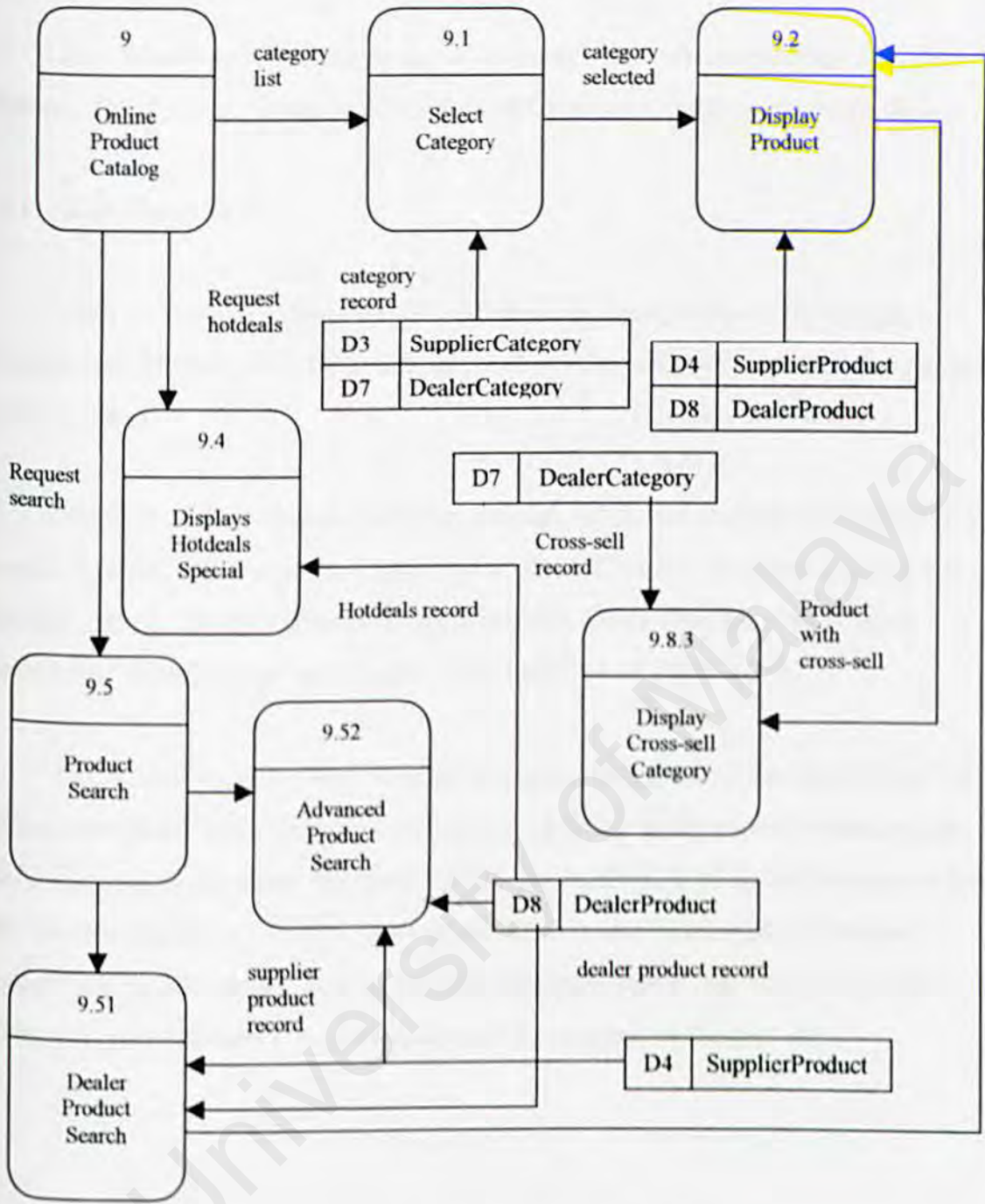


Figure 4-15 : DFD of Online Product Catalog

4.4 Database Design

The objective of database design is to identify the main architecture of OICS database. The database design includes data dictionary and entity-relationship (E-R).

4.4.1 Data Dictionary

Data dictionary or metadata can be defined as descriptions of the database structure and contents [11]. Data dictionary defines the field, field type and descriptions of each table.

In OICS, 2 main database has been defined: OICS and dealerN. Each database contains 6 tables. OICS contains Dealer, User, State, Country, SupplierCategory and SupplierProduct. DealerN contains DealerCategory, DealerProduct, DealerStock, StockOrder, Manufacturer and Voucher (see Table 4-1 to Table 4-12).

OICS database is the host supplier's database that store all the data of supplier products and dealer info. DealerN database can be define as **Dynamic Database** that will be assigned to the dealer that uses DECP. The number, N of dealer depends on how many dealers sign up as member. Once dealer sign up as new member, a database DealerN will be generated. The number N is auto-incremental that means first dealer will be assigned to Dealer1, second dealer will be assigned to Dealer2 etc.

Database Name: **OCIS**Table Name: **Dealer (D1)**

Field	Type	Description
dealer_id	int (auto-increment)	Dealer number
dealer_name	varchar	Dealer's company name
dealer_address1	varchar	Dealer's company first address
dealer_address2	varchar	Dealer's company other address
dealer_postcode	varchar	Dealer's company postcode
dealer_state	varchar	Dealer's company state
dealer_country	varchar	Dealer's company country
dealer_phone	varchar	Dealer's company phone number
dealer_fax	varchar	Dealer's company fax number
dealer_email	varchar	Dealer email address
contact_name	varchar	Contact person name
contact_phone	varchar	Contact person phone

Table 4-2 : Table of Dealer

Table Name: **User (D2)**

Field	Type	Description
user_id	int (auto-increment)	User number
user_name	varchar	User name
user_password	varchar	User password
dealer_id	int	Dealer number

Table 4-3 : Table of User

Table Name: **SupplierCategory (D3)**

Field	Type	Description
suppcat_id	int (auto-increment)	Supplier category number
suppcat_name	Varchar	Supplier category name

Table 4-4 : Table of SupplierCategory

Table Name: **SupplierProduct (D4)**

Field	Type	Description
suppprod_id	int (auto-increment)	Supplier product number
suppprod_name	varchar	Supplier product name
suppcat_id	int	Supplier category number
suppprod_desc	varchar	Supplier product description
suppprod_price	decimal	Supplier product price
suppprod_image	varchar	Supplier product image location

Table 4-5 : Table of SupplierProduct

Table Name: **State (D5)**

Field	Type	Description
State	Varchar	State name

Table 4-6: Table of State

Table Name: **Country (D6)**

Field	Type	Description
Country	Varchar	Country name

Table 4-7: Table of Country

Database Name: DealerNTable Name: **DealerCategory (D7)**

Field	Type	Description
dealercat_id	int (auto-increment)	Category number
dealercat_name	Varchar	Category name
csell	Int	Cross-sell category number
csell_desc	Varchar	Description for cross-sell category
cat_status	Tinyint	Category publish on product catalog
date_created	Date	Date create the form
last_modified	Date	Date modify the form

sequence	Int	Sequence of category
----------	-----	----------------------

Table 4-8 : Table of DealerCategory

Table Name: DealerProduct (D8)

Field	Type	Description
dealerprod_id	Varchar	Product number
dealername	Varchar	Product name
dealerprod_desc	Varchar	Product description
dealerprod_spec	Varchar	Product specification
manu_id	Varchar	Manufacturer number
dealerprod_price	Decimal	Product price
dealerprod_image	Varchar	Product image location
dealercat_id	Int	Category number
hotdeal	Tinyint	Product hotdeal
hotdeal_desc	Varchar	Hotdeal description
prod_status	Tinyint	Product publish on product catalog
date_created	Date	Date the form created
last_modified	Date	Date the form modified

Table 4-9 : Table of DealerProduct

Table Name: DealerStock (D9)

Field	Type	Description
dealerprod_id	varchar	Product number
stock_unit	Int	Stock quantity
reorder_unit	Int	Reorder stock quantity
Stock_level	varchar	Level of stock

Table 4-10 : Table of DealerStock

Table Name: **StockOrder (D10)**

Field	Type	Description
order_id	int (auto-increment)	Order number
dealerprod_id	Int	Product number
order_qty	Int	Stock order quantity
date_order	Date	Date of order stock
date_received	Date	Date of receive stock manually
order_status	Int	Status of ordering stock

Table 4-11 : Table of StockOrder

Table Name: **Manufacturer (D11)**

Field	Type	Description
manu_id	int (auto-increment)	Manufacturer number
manu_name	Varchar	Manufacturer name
manu_email	Varchar	Manufacturer email address
manu_address	Varchar	Manufacturer address
manu_phone	Varchar	Manufacturer phone number
manu_fax	Varchar	Manufacturer fax number
description	Varchar	Description of manufacturer
date_created	Date	Date of form created
date_modified	Date	Date of form modified

Table 4-12 : Table of Manufacturer

Table Name: **Voucher (D12)**

Field	Type	Description
voucher_heading	Varchar	Heading on voucher
voucher_logo	Varchar	Picture on voucher
voucher_desc	Varchar	Description on heading
publish	Tinyint	Publish status

Table 4-13 : Table of Voucher

4.4.2 Entity Relationship Diagram (E-R Diagram)

E-R diagram uses basic graphical diagrams to show the organization of the relationships between data. Two main elements of E-R diagram that used in OICS are entities and relationships (see Table 4-10).



Symbol	Name
	Entiti
	Relationship

Table 4-14 : E-R Symbols

Entiti is an object or concept that used as a data source and relationship is used to show how the entities relates with each other. There are two types of relationship has been used in OICS: one-to-one(1-1) and one-to-many(1-M). By using the E-R diagram, the interrelated between entities in OICS can be shown as in Figure 4-14.

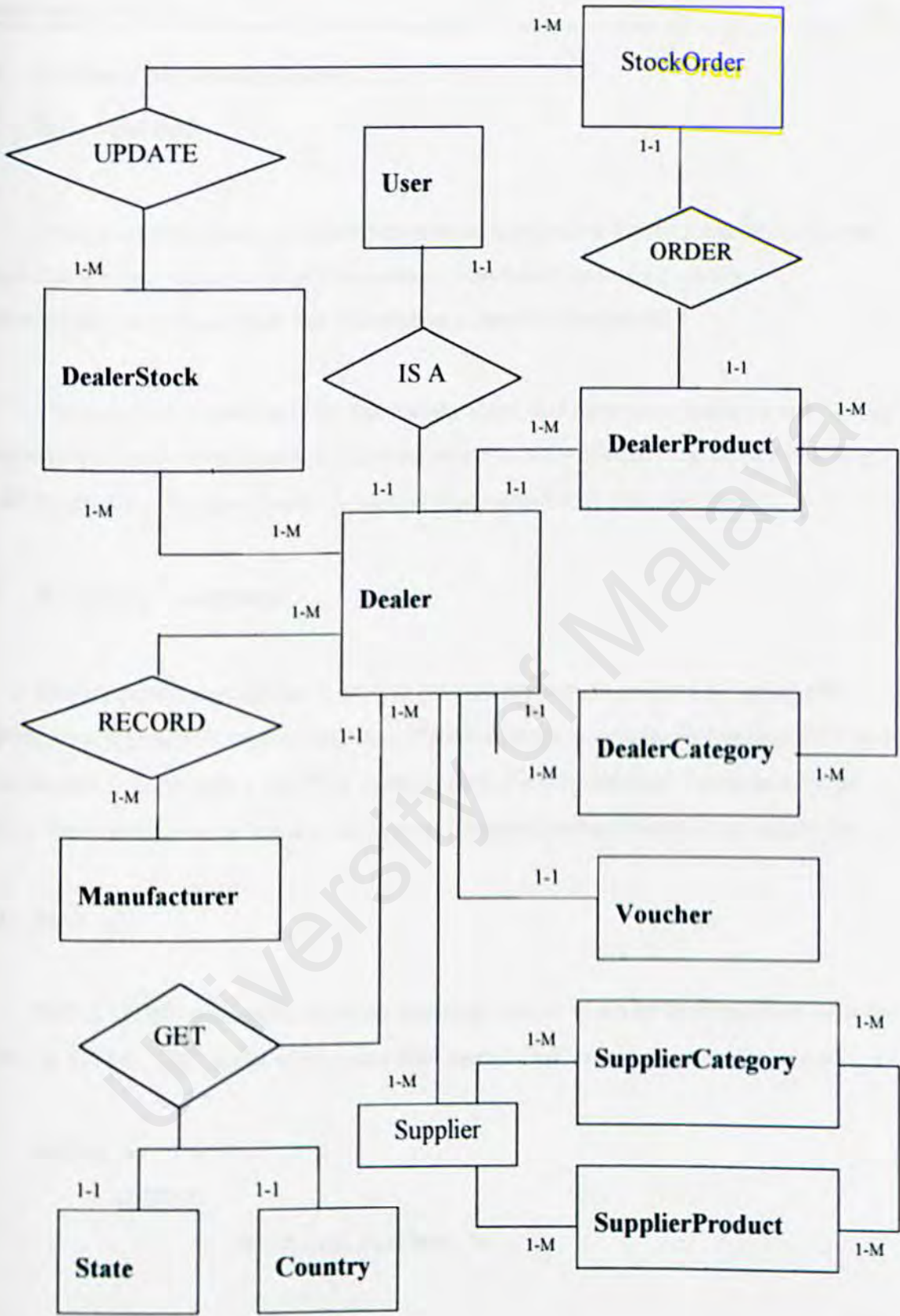


Figure 4-16: Entity-Relationship Diagram of OICS

5.0 System Implementation

5.1 Introduction

System implementation is a process of writing program that implement the system design that has been done in the previous stage. The main purpose of system implementation is to assure that the information system is operational.

The program development for the coding phase had been done based on the module functionality. There are nine modules in three sections in my system. The three sections are Dealer Registration Section, Dealer Administrator Section and User Section.

5.2 Scripting Language

The scripting language that I used to develop my system consists of server-side scripting language and client-side language. Server-side programming language is PHP and for client-side is JavaScript. I use PHP in major part of my system and I used JavaScript only for form validation and some other special features, such as dynamic navigation bar.

5.2.1 PHP

PHP is HTML embedded scripting language, means it can be used together with the HTML. In HTML, PHP script is enclosed with special PHP tags. (see example below)

```
<HTML>
  <BODY>
    <? //PHP code start here ?>
    .....
    .....
  </BODY>
</HTML>
```

To print lines, use *echo*. To add comment to line, use *//* or */* */*,

```
<?    /* This is greeting file*/  
      // to greet  
      echo ("Hello World");    ?>
```

All the PHP files must be saved as .php file type.

5.2.2 JavaScript

For JavaScript, it is also a HTML embedded scripting language and can used together with HTML and PHP. In HTML, JavaScript script is enclosed with special JavaScript tags (see example below).

```
<script language="JavaScript">  
    JavaScript statements  
</script>
```

The script tag is placed in the head of an HTML document so that all the JavaScript definitions have been made before the body of the document is displayed [12].

```
<HTML>  
  <HEAD>  
    <script language="JavaScript">  
      JavaScript statements  
    </script>  
  </HEAD>  
  <BODY>  
    .....  
  </BODY>  
</HTML>
```


5.3 Dealer Registration Section

5.3.1 Register Module

Dealer Registration Section only consists of one module that is **register module**. This module is a web site that developed for host supplier to give a brief introduction to the Dealer E-Commerce Package (DECP) and let the dealers who are interested to register as new member.

To develop this module, I have created three PHP files, named `escom_main.php`, `dealer_form.php` and `dealer_form_submit.php`. For all the .php files, there are some include files written at the upper part of the program. The include statement means read and execute code from a specified file [13]. The advantage of using include files is no need to duplicate writing the same codes in each .php files. If any error found on that particular file, I just need to change one file instead of all the files. The include files in this module as shown below:

```
<?
    include ("shared/connect.php"),
    include ("shared/common.php");
    include ("shared/font.php");
    include ("shared/error.php");
    include ("shared/validate.php");
```

All the include files are stored in a folder named 'shared'. The `connect.php` is created to connect to the MySQL database server.

```
if(!($link = mysql_pconnect ($db_server, $db_login, $db_password)))
{
```

```

        DisplayErrMsg(sprintf("Internal error %d:%s\n", mysql_errno(),
        mysql_error()));
        return 0;
    }

```

The common.php file is created to define the variables used in particular files. So, we do not need to define in each file.

```

$db_server = "localhost";    //database server name
$db_login = "DECP";         //database login name
$db_password = "DECP";      //database password
$db = "dealer".$dealer_id;   //dealer database containing the tables
$OICS = "OICS";              //host supplier database containing the tables
$http_host = "localhost/oics"; //HTTP host

```

The font.php file is created to keep CSS classes. CSS class defines type of text to be displayed, includes font family, font size, font style, font color etc as shown below:

```

<style type="text/css">
<!--
    .heading { font-family: Verdana; font-size: 12pt; color: red; font-style:
    normal; line-height: normal; font-weight: bold; text-decoration: underline}

    header { font-family: Verdana; font-size: 12pt; text-indent: 1em; font-style:
    normal; line-height: normal; font-weight: bold; text-decoration: none; color:
    #11057D}

    .....

    BODY { background-repeat: no-repeat }
-->
</style>

```


The CSS class can be embedded in the HTML tag as shown below:

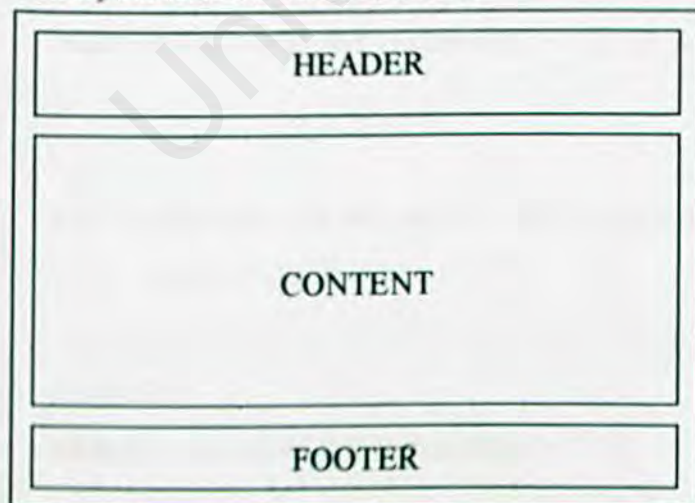
```
<tr>  
    <td colspan=2 class=header>Company Information</td>  
</tr>
```

The escom_main.php includes coding of the user interface design for the host supplier web site. I have used <table></table> to control the different parts in the web site, as shown below:

```
<HTML>  
<BODY>  
    <TABLE> Header is here </TABLE>  
    <TABLE> Content is here </TABLE>  
    <TABLE> Footer is here </TABLE>  
</BODY>  
</HTML>
```

This method is easier to control and create dynamic content. Each time user click button to view another page of that site, changes will only occurred in the second table. This can also solve the problem of slow loading of pages. This method also used in Online Product Catalog module to create the front store of dealers.

The layout structure of the web site:



The dealer_form.php file contains the new member registration form and also client-side form validation using JavaScript. In the *head* of the file, I embed the JavaScript tag.

```
<HTML>
<HEAD>
    <SCRIPT language="JavaScript" SRC="validateDealerForm.js">
    </SCRIPT>
</HEAD>
.....
</HTML>
```

I have generate my own JavaScript validation function stored in JavaScript file named 'validateDealerForm.js'. The client-side validation will check for the empty field, invalid e-mail address and invalid number inserted. The e-mail checking functional is shown below:

```
function isEmail(s)
{
    var i = 1;
    var sLength = s.length;

    // look for @
    while ((i < sLength) && (s.charAt(i) != "@"))
    { i++ }

    if ((i >= sLength) || (s.charAt(i) != "@")) return false;
        else i += 2;

    // look for .
    while ((i < sLength) && (s.charAt(i) != "."))
    { i++
```



```

    }

    // there must be at least one character after the .
    if ((i >= sLength - 1) || (s.charAt(i) != ".")) return false;
    else return true;
}

```

The dealer_form_submit.php created to process the registration form, includes server-side form validation and add into database. The server-side validation includes check for duplication username and invalid password format. After the validation is complete, all the dealer info will be added into dealer and user table.

```

if(!($user = mysql_db_query($OICS, "insert into user (user_id, user_name,
user_password, dealer_id) values (null, \"$user_name\",
PASSWORD(\"$user_password\"), \"$dealer_id\"))) {
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
mysql_errno(), mysql_error()));
    exit();
}

```

For security purpose, I have done the password encryption using MySQL function.

```
PASSWORD(\"$user_password\")
```

DisplayErrMsg function is defined in error.php files that is one of the include files in the dealer_submit_form.php

```

function DisplayErrMsg($message) {
    printf("<blockquote><blockquote><blockquote><h3><font
color=#cc0000>%s</font></h3>\n", $message);
}

```

Once the new account has been created, a database will be generated to the new member. After the database has been generated, 6 tables will be created under the database: dealercategory, dealerproduct, dealerstock, stockorder, manufacturer and voucher. The PHP coding is showed below:

```
$dealer = "dealer".$dealer_id; //$dealer_id is new dealer ID
```

```
//generate new database
```

```
$create = mysql_db_query($OICS, "create database $dealer");
```

```
//create tables
```

```
mysql_db_query($dealer, "CREATE TABLE dealercategory (  
    dealercat_id int(11) NOT NULL auto_increment,  
    dealercat_name varchar(120),  
    csell int(11),  
    csell_type varchar(10),  
    csell_desc varchar(255),  
    cat_status int(1) DEFAULT '0' NOT NULL,  
    date_created date,  
    last_modified date,  
    seq int(11) DEFAULT '0' NOT NULL,  
    PRIMARY KEY (dealercat_id)  
)");
```

```
mysql_db_query($dealer, "CREATE TABLE dealerproduct (  
    dealerprod_id varchar(30) NOT NULL,  
    dealerprod_name varchar(120),  
    dealerprod_desc varchar(255),  
    manu_id varchar(30),  
    dealerprod_price decimal(8,2),  
    dealerprod_image varchar(30),
```



```
dealercat_id int(11) DEFAULT '0' NOT NULL,  
hotdeal tinyint(1) DEFAULT '0' NOT NULL,  
hotdeal_desc varchar(255),  
prod_status tinyint(1) DEFAULT '0' NOT NULL,  
date_created date,  
last_modified date,  
PRIMARY KEY (dealerprod_id)  
);
```

```
mysql_db_query($dealer, "CREATE TABLE manufacturer (  
manu_id int(11) NOT NULL auto_increment,  
manu_name varchar(120),  
manu_email varchar(50),  
manu_address varchar(120),  
manu_phone varchar(30),  
date_created date,  
date_modified date,  
manu_fax varchar(30),  
description varchar(200),  
PRIMARY KEY (manu_id)  
);
```

```
mysql_db_query($dealer, "CREATE TABLE stockorder (  
order_id int(11) NOT NULL auto_increment,  
dealerprod_id varchar(30),  
order_qty int(11),  
manu_id int(11) DEFAULT '0' NOT NULL,  
date_order date,  
date_received date,  
comment varchar(255),  
order_status varchar(5),
```

```
PRIMARY KEY (order_id)
)");
```

```
mysql_db_query($dealer, "CREATE TABLE dealerstock (
    dealerprod_id varchar(30),
    stock_price decimal(8,2),
    stock_unit varchar(11),
    reorder_unit varchar(11),
    stock_level varchar(20)
)");
```

```
mysql_db_query($dealer, "CREATE TABLE voucher (
    voucher_heading varchar(30),
    voucher_logo varchar(30),
    voucher_desc varchar(255),
    publish tinyint(1) DEFAULT '0' NOT NULL
)");
```

After the manufacturer table has been created, one manufacturer record ie escom will be inserted into the table by writing MySQL command.

```
// insert value into manufacturer
mysql_db_query($dealer, "insert into manufacturer values('null', 'escom',
'sj_hew@hotmail.com', '72, Jalan 29/2, Taman Industrial, Kuala Lumpur.',
'79544444', '$now', '', '795444446', 'escom is the host supplier who provides
dealership e-commerce package to the dealers')");
```

Besides that, a directory will be created for the dealer and needed files will be copied to the directory. Folders named prod_pic and voucher_pic created to store pictures of products and discount voucher. The config file creates to keep dealer ID and other variables.


```
// Create directory
```

```
mkdir("$dealer", 0755);
```

```
mkdir("$dealer/prod_pic", 0775);
```

```
mkdir("$dealer/voucher_pic", 0775);
```

```
mkdir("$dealer/conf", 0775);
```

```
// copy files
```

```
copy("display_product.php" , "$dealer/display_product.php");
```

```
copy("voucher.php" , "$dealer/voucher.php");
```

```
// Create config file
```

```
$file = fopen("$dealer/conf/config.php", "w");
```

```
fwrite($file, "<?\\n$\".db=\"\" . $dealer. \"\";\\n\" . \"$\" . \"dealer_id=\"\" . $dealer_id . \"\";\\n\" .
```

```
\"$\" . \"OICS='OICS';\\n?>");
```

```
fclose($file);
```

5.3 Dealer Administrator Section

This section consists of seven modules: authentication module, category management, product management, stock management, order management, manufacturer and maintenance module.

5.4.1 Authentication Module

This module created to allow the authorized dealer admin to access to the store back office of DECP. This module will check whether the username and password that entered by the admin is correct or not. If any missing fields or invalid username or invalid passwords found, it will show error message to warn the admin. If the authentication is success, cookies of the dealer ID, username and password will be set.

```
<?
    setcookie("dealer_id", $dealer_id);
    setcookie("cookie_user", $user_name);
    setcookie("cookie_password", $user_password);
?>
```

To make sure that the dealer admin always log in each time he access the pages of the store back office, I have created a file check.php to check whether the dealer ID cookie, username cookie and password cookie are present. If not exist, it will show illegal page and ask the admin to log in again.

```
<?
    if(empty($dealer_id) || empty($cookie_user) || empty($cookie_password)) {
        header("Location:http://$http_host/shared/illegal.html");
    }
?>
```

The cookies will always exist until the admin logout of the store back office. When the admin logout, all the cookies will be deleted.


```

<?
    setcookie("dealer_id", "");
    setcookie("cookie_user", "");
    setcookie("cookie_password", "");
?>

```

5.4.2 Category Management Module

This module is developed for dealer to add, edit/delete and sort category. All the changes made in this module will be displayed in the dealer's web site. This module consists of three sub-modules: add new category, edit category and sort category.

To add new category, dealer has to fill up a form. After the dealer submits the form, the data will be validated in client-side and server-side. Then, all the valid data will be inserted into database. Dealer can change the data of the category that has been added and update the new data into database.

Dealer can also choose to sort the sequence of category by ascending or descending that will be displayed on the dealer's web site. For user-friendly purpose, dealer just need to click the button of 'asc' or 'desc' to sort the category and this will automatically update to the database.

```

<?
    if(!($asc_result = mysql_db_query($db, "select * from dealercategory order
    by dealercat_name ASC"))){
        DisplayErrMsg(sprintf("Internal Error %d:%s\n",
        mysql_errno(), mysql_error()));
        exit();
    }
    $count=0;

```

```
while($list_asc = mysql_fetch_array($asc_result)){
    $count++;
    $dealercat_id = $list_asc["dealercat_id"];
    $sequence = $count;

    if!($update = mysql_db_query($db, "update dealercategory set
    seq=\"$sequence\" where dealercat_id=\"$dealercat_id\"")){
        DisplayErrMsg(sprintf("Internal Error %d:%s\n",
        mysql_errno(), mysql_error()));
        exit();
    }
}
```

?>

Dealer can delete any category from the category list by clicking the 'delete' button.

<?

```
if!($deletecat = mysql_db_query($db,"delete from dealercategory where
dealercat_id=\"$dealercat_id\"")){
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
    mysql_errno(), mysql_error()));
    exit();
}
```

?>

5.4.3 Product Management Module

This module is developed for dealer to add, edit/delete and search products. All the product data that has been added into database will be retrieved and display on the Online Products Catalog of dealer's web site. Dealer can also upload product picture for each product that added. Dealer can browse picture from the local directory in his own PC. The input field used for store picture is:

```
<input type=file name=dealerprod_image>
```

To avoid duplicate image name, the picture will be defined according to product id stored in the prod_pic folder that has been created.

```
$image_pic = $dealerprod_id . $dealerprod_image_ext;
$dealer = 'dealer' . $dealer_id;
copy($dealerprod_image, $dealer."/prod_pic/" . $image_pic);
```

To delete the product from the prod_pic folder, use *unlink*.

```
unlink($dealer . "/prod_pic/" . $image_pic);
```

Besides that, dealer can search products by product id, product name and category name from the host supplier (escom) and dealer own database. Dealer just need to insert a keyword to search particular products, e.g. if dealer insert 1 into product id field, all the products that has 1 in product id will be displayed, such as Prin-1200 or Bbjct-2901 etc. This can be done by using %% in the variables.

```
<?
```

```
if!($cat = mysql_db_query($OICS, "select * from suppliercategory c,
supplierproduct p where p.suppcat_id=c.suppcat_id and c.suppcat_id like
\"$cat_name\" and p.suppprod_id like \"%%$prod_id%\" and
p.suppprod_name like \"%%$prod_name%\" group by p.suppprod_id")){
    DisplayErrMsg(sprintf("Internal Error %d,%s\n",
```

```
        mysql_errno(), mysql_error()));  
        exit();  
    }  
?>
```

5.4.4 Stock Management Module

This module is developed for dealer to manage stock includes quantity of stock, quantity of reorder level, stock price and keep the record of manufacturer. Dealer can adjust stock or edit info of stock and also can view stock detail from the stock list. The stock list will show the stock status of each stock according to the quantity of stock. Stock level consists of three types: Normal, Low and Critical.

```
if($stock_unit >= $reorder_unit)  
    $stock_level = "Normal";  
if($stock_unit < $reorder_unit)  
    $stock_level = "Low";  
if($stock_unit == 0 )  
    $stock_level = "Critical";
```

If the stock shows Low or Critical means dealer has to aware and prepare to reorder the stock from the manufacturer again. There is a link to the order form under the order management module to let the dealer order through e-mail.

5.4.5 Order Management Module

This module is developed for dealer to order stock from manufacturer through sending e-mail under send new order sub-modules.

```
<?    //send mail function
```



```
mail($to,$subject,$content,"From: \"\$sender\" <\$email>\nX-Mailer: PHP/" .
phpversion(),"Content-type: text/html; charset=us-ascii");
```

```
?>
```

After the e-mail has been sent, it will insert the order record into database and change the order status of the particular product into OOD (Order-On-Delivery).

```
<?
```

```
if(!($insertOrder = mysql_db_query($db, "insert into stockorder (order_id,
dealerprod_id, order_qty, manu_id, date_order, order_status) values(null,
\"$prod_id\", \"\$order_unit\", \"\$manu_id\", \"\$now\", \"OOD\")"))){
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
mysql_errno(), mysql_error()));
    exit();
}
```

```
?>
```

The database will be updated and order status will change to OR (Order-Received) once dealer has verify the order under the receive order sub-module.

```
<?
```

```
if(!($updateOrder = mysql_db_query($db, "update stockorder set
date_received= \"\$now\", order_status= \"OR\", comment= \"\$comment\"
where dealerprod_id= \"\$dealerprod_id\" and order_id= \"\$order_id\""))){
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
mysql_errno(), mysql_error()));
    exit();
}
```

```
?>
```

5.4.6 Manufacturer Module

This module is developed for dealer to add record of manufacturer, [edit/delete](#) the detail from database. This module very important because the data that added [here](#) will be retrieved and used by other module, such as Product Management retrieves the manufacturer name and the order management retrieves the manufacturer e-mail address. Therefore, all the data will be validated under validateManuForm.js before insert or update into database.

5.4.7 Maintenance Module

This module consists of two sub-modules that not belonged to any other modules, that are My Profile and Discount Voucher. My Profile is developed for dealer to view his own detail and do any changes if necessary. Data will be retrieved from the host supplier database based on the dealer id.

<?

```
if(!($retrieve = mysql_db_query($OICS, "select * from dealer where
dealer_id=\"$dealer_id\""))){
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
mysql_errno(), mysql_error()));
    exit();
}
```

?>

Discount Voucher is very important in promotion of product. Dealer can create his own voucher of products to attract customers' attention. Dealer can always change the discount voucher that will be displayed on his company's web site. Dealer can also choose to unpublish the voucher if no promotion in his company by unchecked the publish check box.

5.5 User Section

5.5.1 Online Product Catalog

This module is the dealer's web site that the UID (user interface design) is static but the details is dynamic. The dynamic data is retrieved from dealer's database. This means that the details that will be displayed on the web site are change according to data that entered by dealer in the store back office. Dealer can always view the changes of data by click the 'View My Store' on the top of the side-navigation in store back office. A new window will be popup to show the dealer's web site.

```
<?
    $link = "dealer".$dealer_id."/display_product.php";

    echo("<a class=\"item\" href=\"".$link\" target=\"_blank\">");
    echo("<FONT color=#FF0000>View My Store</FONT></a>");
?>
```

The content web site divided into three parts: left-side navigation, main content and right-navigation. Categories of dealer's products and host supplier's (escom) product will be displayed on the left-side navigation. When user click any category on the left-side navigation, the products under that category (\$cat_id) will be displayed on the main content. The product data is retrieved from the database with the condition the prod_status is 1, means the publish check box in product form is checked.

```
<?
    if!($showPro = mysql_db_query($db, "select * from dealerproduct p,
    dealercategory c where p.prod_status=1 and c.cat_status=1 and
    c.dealercat_id=p.dealercat_id and p.dealercat_id = \"$cat_id\" order by
    seq")){
        DisplayErrMsg(sprintf("Internal Error %d:%s\n",
        mysql_errno(), mysql_error()));
        exit();
    }
```

?>

There are keyword product search and advanced product search available on the right-side navigation. For keyword product search, users need to insert any keyword to search their preference products. For advanced product search, users are provided a form to search the products from the host supplier or from the dealer's company. Users can search by product name and product price.

<?

```
if(!($find = mysql_db_query($db, "select * from dealerproduct where
dealerprod_name like \"%$name%\" and dealerprod_price between
\"$pricet\" and \"$pricet\" and prod_status=1"))) {
    DisplayErrMsg(sprintf("Internal Error %d:%s\n",
mysql_errno(), mysql_error()));
    exit();
}
```

?>

Besides that, users also can print discount voucher from the dealer's web site. When the user clicks on the discount voucher image, there is a popup discount voucher window with a print button.

```

```

The popup function can be done by using JavaScript.

```
<script language="Javascript">
function preview(popupURL)
{
    // open the popup window
    var popup =
    window.open(popupURL, "AboutThis", 'toolbar=0,location=0,directories=0,s
tatus=no,menubar=no,scrollbars=1,resizable=yes,width=300,height=300');
}
```


</script>

User has to click 'print' button under the voucher to print out the voucher.

```
<input type=button value=" Print Voucher " onClick="printit()">
```

The print function is defined as below:

```
<SCRIPT Language="Javascript">
```

```
function printit(){
```

```
    if (document.all) {
```

```
        var WebBrowser = '<OBJECT ID="WebBrowser1"'
```

```
        WIDTH=200 HEIGHT=200 CLASSID="CLSID:8856F961-340A-11D0-A96B-00C04FD705A2"></OBJECT>';
```

```
        document.body.insertAdjacentHTML('beforeEnd',  
        WebBrowser);
```

```
        WebBrowser1.ExecWB(6, 2);
```

```
        WebBrowser1.outerHTML = ";
```

```
    }
```

```
    else{
```

```
        window.print() ;
```

```
    }
```

```
}
```

```
</SCRIPT>
```

5.6 Summary

In this system implementation phase, nearly all the design phases that have been presented and directed toward a final objective that needs to translate representation of system into a form that can be understood by computer. Overall, the primary goal of this phase is to produce a simple, clear source code with internal documentation that will ease the processes of a verification, debugging, testing, modification and further enhancement.

6.0 System Testing

6.1 Introduction

Testing is a critical element of system quality assurance and represents the ultimate review of specification, design and coding. There are several types of testing: unit testing, module testing, integration testing and system testing.

6.2 Unit Testing

Individual components in my system are tested to ensure that they operate correctly. Each component is tested independently, without integrated with other component. All function on each button is examine to ensure it perform the entitle output such as hyperlink to the right page, call the right function to execute, display the correct message according to the error and eliminates all the syntax faults occurred.

6.3 Module Testing

Module testing is a collection of components or units testing. A module encapsulates related components in order to ensure correct flow of logic and events.

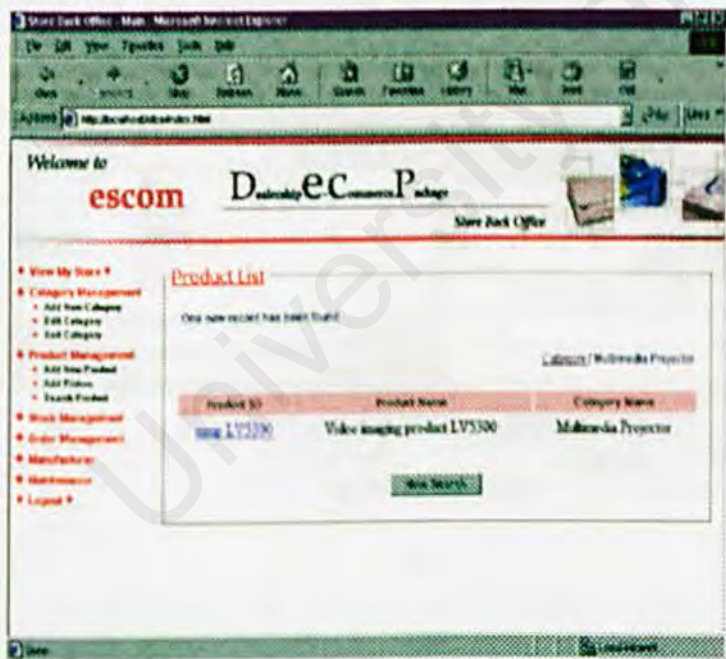
6.3.1 Module Testing on Product Management Module

6.3.1.1 Add Product

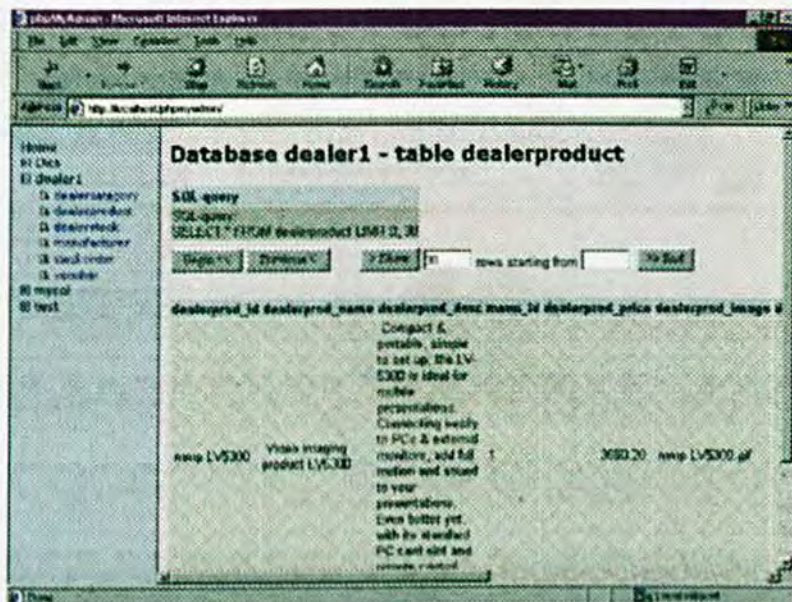
First, I click Add New Product to add new record of product. The product name is Video Imaging Product LV5300.



When I submit the form, it will go to product list to show the new record has been found.

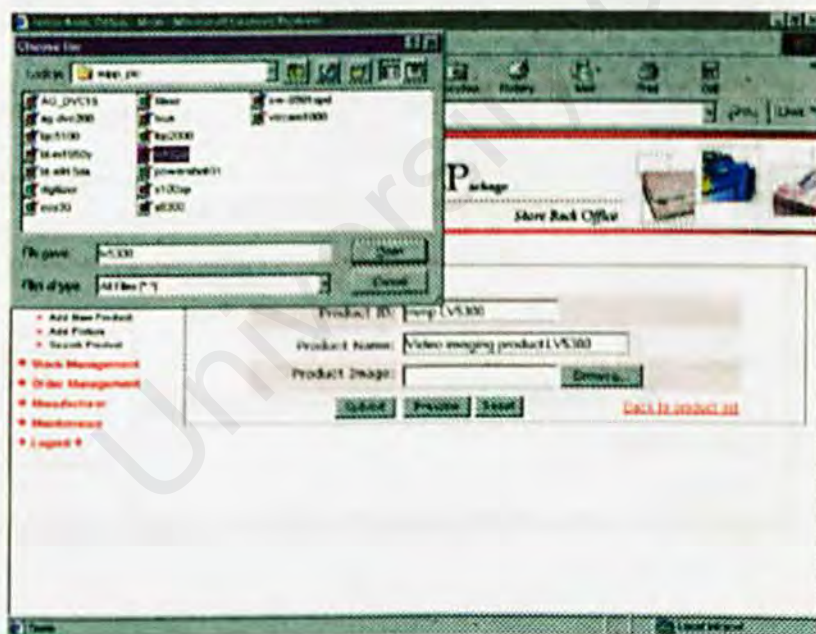


To make sure the record has been insert into database, I check the product table of database and I found the record. Product image use product id as file name: mmp LV5300.gif



6.3.1.2 Add Picture

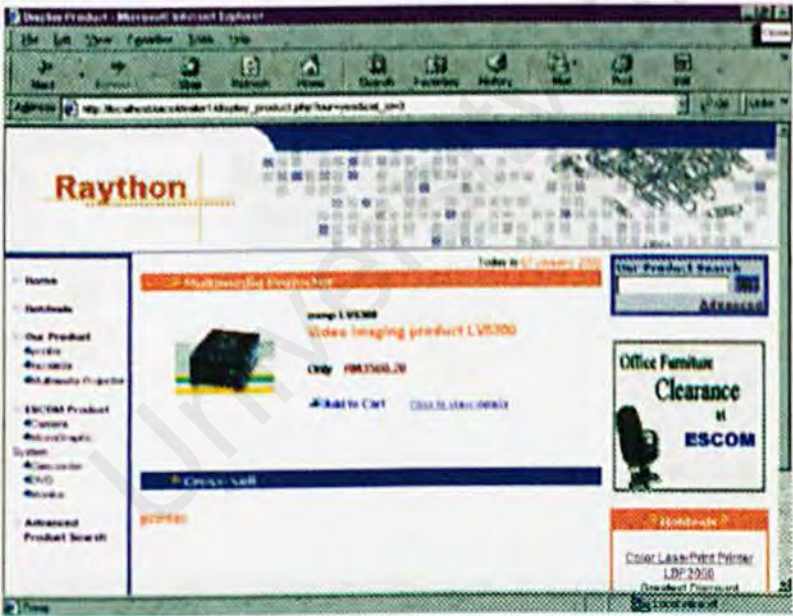
To add picture of the product, I click 'Add Picture' on the navigation. I browse picture from the local directory and open the picture.



I click preview to view the image ensure that is the picture that I want before I click submit to save.

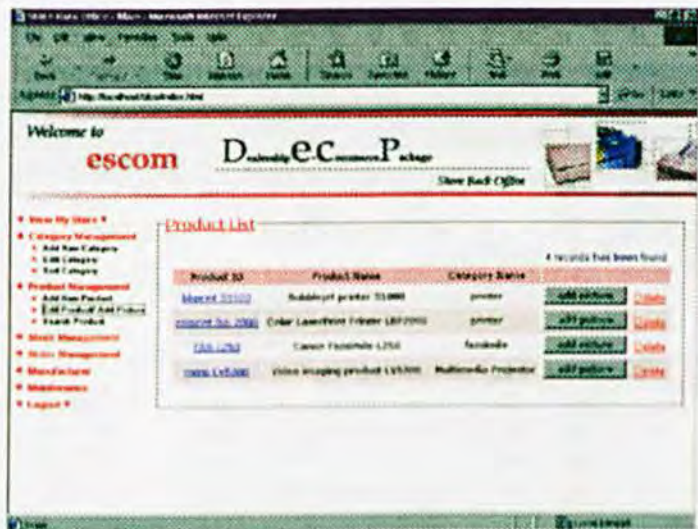


I click 'View My Store' to view the web site to ensure the data of products has been successfully upload and can be view by users.



6.3.1.3 Edit/ delete Product

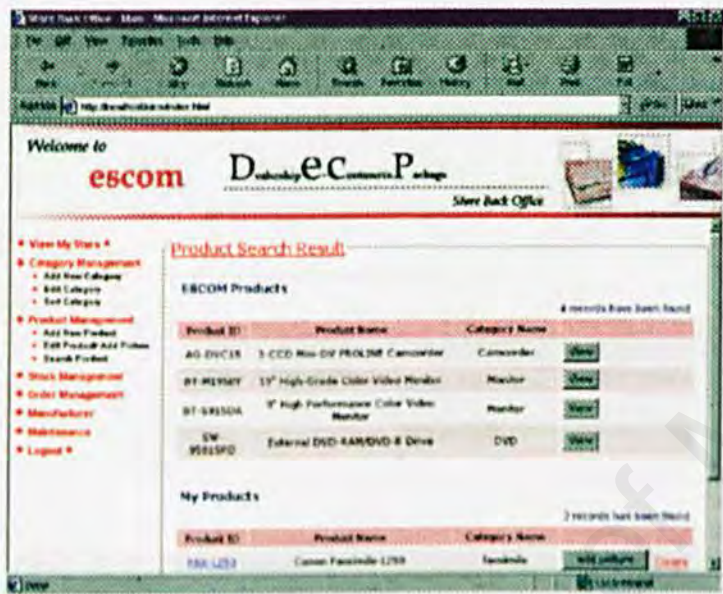
I click 'Edit Product' and then click 'Delete' to delete particular product. A delete confirmation message showed to ask whether confirm to delete.



When I submit OK, I go to database to check the data has been deleted or not.

6.3.1.4 Search Product

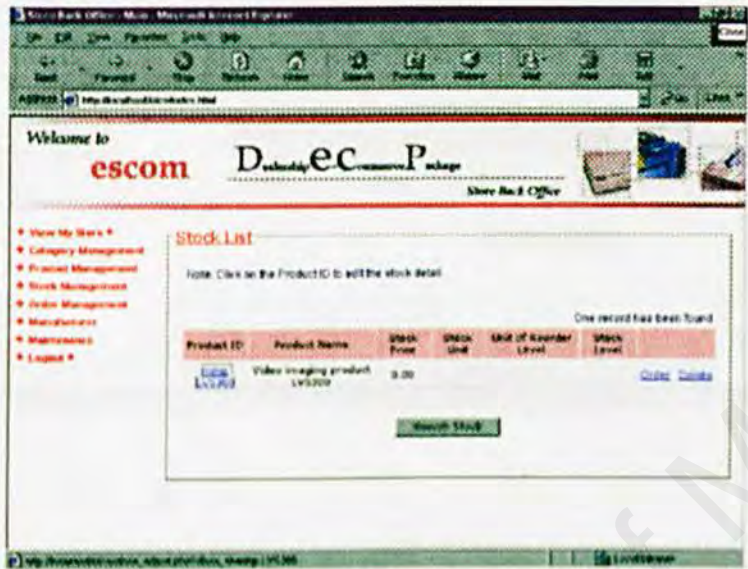
I click 'Search Product' to search product by product id, product name, category name under ESCOM or my own company. I enter 5 in the text field of product id and select all products, so all the products with 5 in product id will be retrieved.



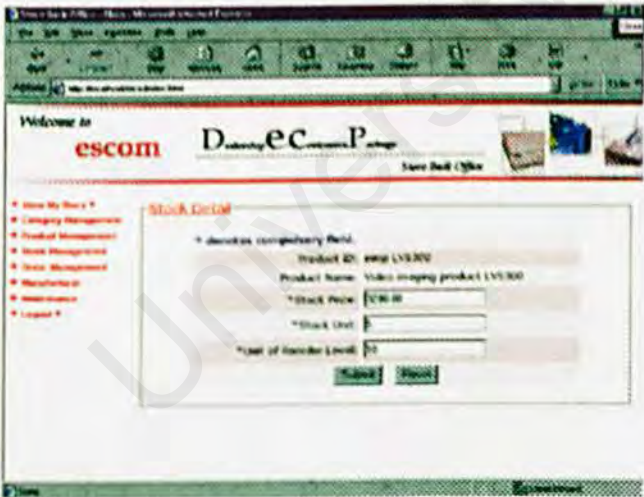
6.3.2 Module Testing on Stock Management Module

6.3.2.1 Edit Stock

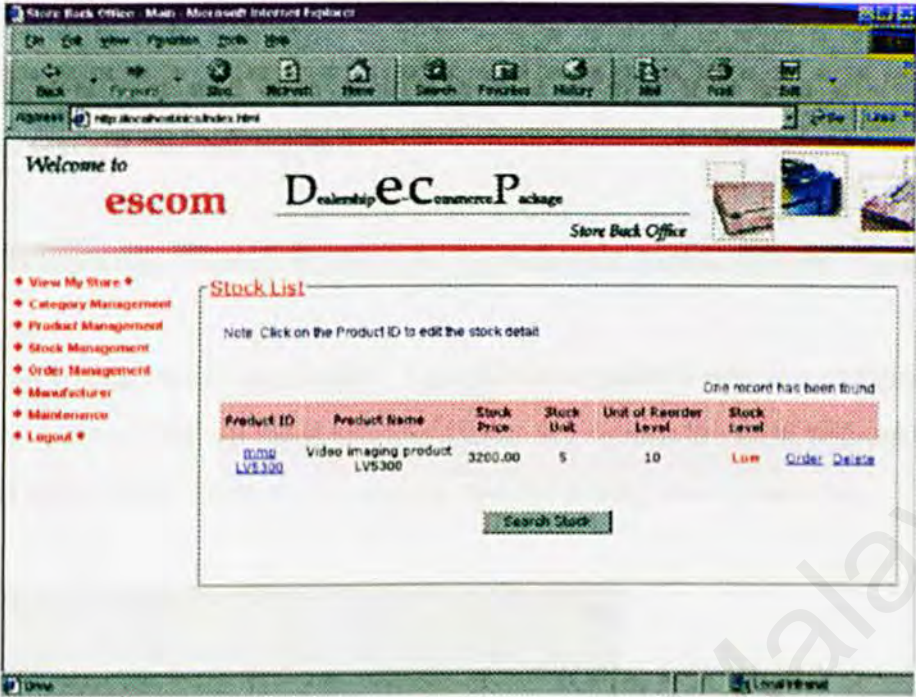
When I add product in Product Management Module, it will add record to the stock list. I go to 'Stock List' to check the stock record.



The stock details in the stock list are empty, so click on the product id to edit stock detail.



The stock detail entered will show on the stock list. The stock level is shown precisely to remind the dealer to reorder stock.



6.4 Integration Testing

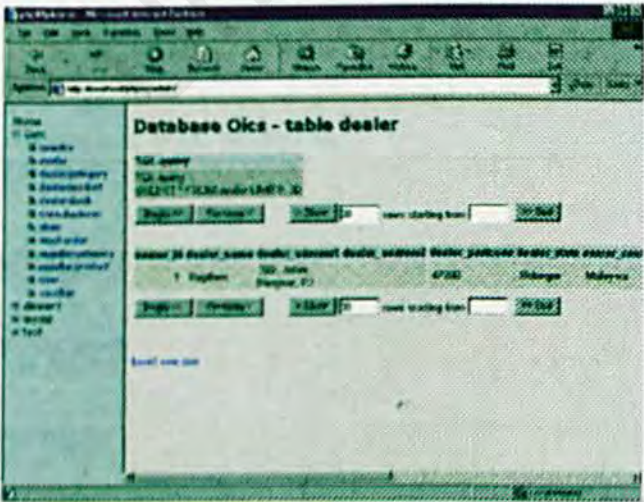
Integration testing is used to test for the combination of the **two independent** modules that are working together.

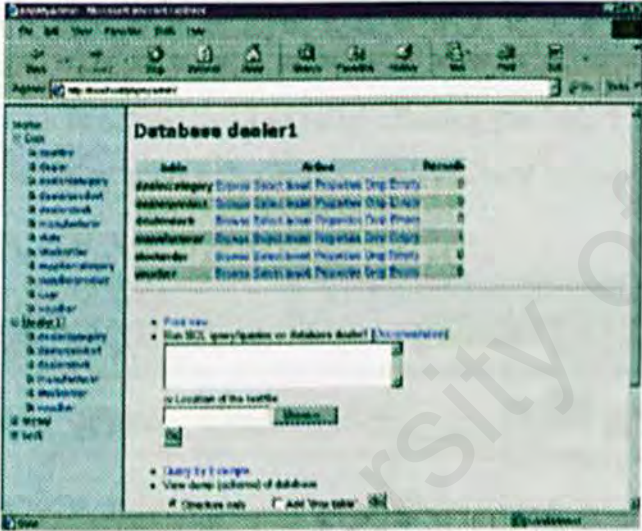
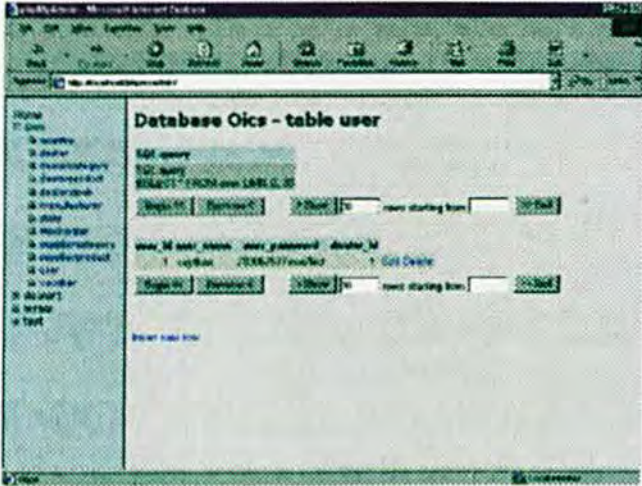
6.4.1 Integration Testing on Register Module and Authentication Module

To test on dealer registration, I go to host supplier's web site and click the 'New Member' button to fill up the registration form. If I submit the form without enter phone which is compulsory field, error message will be prompt out to warn me.



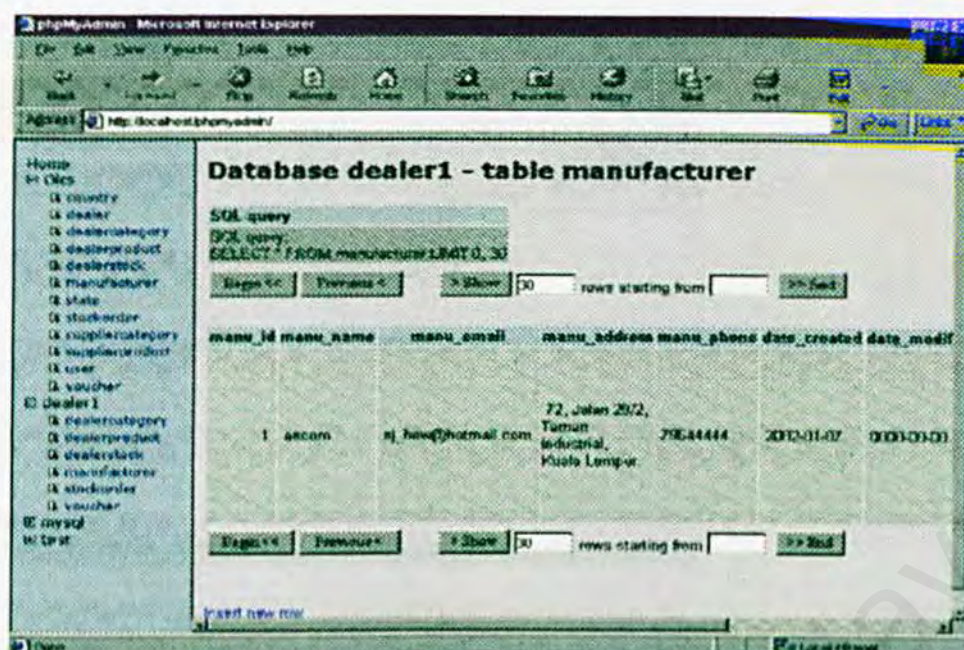
Once I submit the form, a new record will be added into dealer and user database. I open another browser to check the database.



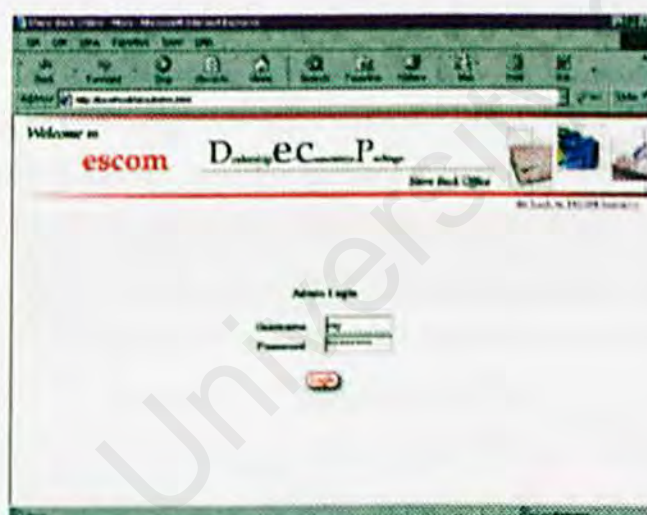


At the same time, new database names dealer1 has been created that contains 6 tables.

I go to manufacturer table of dealer1 database to make sure that a manufacturer record-escom has been added in.



I go to admin login page by clicking the link 'Login DECP store back office' on escom web site. I enter username and password to access to the store back office.



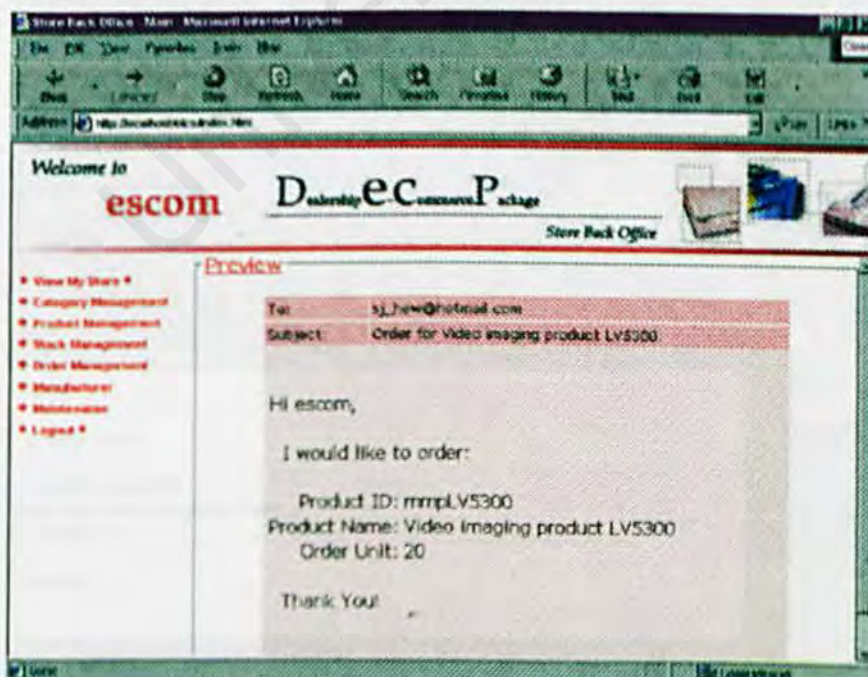
If my username or password is wrong, it will show error message.



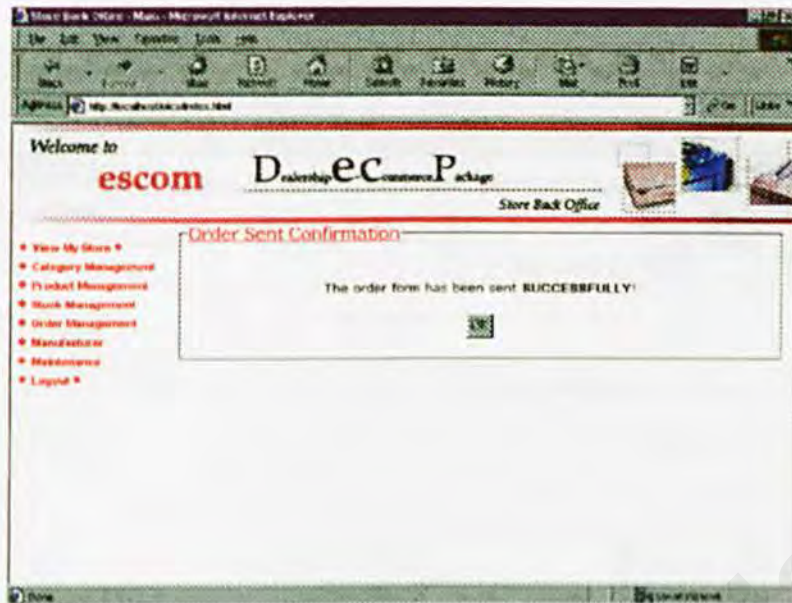
6.4.2 Integration Testing on Order Management Module and Stock Management Module

6.4.2.1 Send Order

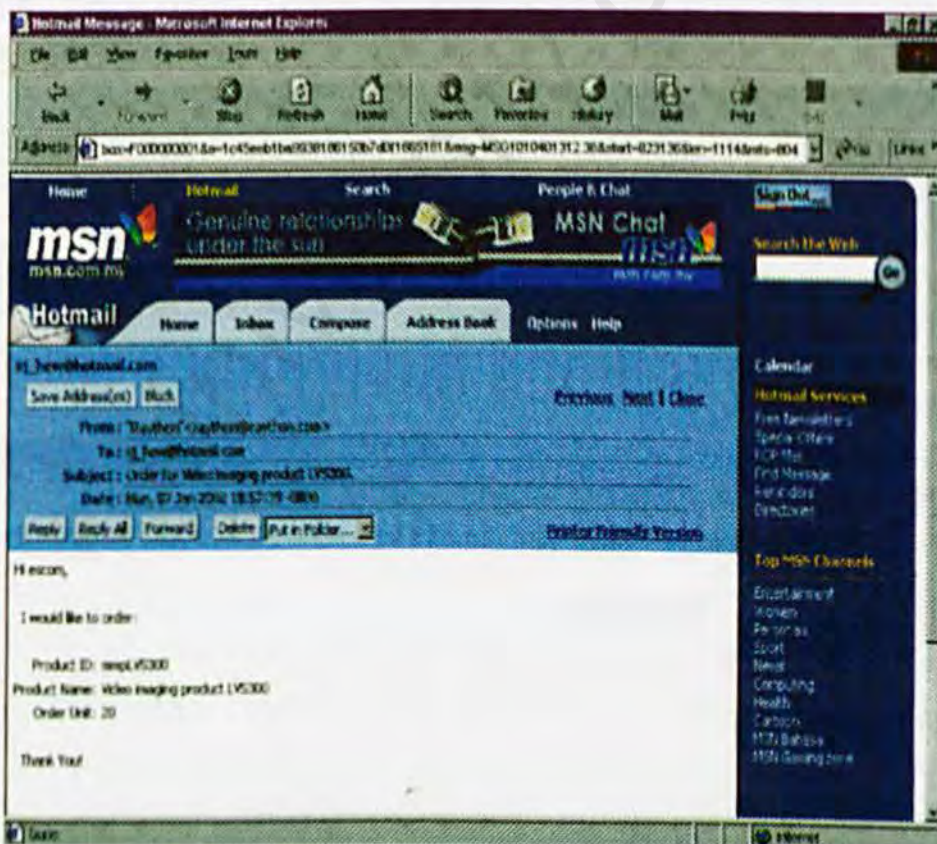
I click 'Send Order' to order stock from manufacturer. I click on the link 'Search from stock list' to search the product that I want to order from the stock list. After get the product id and product name, I enter the order unit and select manufacturer. I click on the 'Preview' button to view the content of e-mail.



After send the e-mail, there is a notification message to show that e-mail has been sent successfully.



I will open another browser to sign in the e-mail account to check whether the e-mail has been sent.

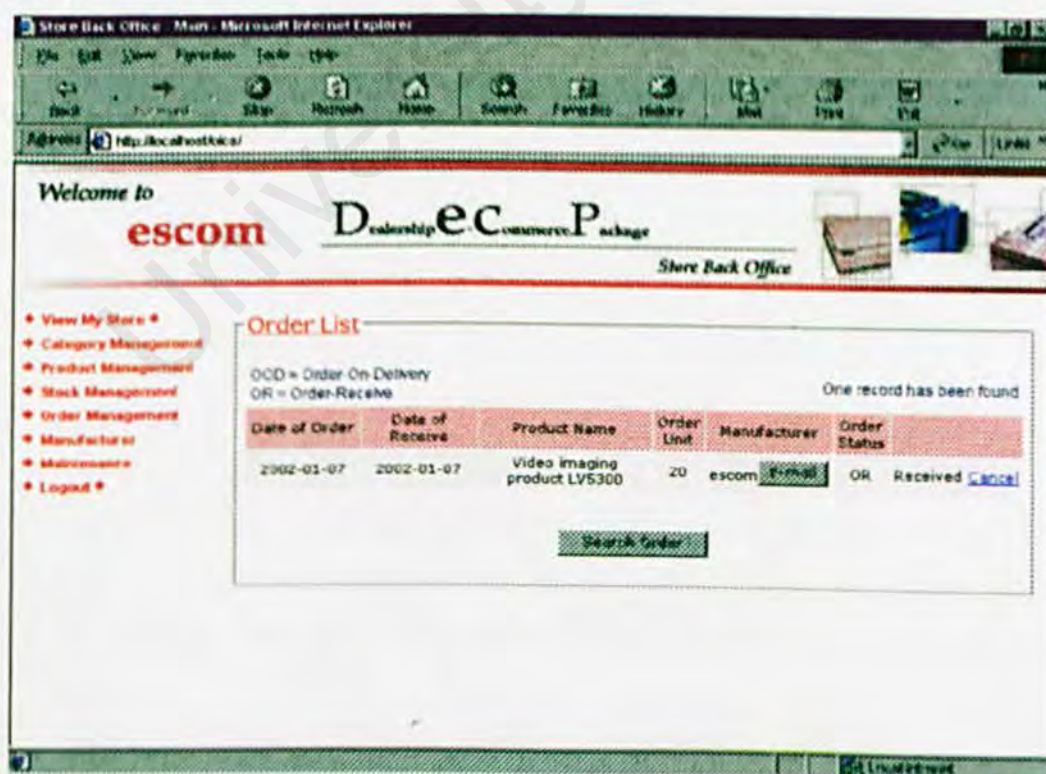


6.4.2.1 Receive Order

I go to 'Receive Order' to view data of order.

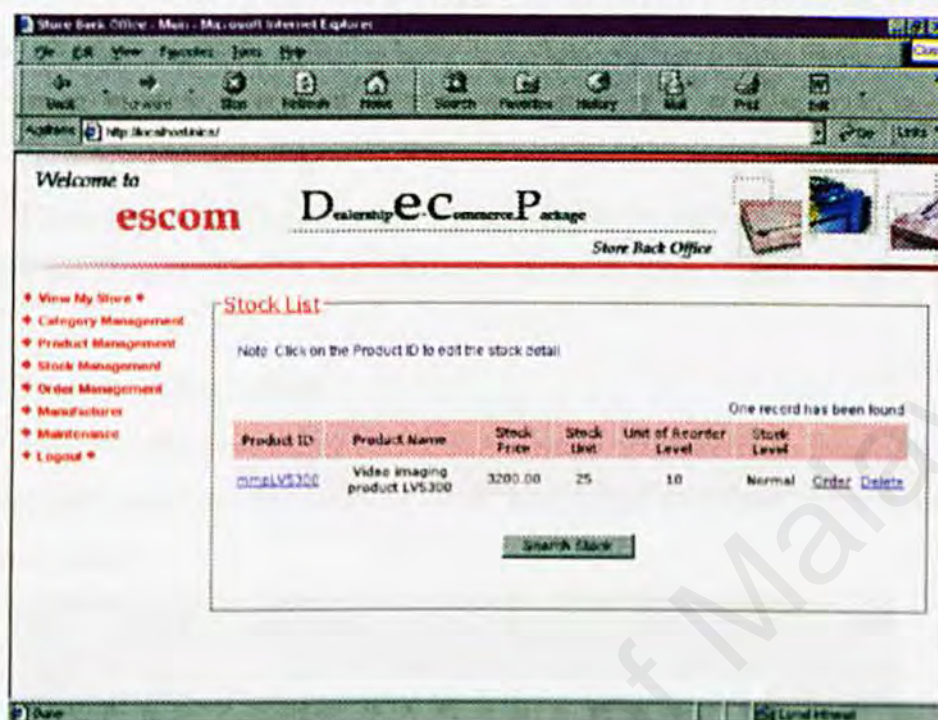


If stock received incomplete or not satisfied, I will click 'Send E-mail' to send e-mail to the manufacturer to report the case. If stock that I receive is complete, I will click 'Verify Order'.



Date of Receive has been notified and order status change to **OR (Order-Received)**.

Now, I will move to stock management to view the changes after the stock ordering.



Stock unit has been increased to 25 and stock level change to normal.

6.5 System Testing

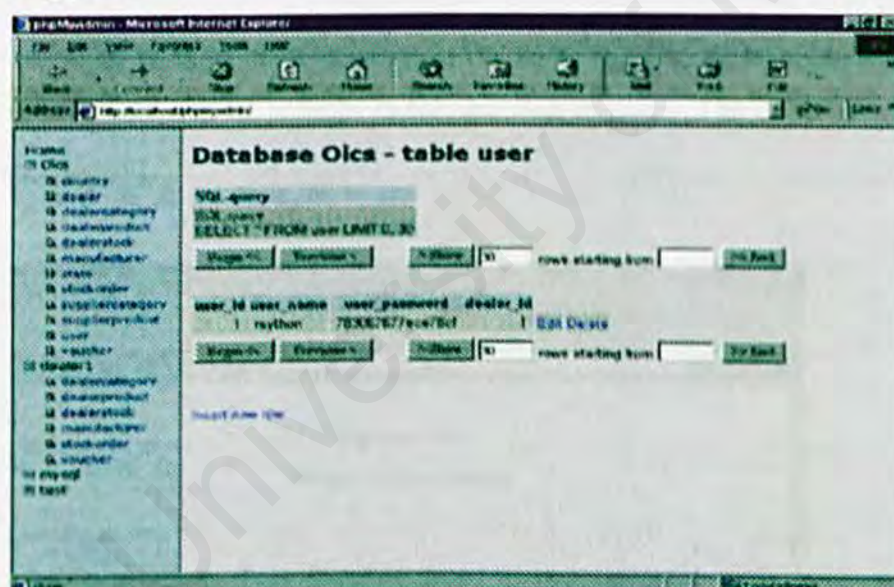
System testing is difference from unit testing and integration testing. System testing is the ultimate testing procedure. System tests study all the concerns issue and behaviors that can only be exposed by testing the entire integrated system or major part of it.

6.5.1 Security Testing

The security testing is to verify the protection mechanism in the system against improper penetration. The system security is tested as three differences way as below:

6.5.1.1 Password Encryption

Password that entered by dealer is encrypted using MySQL function. That means password that view from the database is not the original password, it has been processed using encryption.



6.5.1.2 Password Case Sensitive

Password to access to the store back office is set to case sensitive, means that if password is raython and admin enter the password with RAYTHON, it will prompt error message.



6.5.1.3 Set Cookies

The username cookie and password cookie will be set when user log in. The cookies will be checked to avoid user accessing the page without logging in to the system. The illegal action page will be prompt to ask user log in again. The cookies will be deleted when user logout.



6.6 Summary

Generally, the main objectives of the project as defined in earlier phase have been achieved. The system is able to handle the dealer registration and create new account for each new member. Besides that, it can handle and maintain the database for each dealer admin. The system is able to built dynamic web site and handle upload data. This system also provides safeguard to prevent the unauthorized users from accessing or modifying the system or database.

University of Malaya

7.0 System Evaluation and Conclusion

7.1 Introduction

Evaluation is the ultimate phase of developing a system and an important phase before delivery the system to the end users. Evaluation was related to user environment, attitudes, information priorities and several other concerns that are to be considered carefully before effectiveness can be concluded. At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

7.2 Problems and solutions

7.2.1 Difficulties in choosing a Programming Language

In the market, there are several popular programming language used for web development. Choosing a suitable programming language was a critical process as all tools have their own strengths and weakness.

In order to solve this problem, I search information from Internet and study on the strengths and weaknesses of each programming language. I have chosen a programming language that support all the requirements defined in my system. The information in the Internet helps me a lot in making up the decision.

7.2.2 Difficulties in mastering and debugging PHP

No text editor for PHP and done by typing, this can easily cause parse error in the program. In the market, do not have any debugger for PHP and all have to be done by manually. I have faced some debugging problems in tracing the errors in my system and I found I have used much time in debugging code.

The solution is to copy and learn the codes that done by other programmer from Internet. Besides that, I also join some phorum on web to increase my knowledge on PHP. This problem can be decreased after I have experience on writing PHP program.

7.2.3 Using Windows 98 instead of Windows 2000 for VIVA

As defined in the 3181 report, I have used Windows 2000 to develop my system. However, I was sharing a PC with my other partners who use Windows 98 and the lab assistance mention that it is not possible to install dual OS in one PC.

Therefore, I have used Windows 2000 for VIVA presentation. This do not cause any crash in my system because I just transfer my end system from Windows 2000 to Windows 98 for demo purpose.

7.3 Evaluation by End User

Evaluation by end user was collect feedback and comments from the users after they test on my system. Evaluation can be positive and negative. Through this evaluation, I can know that how is my system meet their need in business, which part is the most attractive part and which parts need to be improved. I have found 5 end users whose are electronic products dealers to test on my system and answer my questionnaire (appendix).

From the evaluation made by end users, the most attractive section in my system is the user-friendly and easy-to-use application to built their own online product catalog. Through this system, they feel that creating a dynamic web site not a tough job. After trying on the Product Management module to upload data to the web, they feel satisfy and cannot believe they can do such things even though they do not have any skills on web developing.

The second most attractive section in my system is the stock management that will show the stock status to the admin. They will be aware and prepare for the stock ordering when they see the Low and Critical level.

However, some of them do not get use in using e-mail application to order stock from manufacturer due to they usually order through phone ordering or go to manufacturer's shop. Anyway, the end users feel that this is a good start to use web-based application because nowadays electronic mail becomes very popular and also very cheap.

7.4 System Strengths

7.4.1 Easy-to-use Application

Ease-of-use is most important aspect in developing this system. The system provides easy-to-use application to dealers to manage their stock in the shortest time and lowest cost. Dealers can check which stock need to be ordered soon just by clicking a button and order stock using the customized order form through e-mail.

7.4.2 No Geographical Barrier

Dealer does not have to worry about the geographical barrier when using the Online Inventory Control System. Business can be deal between dealer and users from any states in Malaysia through Internet. Dealers can also order stock from manufacturer from other states through e-mail application.

7.4.3 User-friendly Interface

My system designed with user-friendly Graphic User Interface (GUI) components, such as interactive button, hyperlink to other pages, dynamic side navigation etc. This is used to minimize the user actions when performing certain task.

7.4.4 Custom password validation

A custom password-authentication system is created to prevent unauthorized users from accessing the page if they do not have any permission to view. More importantly, the authorized users are prohibited from accessing the functionality, which is out of their privilege.

7.5 System Constraints and Future Enhancements

7.5.1 Integration with three other modules of DECP

Dealership E-Commerce Package consists of four independent modules and OICS is one of the four. So, if OICS can integrate with three other modules: Configurable Web Templates, Online Shopping Cart and Ordering System and E-Payment System, it will become a very powerful system. Unfortunately, due to time limitation and some integration problems, we have to present our system independently. The ability of planning time schedule and team member cooperation and discussion can be improved to obtain excellent result.

7.6 Summary

System Evaluation is the last phase in the system development. It is an evaluation and review process for the end system. Through this evaluation, developer can review the problems encountered and solution to solve it. Moreover can understand more about the system strengths and constraints. Then, a more complete and comprehensive system can be developed in the future enhancement.

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Conclusion

Online Inventory Control System (OICS) is a start to the web-based inventory management. Adjusting stock, ordering stock, updating stock, creating product catalog and dynamic web site all can be done by the dealers themselves through Internet without any cost. Development of the whole system is not an easy task because this system still fresh to the dealers in Malaysia. So, many considerations have been involved and many objectives have been targeted, but it still can be considered as a contemporary effort to achieve the goals. Overall, this project has achieved and fulfilled the objectives and requirements as determined during analysis phase. Moreover, this system has obtained good evaluation and feedback from the end user.

Although this system probably cannot be considered advanced or complex, the successful development of the OICS is the first step towards more comprehensive and innovative system development of inventory control in future. The problems and experiences gained during the system development definitely provide very useful foundation in my future endeavors.

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